



## HARRIS CORPORATION STANDS BEHIND COLLEGE WITH \$1.25 MILLION GIFT

Since 2012, Harris Corporation and the College of Engineering have worked to establish a strategic partnership that is a true win for all involved. The partnership is characterized by a single guiding principle—the development of future engineering talent. As such, Harris is rewriting the playbook for how companies can most effectively partner with academia.

In terms of breadth and depth, Harris's contributions to the academic life of the College are unparalleled. The company has invested considerable financial and human resources, supporting a range of professional development activities for undergraduates, and working collaboratively with student teams through senior capstone design projects. The cumulative result of these engagements is a robust talent pipeline of summer interns and new college graduates for Harris Corporation. In just four years' time, the company has emerged as the leading employment destination for Villanova engineering graduates. In 2017, its recruiting yield was unprecedented—10 full-time employees and 15 summer interns, which is twice the amount any company has recruited in a single year.

“Our work with Villanova students has been extremely rewarding,” says Harris Corporation Chairman, President and CEO William M. Brown '84 ME, '87 MSME. “Our interactions have proven that the College of Engineering is preparing them very well for their careers.”

*In spring 2017, Harris Corporation Chairman, President and CEO William M. Brown '84 ME, '87 MSME (front row, far left) returned to Villanova University to meet with more than two dozen engineering students who accepted internships or employment offers from Harris Corporation. They were joined by Provost Patrick G. Maggitti, PhD (front row, far right).*

Without question, the most exciting and dynamic aspect of the partnership is the Villanova Summer Innovation Incubator, which was launched in summer 2015. Through VSII, self-directed teams of engineering students engage in an open design process to solve real-world problems. This past fall, Harris Corporation established a \$1 million endowment fund in support of VSII, which will be renamed the Harris Summer Innovation Program. The company simultaneously committed to providing five years' general operating support to HSIP while the endowment fund matures, bringing the total commitment to \$1.25 million. It is the single largest corporate gift in the College's history.

Drosdick Endowed Dean Gary A. Gabriele, PhD, says, “I have no doubt that the students who participate in this program are better prepared to meet the demands of our modern world, and I'm pleased that Harris will continue to recruit such talented engineers from this program for years to come. Thanks to Harris, the College is well-positioned to assume its rightful status as one of the most innovative engineering programs in the world.”

### ABOUT HARRIS CORPORATION

Harris Corporation is a leading technology innovator, supporting government and commercial customers worldwide through three business segments: Communications Systems, Electronic Systems, and Space and Intelligence Systems. Based in Melbourne, Florida, with \$6 billion in annual revenue, 45 percent of its 17,000-person-global workforce are engineers and scientists.

## Message from the Dean

It is fitting that the cover story of this issue of *VEU* celebrates our strategic partnership with Harris Corporation, which recently donated \$1.25 million to support and endow the Harris Summer Innovation Program. This extraordinary gift—the largest corporate contribution in the College's history—caps a decade of increasing “win-win” engagements with industry that have helped establish Villanova as one of the country's most innovative engineering programs. Last year alone, more than 20 partners—large and small and representing most major industries—contributed roughly \$800,000 (and countless volunteer hours) that directly enhanced the quality of our teaching and research.

The College began recruiting corporate partners in earnest in 2010 with the inception of the Multidisciplinary Design Laboratory. The facility serves as a corporate engagement vehicle, allowing teams of mechanical, electrical and computer engineers to work on real-world, company-defined, capstone design projects. In addition, industry partners and alumni serve as mentors to students through our professional development program, Career Compass (see page 3). Our research centers and labs provide faculty and students—undergraduate through PhD—the opportunity to work side-by-side with representatives from industry, academia, government and philanthropic sectors. The Villanova Urban Stormwater Partnership, for example, has more than a dozen partners and members supporting its mission to advance the practice of comprehensive stormwater management. Industrial partnerships also are facilitating ground-breaking research in the Center for Energy-Smart Electronic Systems and applied sustainability studies through the RISE (Resilient Innovation through Sustainable Engineering) Forum.

As the College of Engineering builds its strategic plan for the next 10 years, we look forward to developing additional opportunities for industry and academia to work together to tackle some of the world's greatest challenges, while preparing the next generation of engineers to solve them.

Gary A. Gabriele, PhD  
Drosdick Endowed Dean



## Campaign Momentum Continues

The most ambitious fundraising initiative in the University's history, For the Greater Great®: The Villanova Campaign to Ignite Change, continues to break records.

As of March 23, 2018, more than 75,200 Villanovans have contributed to the campaign, bringing the campaign total to \$750.3 million—far exceeding its \$600 million goal. Of that total, \$62.5 million has been raised in support of the College of Engineering.

With the campaign set to close in May, fundraising efforts are continuing for the proposed expansion of the Center for Engineering Education and Research, the College's flagship teaching and research facility.

Alumni are also encouraged to help Villanova reach its final campaign goal of 30 percent undergraduate alumni participation by May 31. The participation rate is a widely used measure of alumni satisfaction and a point of distinction for Villanova. Every gift makes a difference in helping the University reach this meaningful goal. Visit [villanova.edu/makeagift](http://villanova.edu/makeagift) to support Villanova.





NASA flight director and College of Engineering alumnus Brian T. Smith '93 EE delivered the 2018 Patrick J. Cunningham, Jr. and Susan Ward '80 Endowed Lecture Series in Engineering.

## Re-energized Engineers' Week Kicks Off with "Girls' Day In"

"We wanted to turn it into more of a celebration," explains Associate Dean of Academic Affairs, Andrea Welker, PhD, PE, when asked about the many events introduced in the College for Engineers' Week, February 18–24, 2018.

Among the variety of activities:

- A presentation and networking session with representatives of ARCO, a design/build general contractor in Philadelphia
- Order of the Engineer Ring Ceremony
- Bagels and K'Nex competition
- Online speed mentoring with the Villanova University Engineering Alumni Society
- A presentation from Michael Baker International about a local bridge project
- Art of Engineering exhibit featuring the creative works of engineering faculty, staff, students and alumni, which now adorn the walls of the Center for Engineering Education and Research
- VUEAS Awards Presentation for Innovative Teaching and Staff Work Process Improvement
- Engineering Alumni Society Game Watch

Kicking off Engineers' Week was "Girls' Days In: Exploring a Villanova Engineering Degree." More than 60 high school girls, and 50 parents and guidance counselors attended the College of Engineering's first informational program designed to introduce young women to engineering as a major and as a career. Hosted and moderated by Dr. Welker, the half-day event featured panels with female faculty, students and recent alumnae representing each of the College's five majors. They presented a range of aspects of the Villanova Engineering experience—from caring and committed faculty and a collaborative student community, to service learning, STEM outreach and study abroad—that make the College and University such an exciting and rewarding place to pursue an engineering degree. In addition to the panels, participants chose from a variety of breakout sessions, which took them deeper into the individual disciplines.

"We filled the seats in less than two weeks of opening registration, proving there's a definite interest," says Dr. Welker. "Girls' Day In is a wonderful opportunity to encourage the next generation and further demonstrate our commitment to women in engineering. We anticipate it will become an annual—if not semiannual—event!"

(left) Kristin Sample-Lord, PhD, PE, assistant professor of Civil and Environmental Engineering, received the Villanova University Engineering Alumni Society's Innovative Teaching Award.

(right) Colleen Stover, administrative assistant in the Department of Chemical Engineering, was presented with the new VUEAS Work Process Improvement Award.



## ALUMNUS AND NASA FLIGHT DIRECTOR DELIVERS ANNUAL WARD LECTURE

At Villanova University, Engineers' Week culminates in the College of Engineering's annual Patrick J. Cunningham, Jr. and Susan Ward '80 Endowed Lecture Series in Engineering. This year's speaker, NASA flight director Brian T. Smith '93 EE, presented "The International Space Station: Engineering the Unknown."

Describing the International Space Station as "the greatest engineering feat of mankind," Smith explained how, after 11 years of construction and 115 space flights conducted on five different types of launch vehicles, the ISS now serves as a world class orbiting laboratory. "That orbiting laboratory," he added, "has sustained a permanent human presence for over 17 years, making it also a bedroom, bathroom, kitchen, closet, gym and shipping/receiving center." Keeping the ISS operational and supplied is a 24/7 job performed by specialized engineering and operations teams from around the world. Smith noted that despite the wealth of knowledge amassed over the years, and the testing, training and meticulous planning involved in their execution, "Missions do not always go as planned, and sometimes there is not a lot of information available to figure out why." Captivating the audience, his lecture offered real-world examples that Smith personally was involved with, demonstrating how the NASA community uses creative engineering, reverse engineering and real-time engineering to solve problems in the absence of key information.

### Smith's NASA Resume

After graduating from Villanova magna cum laude in 1993, Smith spent five years as a hardware engineer for L-3 Communication Systems—East, where he designed, built and tested communication flight hardware for the International Space Station. In 1998, he moved to Houston, Texas, where he worked for the United Space Alliance as an International Space Station flight controller in NASA's Mission Control Center. In this role he was responsible for all communication systems on the ISS, some of which he designed, built and tested in his previous job. He logged over 3,000 hours in Mission Control as a flight controller.

In February 2005, Smith was selected as a NASA flight director and earned his ISS certification a year later, becoming the 64th flight director in NASA's manned space flight history. Highlights in his NASA career include:

- Leading the first non-Russian unmanned cargo flight to ISS—the European Space Agency's Automated Transfer Vehicle Jules Verne mission
- Serving as NASA's lead flight director for Orbital Science Corporation's Cygnus unmanned cargo mission, Orb-1
- Leading a critical, rapid response team to plan and execute a contingency spacewalk in 11 days to replace a failed computer on the outside of ISS
- Three years later, leading the same team in responding to a similar failure, this time completing the mission in just over two days
- Twice serving as the operations lead to the agency-wide NASA team assembled to investigate the failure of two Russian unmanned cargo spacecraft missions
- Currently leading the first expandable module in manned space flight history, the Bigelow Expandable Activity Module, as well as the Dream Chaser Cargo System, an unmanned cargo spacecraft system

### The Patrick J. Cunningham, Jr. and Susan Ward '80 Endowed Lecture Series in Engineering

Established in 2009 by Villanova Engineering alumnus Susan Ward '80 ChE and her husband Patrick Cunningham, Jr., the series exposes students to experts from various engineering fields and educational opportunities outside the classroom.

## CAREER COMPASS PROGRAM GAINS NATIONAL ATTENTION

As the College of Engineering's groundbreaking Career Compass program continues to evolve and grow, it has attracted the attention of industry groups and engineering educators. Launched in fall 2016, the program ensures that Villanova Engineering graduates possess not only the scientific, mathematical and engineering principles expected of every engineer, but also the professional skills needed to succeed in any career. This past year, Career Compass became part of the Engineering and Construction Contracting Association's "Closing the Gap" initiative, and was featured in "Real World 101," an article in the December 2017 issue of *PRISM*, the flagship publication of the American Society for Engineering Education.

Both "Closing the Gap" and the *PRISM* piece highlight the imperative for academia to keep up with the needs of industry. While specifically focused on helping prepare entry-level engineers for the emerging capital projects industry, the ECC initiative points to widespread demand for college graduates who are prepared for "a dynamic changing global work environment." At the association's annual conference in December, the ECC leadership expressed concern that "current pedagogical approaches and learning environments are not keeping up with professional practice and many educators are not taking advantage of a wealth of industry knowledge (best practices) and experience (lessons learned) in the curricula."

During a plenary discussion with academic institutions involved in the initiative, Frank Falcone '70 CE, '73 MSWREE, AP, PE, D.WRE, the College's director of Professional Development and Experiential Education, presented Career Compass as an example of what's being done within universities to address the disconnect between industry's needs and what academia delivers. More specifically, Villanova and other schools are working with the ECC to develop project management coursework, which, within Career Compass, will make up a fourth-year unit. After the conference, Falcone was pleased to report that, "Our program is at the forefront of new and emerging initiatives in the professional development field."

The *PRISM* piece provided further evidence that Career Compass is, in fact, on the cutting edge of professional development initiatives at engineering schools across the country. Of those featured in the article, including the University of Illinois, Chicago; James Madison University; Stanford University; and Rose-Hulman Institute of Technology, Villanova is the only school requiring a multiyear, credit-bearing professional development program for all engineering undergraduates. Explaining the rationale for Career Compass, Falcone says simply, "We're not just building an engineer; we're creating a professional person."



(above) Frank Falcone '70 CE, '73 MSWREE, AP, PE, D.WRE, the College's director of Professional Development and Experiential Education

(right) Brittany Doyle '12 ChE, a project engineer with Sequence, Inc., enjoys sharing advice with her mentee, Veronica Regina '20 ChE (second from right in group photo).

(below) Alex Metz '13 ME, a mechanical design engineer for CHL Systems, mentors Peter Dethlefs '20 EE (far left in group photo) in the College's Career Compass program.



(left) Rachel Lorge '20 ChE appreciates what's she learned from mentor Katie Edin '15 ME (not pictured).



### Sophomores Gain Invaluable Insight through Career Compass Mentorship Program

Last academic year, the class of 2020 was introduced to Career Compass, the College of Engineering's new professional development program. This year, an alumni mentorship component is helping these now-sophomores begin to build their professional networks and gain advice from alumni who know what it's like to be in their shoes.

Alex Metz '13 ME and Peter Dethlefs '20 EE hit it off from the beginning. Their initial exchanges began with email, but the two have since met over coffee and plan to continue their in-person meetings, which is feasible given that Metz works in the region as a mechanical design engineer for CHL Systems.

Metz says, "I've been impressed with Peter's enthusiasm in building this relationship. Even though we're in different disciplines, I think he's learned a lot. He sees it as an opportunity to supplement what he's learning in school by asking questions about what it's like working in the real world."

Peter holds the same appreciation for the relationship. "I shared with Alex my interest in aerospace, and it turns out he has friends and family in that industry with whom he's going to put me in touch. These are great connections that I know I probably wouldn't have made if it weren't for this program."

Project engineer at Sequence, Inc., Brittany Doyle '12 ChE enjoys sharing advice with mentee Veronica Regina '20 ChE. Doyle believes networking is the No. 1 tool in finding a job and encourages Veronica to take advantage of alumni connections. "I want her to know it's not scary to talk to people like me. If she's comfortable talking to me hopefully that will translate into her feeling comfortable talking to others."

Veronica notes that she now feels more prepared in a networking setting thanks to her relationship with Doyle. Veronica shares, "I've grown professionally through this experience. I had the chance to meet with Brittany right before a professional development event, and she encouraged me to ask a lot of questions when speaking with potential employers. After talking with her, I felt ready."

Katie Edin '15 ME, a commodities trader at Goldman Sachs, remembers what it was like as a student searching for guidance in her career path. She recalls, "I was lucky enough to make some great alumni connections while at Villanova, which helped get me to where I am today. I'm happy to pay it forward and help students navigate that path, which can be pretty intimidating when you're a sophomore."

Rachel Lorge '20 ChE appreciates the perspective Edin provides. Rachel notes, "It's comforting having someone who has just gone through the process to bounce ideas off of and ask questions. I know I'll have more questions as I get closer to graduation, so I hope to continue to grow this relationship."

When asked what advice she has for students starting the program next year, Rachel says, "Take it seriously. At first, I thought this was just another assignment, but if you personalize it to what you're looking for, you will get so much more out of the relationship."



## ENGINEERING ENTREPRENEURSHIP MINOR CULMINATES IN BUSINESS PITCH PRESENTATION

In early December, 33 senior engineering students anxiously huddled in the Idea Accelerator, putting the finishing touches on their final business pitch presentations for the concepts they had labored over for the past two-and-a-half years. The projects ran the gamut, from the local—dishwashers for dorm rooms—to the global—a chip to store medical history in the cloud. While the range of products was diverse, each of the student teams arrived at the final presentations having taken the same journey: conceptualizing, refining, testing, prototyping and creating a business model from scratch as participants in the Engineering Entrepreneurship minor program.

Supported by generous funding from the Kern Family Foundation, the Engineering Entrepreneurship minor began in 2008 with the goal of developing an entrepreneurial mindset in engineering students that would provide them with the skills to become curious about the world around them, make connections between concepts to create innovative solutions, and develop the capacity to recognize the ways that they can create value for an organization and society. Since its inception, the program has continually increased in popularity, and to date, 137 students have graduated with a minor in Engineering Entrepreneurship, and another 33 students are expected to complete the program in 2018.

The 16-credit minor follows a sequence of courses, beginning in the fall semester of sophomore year with a course in Creativity and Innovation. The courses that follow teach students how to identify business opportunities; determine whether their ideas are technically and financially feasible; develop a prototype to test and display their ideas; and finally, develop a business model for their concepts, including aspects of marketing, financing and venture planning. The final course concludes with a presentation to a room of mentors and business professionals, who also are real-life possible investors for the projects they refined over the course of the program.

On December 7, the “boardroom” was abuzz with the senior teams proudly pitching the fruits of their labors. In addition to the DishQuik team’s small, low-cost dishwasher, and the Connected Care team’s medical health information storing chip; the BottleBak team developed a low-cost, disposable CamelBak-type dispenser for water to be sold at outdoor venues; and the Identiguard team constructed a mouth guard for athletes to wear when playing sports that would also detect if they had suffered a head injury. The JoGo team designed a portable Keurig-style coffee maker that could be carried in a backpack; the Pinpoint team developed a sensor for hockey games to detect when the puck goes over the goal line; and the eRoom team developed an app for reserving study spaces on Villanova’s campus.

Students like Peter Paralikas ’18 CpE express appreciation for the program’s director, Edmond Dougherty ’69 EE, ’86 MSCS. “Professor Dougherty is incredibly dedicated to showing us how to succeed, but more than that, he’s passionate about truly helping us realize our own ideas and giving us the resources to bring them to fruition. I know that the methods and ideas I’ve gained from this minor will help me thrive in the workplace.”

Mary Spillane ’18 ME discovered that the minor offered opportunities beyond an engineering discipline alone. “I was able to explore the innovative side of engineering and integrate my creativity. I gained experience working closely with a small team to develop a product from paper to prototype to provisional patent. The minor gave me the tools and knowledge to start a business; the experience of working on a long-term project; and, most importantly, the ability to confidently face challenges and obstacles after graduation.”

*This summer, the College will launch E2SI—the Engineering Entrepreneurship Summer Institute. This newly-redesigned, accelerated program will allow all Villanova students (not just engineering majors) to earn a minor in engineering entrepreneurship through a condensed-but-intense seven-week session.*

## VILLANOVA ENGINEERING EXPERT PARTNERS WITH COMCAST ON FALL DETECTION SYSTEM

It’s been nearly two decades since Moeness Amin, PhD, director of Villanova’s Center for Advanced Communications, began conducting research on sensing through walls using radar. His early work focused on the use of radar imaging technologies to benefit defense, security and the criminal justice system, allowing soldiers and law enforcement officers to map building interiors and locate and apprehend outlaws and adversaries inside enclosed structures. Throughout the past five years, Dr. Amin’s research has evolved to consider civilian applications for this technology. More specifically, with the support of a number of major grants, Dr. Amin is examining the use of radar to detect falls and monitor the elderly in their individual living spaces. His work has been featured in a variety of national and international news media, from *The Atlantic* and *The Wall Street Journal* to the *Daily Mail* and PBS.

In 2017, Dr. Amin’s research caught the attention of global telecommunications conglomerate Comcast, which proposed a partnership that would link his work to their smart home technology. Dr. Amin says, “The fall detection system could work like a home security system, where there’s a one-time cost for setup and then

a monthly service fee for monitoring.” The next step in the process will be determining the most reliable algorithm for implementing the fall detection technology. “We need a machine-learning algorithm that can detect the difference between a fall and human daily activities, and does not confuse falling with similar motions, like sitting, so that costly false alarms are prevented,” he explains. The ultimate goal of Dr. Amin’s research in this area of health care technology is to make a radar that is personalized and specific to the individual being monitored, which is a form of a “cognitive radar.” It would be self-learning and would tune its motion classification parameters as it continues observing the person, delivering superior performance to a radar designed for a generic person.



**Moeness Amin, PhD, director of Villanova’s Center for Advanced Communications, accepts a two-year honorary appointment as a Visiting Professorial Fellow from Professor Eliathamby Ambikairajah, PhD, Head of School of Electrical Engineering and Telecommunications, University of New South Wales.**

## FACULTY WORKING TO MAKE BATTING PRACTICE A VIRTUAL REALITY

Mark Jupina, PhD, assistant professor of Electrical and Computer Engineering, is leading a new collaborative effort involving faculty and students in the Colleges of Engineering and Liberal Arts and Sciences that will provide players on the Villanova baseball team the opportunity to take virtual batting practice, whether it be in the University's virtual reality CAVE environment, on Villanova's ball field while wearing a Microsoft HoloLens or anywhere while wearing an Oculus Rift.

The project, PITCHvr, uses Major League Baseball pitch data available from the PITCHfx database. From the PITCHfx data parameters, the engineers use a model to recreate the motions of a pitched ball—including the path, velocity, orientation and spin of the baseball—from the batters' perspective. In the virtual or augmented realm, there are no limits as to how the training experience can be varied and analyzed. For example, the use of sound can be added to help train a batter's foveal vision. Dr. Jupina's algorithm generates a unique audio signature for each virtual pitch created. When this audio is played along with the virtual pitch, the audio helps to train an individual's eyes in tracking the motion of the baseball.

In cooperation with Professor and Chair Thomas Toppino, PhD, and Gerald Long, PhD, in the Department of Psychological and Brain Sciences, the developers also plan to eventually use existing neurofeedback and eye tracking technology along with their own visual feedback designs to assist the user in generating the correct predictive eye saccades during dynamic visual acuity training.

Dr. Jupina says, "Virtual batting practice will allow batters to see more pitches and hone their pitch recognition abilities, while at the same time provide an opportunity for the Villanova research community to design new systems, which will lead to a better understanding of how to further enhance a player's vision training experience."

Working closely with Villanova's head baseball coach Kevin Mulvey '13 CLAS, a former standout pitcher for the University who reached the major leagues, has provided Dr. Jupina with input on the experience and how it could impact his players. "The opportunity to work alongside Dr. Jupina and his team as he put together the amazing experience that PITCHvr offers has been incredible," says Mulvey. "Being able to answer

questions, add input and enhance the overall experience from the baseball side of things was fun and exciting. Thanks to Dr. Jupina's efforts, our student-athletes are now able to experience something that wouldn't otherwise be available to them had it not been for his willingness to include our program from the start."

Recently, the Villanova baseball team began vision training in the CAVE with 3-D animations of MLB pitching. Players were able to step into the CAVE and, in a virtual environment, see what it's like to stand in the batter's box against some of MLB's hardest throwing pitchers (such as Red Sox closer Craig Kimbrel and Yankees hurler Aroldis Chapman) and nastiest sliders (from the likes of Indians pitcher Corey Kluber and others). Beyond this, realistic pitches of tomorrow can be generated by PITCHvr where even faster fast balls and nastier sliders, cutters and splitters will be seen by the players.

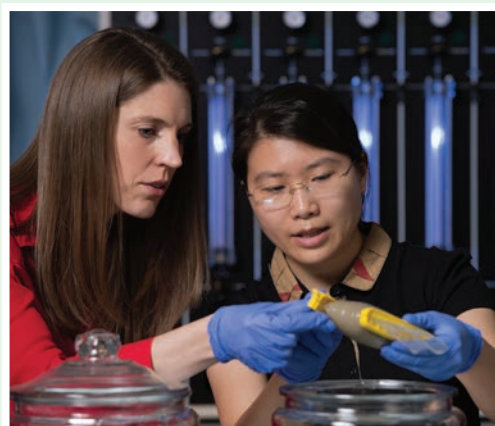
Shortstop Timothy Lilly '20 VSB liked what he saw his first time in the CAVE. "Anything that can help you simulate live pitching makes you more comfortable in the batter's box."

Dr. Jupina and his collaborators plan to add in a background of Villanova Baseball's home field, as well as more realistic animations of pitching avatars. The last step will be to capture the bat's motion live during an actual swing utilizing new imaging technology and incorporate a virtual batted ball's motion into the animation. Thereby, batters will be able to obtain metrics such as launch angle and velocity of the batted ball, distance traveled, etc.

A true multidisciplinary effort, in addition to the psychology faculty, PITCHvr has engaged Computing Sciences faculty Frank Klassner, PhD, professor and director of Villanova's Center of Excellence in Enterprise Technology; Assistant Professor Edward Kim, PhD; and Andrew Grace, who offer expertise in computer animation and virtual reality. Also involved from the College of Engineering are Edmond Dougherty, Engineering Entrepreneurship director and president of Novation Tech LLC, who has brought to the table his knowledge of artificial intelligence and embedded systems; and Electrical and Computer Engineering Professor Ahmad Hoorfar, PhD, who specializes in antennas and radio frequency sensing and imaging.



Villanova Wildcats shortstop Timothy Lilly '20 VSB was the first to take virtual batting practice with PITCHvr in the University's CAVE.



Geotechnical expert Kristin Sample-Lord, PhD, assistant professor of Civil and Environmental Engineering

## PROFESSOR'S GEOTECHNICAL RESEARCH MAKES ITS MARK

Kristin Sample-Lord, PhD, PE, is only in her third year as assistant professor of Civil and Environmental Engineering at Villanova University. Her limited tenure, however, has not in any way limited her professional progress. During the fall semester, she was awarded seed grants from the National Science Foundation for research she's collaborating on with other universities; two of her journal publications received special recognition; and she and Virginia Smith, PhD, assistant professor of Civil and Environmental Engineering, were awarded \$245,000 from the PA Department of Environmental Protection's Growing Greener Program.

An expert in geotechnical and geoenvironmental engineering, Dr. Sample-Lord's specialties include soil barrier systems for protection of human health and the environment, green infrastructure for stormwater management, and innovative methods for laboratory testing of soil properties. Her expertise was

acknowledged by the American Society of Civil Engineers, which selected her article "Membrane Behavior of Unsaturated Sodium Bentonite" as the editor's choice for the January 2018 volume of the *Journal of Geotechnical and Geoenvironmental Engineering*. The Alliance of Crop, Soil, and Environmental Science Societies similarly recognized her work, choosing "Apparatus for Measuring Coupled Membrane and Diffusion Behavior of Unsaturated Sodium Bentonite" for special promotion in the February 2018 volume of *CSA News Magazine*. Her research also led to two \$5,000 NSF seed grants—subawards from Syracuse University—to study geosynthetic clay liners and cyclic soil testing.

On the PA DEP Growing Greener project—"Impact of Nutrient and Fine Sediment Accumulation and Distribution on Stormwater Rain Garden Performance"—Dr. Sample-Lord says she and Dr. Smith are "leveraging their combined expertise in water and soil to study the movement and impact of sediment, water and contaminants" on Villanova's four campus rain gardens. Professors Andrea Welker, PhD, PE, associate dean of academic affairs, and Bridget Wadzuk, PhD, are serving as co-principal investigators on the three-year project.

In addition to her professional success this year, Dr. Sample-Lord and her husband welcomed a new family member in February. Vivian Leigh Lord joined big sister Ava (4), and Dr. Sample-Lord is busy mastering the work/life balance!

## CHEMICAL ENGINEERING RESEARCH INVESTIGATES POWER OF SEDIMENT MICROBIAL FUEL CELLS

Microbial fuel cells convert chemical energy to electrical energy by the action of microorganisms. As such, they have been explored as a renewable source of power, ideal for remote areas where access to electricity is limited. While fundamental research in this field began in the late 1970s, little progress has been made in moving toward practical applications. Zuyi “Jacky” Huang, PhD, associate professor of Chemical Engineering, and director of the Biological and Environmental Systems Engineering Laboratory, has made it his mission to scale up the use of MFCs, particularly sediment microbial fuel cells. The University’s campus wetlands are serving as his living laboratory.

“Our goal is to develop an MFC to power a sensor and remove pollutants from stormwater in the wetlands,” says Dr. Huang. Sophomore Chemical Engineering major Brendan Gorman worked with Dr. Huang’s team through a Villanova Undergraduate Research Fellowship. His research titled “Optimization of Wetland Microbial Fuel Cells (wMFC) Using Novel Electrodes” was presented at the University’s 2017 Undergraduate Research Symposium. Brendan explains how the process works, “The anode is buried in sediment, which is rich in organic matter and exoelectrogenic microorganisms. The organic matter is oxidized by those organisms, sending electrons from the anode to the cathode, which lies in the water above the sediment.”

Step one of this multiphase process involved determining whether, in fact, the wetlands would work as a source for the MFCs. Once Dr. Huang’s team established that

the environment was conducive, they set about researching the wetlands’ various soil compositions, noting that different soils consist of different organisms and vary in their ability to generate power. Given the typically low power density production of MFCs, the third and current phase of the research is focused on counteracting that issue by designing electrodes that provide efficient performance at a reasonable cost. A number of variables will be adjusted in order to optimize the wMFC design. These include electrode materials and design, placement, and testing with source water instead of distilled water. Finally, the wMFC will be combined with a power management system (PMS) to accumulate energy for increased electrical output that can power sensors in remote areas.

Dr. Huang says, “By combining the MFC with a proper PMS, renewable and maintenance-free electricity can be generated to power wetland sensors for many environmental monitoring applications.” With a seed grant from the Villanova Center for the Advancement of Sustainability in Engineering, and the support of Civil and Environmental Engineering Professor Bridget Wadzuk, PhD, and Engineering Entrepreneurship Director Edmond Dougherty, Dr. Huang’s group has successfully built the first generation of sediment MFCs at Villanova. Future research will employ a computational fluid dynamics approach to scale up the size of the fuel cell in order to optimize the design and operation of large-scale MFCs and generate even more electricity.



Zuyi “Jacky” Huang, PhD, associate professor of Chemical Engineering, works with Brendan Gorman ’20 ChE on microbial fuel cell research.



(top left) Professor Hashem Ashrafiun, PhD, Mechanical Engineering, and director of Villanova’s Center for Nonlinear Dynamics and Control



(center) Clare Boothe Luce Assistant Professor Verica Radisavljevic-Gajic, PhD, Mechanical Engineering



(right) Clare Boothe Luce Assistant Professor Seri Park, PhD, Civil and Environmental Engineering



(bottom left) Assistant Professor Danai Chasaki, PhD, Electrical and Computer Engineering



(right) Assistant Professor Virginia Smith, PhD, Civil and Environmental Engineering

## RESEARCH ROUNDUP

### Optimizing the Performance of Defensive Systems

Military defensive systems need to be able to respond quickly and precisely to intercept warheads and other targets, and a Villanova engineer has developed a novel and efficient algorithm to help ensure that they do. Hashem Ashrafiun, PhD, professor of Mechanical Engineering, and director of Villanova’s Center for Nonlinear Dynamics and Control, has been addressing the challenges of how to compensate for the unstable shape of rockets and other crafts without sacrificing maneuverability and orientation. Dr. Ashrafiun’s findings were published in “Guidance and Attitude Control of Unstable Rigid Bodies with Single-Use Thrusters,” which appeared in *IEEE Transactions on Control Systems Technology*.

### Multidisciplinary Engineering Faculty Collaborate on Internet of Things Publication

The Internet of Things is a network of physical devices, vehicles, home appliances and other items, which are embedded with electronics, software, sensors, actuators and network connectivity, enabling them to connect and exchange data. There are countless potential applications for IoT, from smart homes and enterprise, to infrastructure management and health care. Unfortunately, as is the case with all technologies, there exist vulnerabilities, which put these systems at risk of outside physical and cyberattacks. Clare Boothe Luce Assistant Professors Verica

Radisavljevic-Gajic, PhD, Mechanical Engineering; and Seri Park, PhD, PTP, Civil and Environmental Engineering; together with Danai Chasaki, PhD, assistant professor of Electrical and Computer Engineering, address these risks from their multidisciplinary perspectives in “Vulnerabilities of Control Systems in Internet of Things Applications.” The paper, which appeared in *IEEE Internet of Things Journal*, is one of only a few studies about the vulnerability of applied control systems in general, and especially in the IoT environment.

### A First in Modeling a River’s Response

Water resources expert Virginia Smith, PhD, and students in her Urban Coastal Rivers research group undertake projects related to hydrology, sediment transport and climate. Dr. Smith, assistant professor of Civil and Environmental Engineering, was the lead author on a study published in *Geomorphology* of a dam’s effects on the downstream channel evolution of a sandy river in Texas. Reservoirs behind dams act as deposition sites for much of the sediment being transported by rivers. As a result, the downstream river flow can be well below the transport capacity for bed-material. This promotes bed erosion and other geomorphic changes over some length of river located immediately downstream from a dam, which can have major implications for downstream infrastructure and ecosystems. Dr. Smith’s work presented the first geomorphic model of a downstream response to a dam.

## SEPTA PARTNERSHIP LEADS TO NEW CAPSTONE EXPERIENCE

For years, the senior capstone project has been a culminating hallmark of Villanova University's Civil and Environmental Engineering program. This year, the introduction of a "professional practice" approach is taking this senior experience to a new level. Through a partnership with the Southeastern Pennsylvania Transportation Authority (SEPTA), 23 students are working in teams on the restoration of a commuter rail service between Elwyn and Wawa, Pa. As a full-scale, real-time endeavor, the project encompasses every aspect of civil engineering: transportation and geotechnical (track alignment and reconstruction), structural (a new station building and a new parking garage), and water resources and environmental (stormwater management design), including the environmental impact analysis for the entire project.

At the onset of the course, each student group visited the currently inactive rail line to gain an understanding of the scope of the project. Senior Cory Byrnes says, "Getting a firsthand look at the site where we were about to design a new station and track was extremely helpful when trying to visualize things for design concepts." During the design phase, each group was tasked with identifying and evaluating environmental concerns and land use, estimating trip generation and analyzing facets of alternative options.

After presenting these initial findings to SEPTA, students considered a preliminary cost estimate of each section of the proposed project, as well as a master schedule for each phase of implementation and an on-site construction management plan. The fall semester concluded with each group presenting a 30 percent complete conceptual design to Associate Professor Leslie McCarthy, PhD, PE, Adjunct Professor Zeyn Uzman, PE, SE, PEng, FNSPE, and SEPTA representatives. Dr. McCarthy explains, "This approach allows students to dig in at a deeper level on the very important aspects of preliminary design. They also learn much more about group dynamics by self-organizing and self-managing the project."

Senior Chandler Anctil says, "One of the greatest features of this newly modified professional practice class is the fact that it serves as a great introduction to the capstone class that we take in the spring." During their final semesters, students divided into groups to focus on one aspect of the project that relates to their concentrations. They will then bring that aspect to completion.

The Civil and Environmental Engineering department's partnership with SEPTA began nearly a decade ago and has spanned a variety of projects. This new professional practice aspect of the capstone was suggested by advisory board member and SEPTA Assistant General Manager Robert Lund, PE, '78 CE, '81 MSCE. Working with Dr. McCarthy, the goal was to find a local project that would effectively cover all aspects of civil engineering. Through the efforts of Lund and the relationships that Dr. McCarthy has established with SEPTA, an agreement was reached, and the course was set in motion.

A mutually beneficial collaboration, Lund explains that the students open up new perspectives. "It's definitely an advantage to have fresh sets of eyes on the projects they are involved in." He adds that the company will take recommendations from the student presentations and consider implementing them as a part of future projects.



## Work-Study Program Offers Students Professional Opportunities

In fall 2016, SEPTA brought on board its first Villanova College of Engineering work-study students. For 20-hours a week, then-seniors Alicia Leiby '17 EE and Matt McAnally '17 CE engaged with "real engineers on real engineering projects," explains Tyler Ladd, PE, '02 CE, '04 MSWREE, '15 MBA, the manager of Power Engineering at SEPTA, who was instrumental in establishing the program.

During her internship, Ladd says Leiby "got into the technical weeds" and developed a comprehensive set of technical specifications for the Power Engineering Department that will be used on future projects. She also worked with SEPTA's lighting designer to conduct a lighting inventory and establish a framework for an inventory system. Leiby says, "It was a great experience to see behind the scenes. For example, I got to see firsthand the development of the electric-powered bus project." Today, Leiby works for Harris Corporation as an electrical engineer.

McAnally also appreciated the insider's look at the business of public transportation. "It seems so simple at first glance—I show up at the station, drop the fare and get on my way. But my time with SEPTA showed me what intricate planning it takes for a public transit authority to leave no stone unturned and make getting around that easy for millions of people." McAnally now works in construction management with AECOM Tishman.

In spring 2018, Andy Ye '18 CE began a work-study with SEPTA's Bridges and Buildings Department where he has been tasked with a specifications project similar to Leiby's. He says, "The most exciting part of my experience is that I get to actually apply knowledge I learned in a classroom to help design a real train station that is to be built in the near future. SEPTA has given me my first taste of professional engineering that will bring about tangible results, and I cannot wait for what will come next!"



(left) John Aquino '18 spent the summer conducting research with Associate Professors Michael Smith, PhD, and Charles Coe, PhD (not pictured). (center) Matthew Hall '19 pursued a gene therapy project with Assistant Professor Jacob Elmer, PhD. (right) Tatyana Chouikha '18 focused on biomaterials and drug delivery with Department Chair and Associate Professor Noelle Comolli, PhD.

## SCHOLARSHIP OPENS RESEARCH OPPORTUNITIES FOR CHEMICAL ENGINEERING STUDENTS

When Carlos B. Rosas '62 ChE won a \$50,000 Directors' Scientific Award from Merck, his then-employer, the memory of his undergraduate research experience under the tutelage of former Chemical Engineering Chair and Professor Robert E. White, PhD, prompted him to donate the prize money to Villanova University. The award was used to establish the Carlos B. Rosas Chemical Engineering Scholarship, which supports summer research opportunities for Chemical Engineering majors. Each year, eight to 10 undergraduates receive \$4,000 in scholarship money, for which they spend 10 weeks conducting summer research with faculty. To date, 79 Chemical Engineering students have received these scholarships.

Associate Professor and former Department Chair Dorothy Skaf, PhD, explains how the program works. "The students contact those faculty whose research interests them. They submit their resumes and then each faculty member selects the student they want to work with." Dr. Skaf notes that recipients are typically juniors who can then continue the work into their senior years.

During summer 2017, 11 Chemical Engineering students received full or partial research scholarships. Among the recipients was Matthew Hall '19, who worked on a gene therapy project with Assistant Professor Jacob Elmer, PhD. Matt explains, "The goal of Dr. Elmer's on-going research is to increase the efficacy of nonviral gene therapy using genetic engineering techniques." Having long been interested in molecular biology and pharmaceuticals, he says, "Working with Dr. Elmer I learned all about genetic engineering techniques, including site-directed mutagenesis and oligo annealing cloning. I also learned a lot about maintaining a sterile environment in the lab, as

well as how to maintain bacterial and mammalian cell lines." Continuing to work with Dr. Elmer this academic year, Matt's postgraduation plan involves pursuing a PhD in either biochemical engineering or a biology/pharmacology program.

Tatyana Chouikha '18 also received the Carlos B. Rosas Chemical Engineering Scholarship and spent the summer working with Associate Professor and Department Chair Noelle Comolli, PhD. Tatyana explains the research: "We primarily focused on biomaterials and drug delivery, trying to develop an intercellular carrier for chemotherapeutics for the treatment of glioblastoma, Ewing's sarcoma and breast cancer. At the end of the summer, a paper was submitted for review in a peer review journal."

Tatyana notes that she has always been interested in the health care profession and biotechnology in particular. "Being on a research team that was essentially trying to find a cure for cancer was life-changing. I felt like all of my engineering knowledge was being put to work to try to create a positive impact on society." The experience has convinced her to pursue a research-oriented career in the pharmaceutical industry after graduation.

A third recipient of the Rosas Scholarship, John Aquino '18, conducted research with Associate Professors Michael Smith, PhD, and Charles Coe, PhD. Among the many topics they covered was catalysis "a critically important sector of chemical engineering whose intricacies," he says, "are lost in the classroom." Appreciating the opportunity to work so closely with faculty, John notes, "Drs. Smith and Coe are extremely enthusiastic about this subject and really care about the students who work for them. They continuously reached out to help me learn more."

In addition to all he discovered about catalysis, on a broader scale John says he learned "what it takes to start and finish a successful engineering project, and how to find the balance between a sound method and research, as well as using creativity and taking action."

John continues to work in this area of research—"a topic I had really no understanding of before"—and his experience has led him to consider the possibility of pursuing a master's degree at Villanova, so he can take the work even further.

He speaks for his fellow recipients when he says, "This scholarship really means a lot to me. Throughout my time at Villanova, I have come to appreciate every opportunity, whether it's cheering on the basketball team in Houston when we won the championship or being in the classroom with teachers like Dr. Smith who really spark my interest in my studies. I feel truly blessed to be a part of this school."

## MARIO KART MIND GAMES

Mario Kart, Nintendo's iconic go-kart style racing video game first released 26 years ago, could now help children (or the young at heart) improve their ability to focus, thanks to a group of Villanova Engineering students.

For their senior capstone project, four Electrical and Computer Engineering students—Nathan Cheong, Stephanie Jones, Scott Miller and Daniel Tagliaferro—worked with faculty advisor Mark Jupina, PhD, assistant professor, to design a system that measures players' brain waves to assess their levels of focus while playing Mario Kart. Daniel explains, "The more focused the player is, the quicker he or she will be able to move in the game, while lapses of focus slow the player's Kart down." Stephanie adds, "Our goal is to help children with attention deficit disorders improve their ability to focus, while having fun at the same time in a low-pressure environment."

Here's how it works: The player dons a pair of neurofeedback glasses, which use sensors to track brain activity. The glasses connect with a device called the Makey Makey, which sends signals based on the measured brain activity to a tiny computer called Raspberry Pi. Using Raspberry Pi, the students designed a program to run in the background of Mario Kart. As the player's focus level changes, the background program adjusts the speed of the Kart accordingly.



The Mario Kart team includes Electrical and Computer Engineering seniors Stephanie Jones, Daniel Tagliaferro, Scott Miller and Nathan Cheong.

To contain Raspberry Pi, the students 3-D printed a box on which they also installed a line of 10 lights that display the player's focus level based on his or her brain waves. Scott says, "That way both the player and observers are able to better track changing concentration levels."

Designing and bringing the system to demo took the students the entire fall semester. Nathan says their next goals include "incorporating a PlayStation controller for more natural game play"—the system currently uses a computer keyboard—as well as enabling game play for multiple users at the same time and simplifying the system components to make it more portable and user-friendly.





Catharine "Katie Rose" Scoboria '18 ME

## FROM CAMPUS TO COSTA RICA, SENIOR MAKES THE MOST OF HER UNDERGRADUATE EXPERIENCE

Mechanical Engineering major Catharine "Katie Rose" Scoboria has been an engaged and dedicated member of the Villanova community since her freshman year. From research with faculty to STEM outreach programs with youth, she's demonstrated her technical knowledge and know-how, as well as her leadership and people skills. Her senior year is proving to be an impressive combination of experiences and initiatives that will leave their marks on the College of Engineering.

For Katie Rose, the highlight of 2018 may very well be the spring break service trip to Costa Rica that she organized as president of the University's chapter of the Society of Women Engineers. Given that one of SWE's priorities is globalization, Katie Rose and her SWE president predecessor Kristin Poole '17 CE decided an international service trip would be a rewarding and exciting way to fulfill that mission. With the guidance of Villanova Engineering Service Learning Director Jordan Ermilio '08 ME, '06 MSWREE, and the help of an SWE-affiliate ambassador in Costa Rica, their idea came to fruition. In March, a group of seven female Villanova Engineering students and chapter advisor Noelle Comolli, PhD, chair and assistant professor of Chemical Engineering, teamed with faculty and students at the University of Costa Rica and ULACIT, the Latin American University of Science and Technology, to present a STEM workshop to 120 high school girls. The event was made possible by a Program Development Grant from the SWE through a generous donation from the ExxonMobil Foundation.

Katie Rose's commitment to girls in engineering has made her the go-to representative for the College's STEM outreach activities. From volunteering for Girls in Mechanical Engineering Day and serving on the student panel for "Girls' Day In: Exploring a Villanova Engineering Degree," to interviewing Mechanical Engineering Professor and Chair Amy Fleischer, PhD, on Facebook Live for Women's History Month, Katie Rose has responded to every opportunity to encourage other young women to pursue this field that she's become so passionate about. Dr. Fleischer says, "Katie Rose is an incredibly talented student who has shown exemplary leadership throughout her time at Villanova. Her dedication to engineering outreach has benefited hundreds of young women and is helping to shape the next generation of engineers." The admiration is mutual. Having conducted research with Dr. Fleischer since her sophomore year, Katie Rose identifies their relationship as one of the most meaningful aspects of her college career. "Dr. Fleischer's mentorship has been super impactful on my time here. Just her personality and guidance in all things has been really awesome."

After graduation, Katie Rose looks forward to moving to Melbourne, FL, where she'll work in Space and Intelligence Systems for Harris Corporation. "I interned there last summer," she says. "I got to do a 10-week project, on my own, where they gave me a problem, provided me with the resources and said, 'figure this out.'" Appreciating a level of responsibility that she had not found in her previous internships, Katie Rose was thrilled to tackle the research, design and testing required to find a solution to the challenge they set before her. "It was a lot of responsibility, but I loved it."

## UNDERGRADUATE PURSUES CUTTING-EDGE ANTENNA RESEARCH

Undergraduates begin college with varying degrees of certainty as to their academic pursuits. While some are just beginning to explore their passions, others like Christopher Israel have known for years which path to take. A second-year Electrical Engineering major with enough credits to qualify as a junior (with a 4.0 GPA), Chris has wanted to be an electronics engineer since the eighth grade. More specifically, Chris fell in love with antennas and radio-frequency engineering. "I particularly like it because it merges many different aspects of engineering, where it's almost as much materials science and mechanical engineering as it is electrical." Fast forward six years, and this 20 year old has parlayed his high school hobby into an impressive undergraduate research experience.

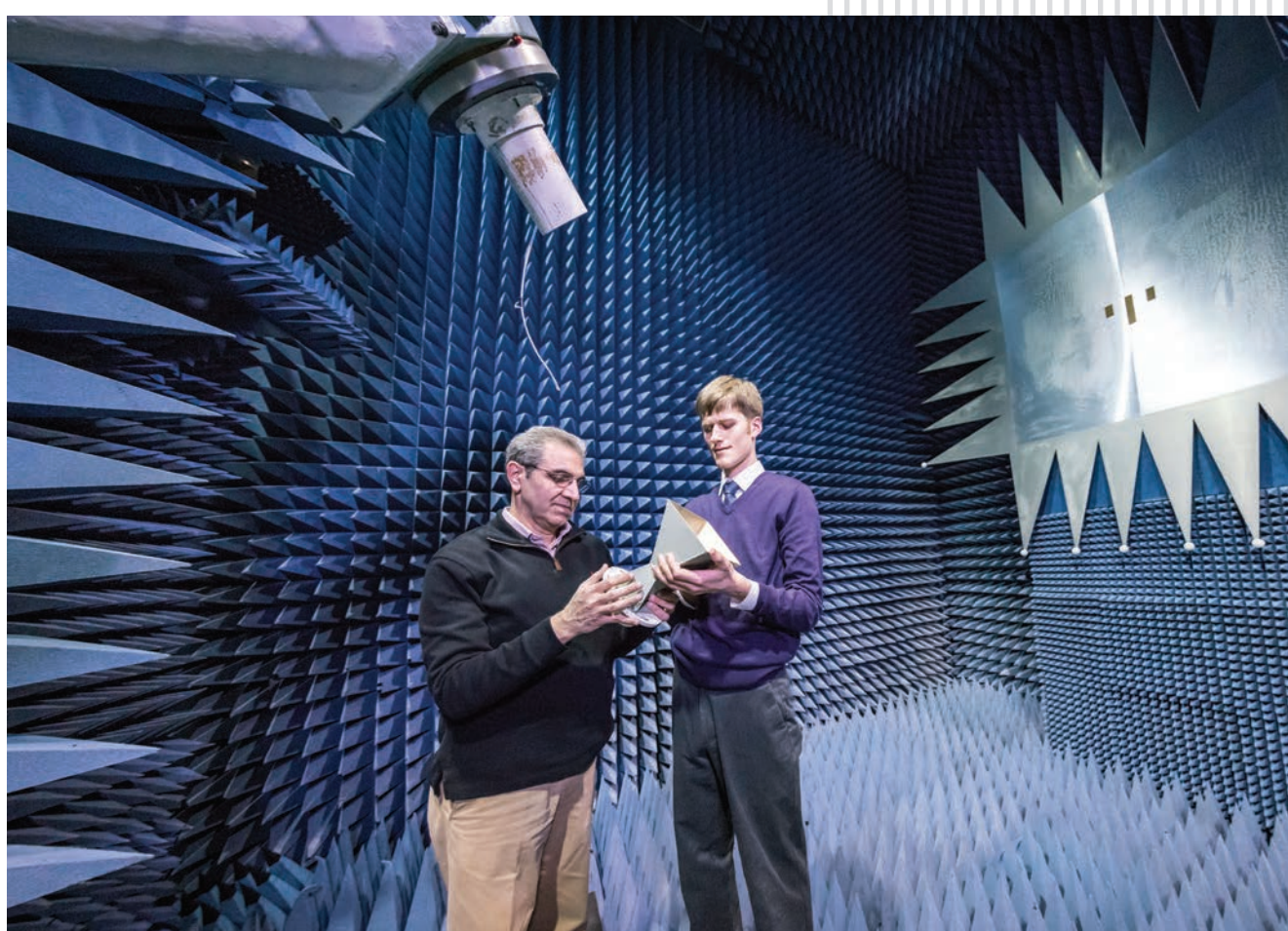
"In my first semester at Villanova, I reached out to Dr. Ahmad Hoorfar, asking to see his lab (the Antenna Research Laboratory) and about potential opportunities to work with him. He encouraged me to apply for the Villanova Undergraduate Research Fellowship." Dr. Hoorfar recalls being "initially surprised that a freshman was interested in doing advanced antenna research that usually requires graduate-level expertise." After meeting with him a couple times, however, he says, "I realized that Christopher was indeed not a typical freshman engineering student, but an unusually bright, well-informed, and a quite intellectually mature young man who came well-prepared, knew a lot about the activities in my research group, was informed about where I had spent my sabbatical leaves, and had already read some trade-journal papers about the latest developments in antenna test and fabrication."

Chris's VURF application was accepted, and he spent this past summer with Dr. Hoorfar researching "3-D Space-filling Curve Antennas," whose geometries can significantly reduce the size of low frequency

antennas. The impetus behind his work is the critical need to reduce the antenna footprint in applications ranging from aerospace communications to personal electronics. He explains, "Villanova researchers have studied and advanced the use of 2-D space-filling curves for miniaturization of antennas; my goal was to make 3-D versions of these antennas viable." Chris was able to produce his novel antennas using the College's 3-D printing technologies, which could then be validated and further analyzed for real-world performance through Villanova's state-of-the-art facilities in the Antenna Research Lab. Still dedicating about 10 hours a week to his research during the academic year, Chris says his end goal is having tests and measurements of multiple configurations of 3-D printed antennas to validate the simulation driven work that is largely already done. He plans to write a paper based on his work and submit it to an IEEE conference in the near future.

When asked what's next for him to explore, Chris notes, "My interest lies in applications of different materials and new manufacturing processes and applying them to RF technologies. I may also continue designing around additive manufactured antennas." As he grows in his knowledge of advanced math and takes courses like signal processing and radar, he anticipates new doors will open.

This summer, Chris looks forward to applying his knowledge and experience as an intern at Lockheed Martin Space Systems. "I pursued a more academic program this past summer, and I will explore working in industry this summer. We'll see what happens in the future!" Dr. Hoorfar has no doubts that Chris has a bright future in engineering and scientific research. He ranks this impressive young man "in the top 5 to 10 percent of the undergraduate students that I have taught during my long academic career."



Ahmad Hoorfar, PhD, professor, Electrical and Computer Engineering, with Christopher Israel '19 EE in the College's Antenna Research Lab, which Dr. Hoorfar leads.

## ENVIRONMENTAL FOCUS LEADS UNDERGRADUATE TO RESEARCH OPPORTUNITIES AND INTERNSHIPS

When asked to recommend a noteworthy undergraduate to feature in this publication, Civil and Environmental Engineering Department Chair and Associate Professor Shawn Gross, PhD, responded with junior Bridget Gile. “She demonstrates an impressive level of engagement, including research, plus a minor in Sustainability Studies, all while maintaining a 4.0 GPA.”

One could say that engineering is in Bridget’s blood. As the daughter of an engineer, she recalls building a passive solar heater for her dad’s workshop, constructing a front porch and even doing some roofing as a teen. A high school service trip showed her just how capable she was of managing her own projects.

After earning a Presidential Scholarship, Bridget chose to leave her Illinois home and come to Villanova, where she discovered a passion for sustainability, the environment and stormwater systems, in particular. “A Natural Resources and Conservation class got me really interested in the subject,” she says. A semester-long project for that course connected her with Philadelphia’s Green City, Clean Waters program, which led her to pursue a position as a lab assistant for the Villanova Urban Stormwater Partnership. Summer experiences also focused on this area of

interest. In 2016, Bridget conducted undergraduate research at Virginia Tech, studying hydrologic controls on wetland function as part of the National Science Foundation’s Research Experiences for Undergraduates program. This past summer she held a water resources internship with AKRF, an environmental, planning and engineering consulting firm in Philadelphia. This semester she’s working with Civil and Environmental Engineering Professor Bridget Wadzuk, PhD, looking at water flow through the campus’s constructed wetland. Dr. Wadzuk describes Bridget as “driven, curious, enthusiastic about diving into a new area of research and willing to learn.”

When she’s not in the classroom or lab, Bridget engages in STEM outreach activities at local schools, volunteers as a CEER PEER (a student-to-student mentoring program), addresses sustainability as a member of the Villanova Environmental Group, and captains the University’s Women’s Ultimate Frisbee club team.

Having really enjoyed her research experiences, she is considering graduate school as a next step, possibly in the area of stormwater. Bridget says, “As a relatively new, developing field, there are a lot of areas left to be explored!”



Bridget Gile '19 CE

## A PASSION FOR SUSTAINABILITY SPARKS INTEREST IN AEROSPACE

Introduced to sustainability at a young age, Alicia Piscitelli recalls, “My parents always practiced green living; we had a garden, composts and canned our own food.” Her own interest blossomed during college. As a chemical engineering student at Rochester Institute of Technology, she became involved with The Wells Project, a nonprofit organization that raises awareness about the worldwide water crisis. Piscitelli knew she wanted to continue learning about sustainability after graduation and enrolled in Villanova’s Master of Science in Sustainable Engineering program.

As an MSE student, Piscitelli participated in the RISE (Resilient Innovation through Sustainable Engineering) Forum, a corporate partnership program that connects students with company-defined sustainability projects. She was chosen to lead a life-cycle assessment project with Boeing, and her work with the company continued during a summer internship. As she learned more about the organization, she became intrigued, as the aerospace industry isn’t typically associated with sustainability. She asked Boeing employees where they saw opportunities for increased sustainability and learned that while composites used to build airplanes increase fuel efficiency, they cannot be recycled. She explains, “The life of an airplane is about 30 years and since they were only recently built using composites, there is still an opportunity to find a sustainable solution.”

At the same time, Piscitelli began a project in a biomimicry course taught by Ross Lee, PhD. This assignment allowed her to research alternatives to the nonrecyclable

composite materials. She notes, “I dug deep into the way aircrafts work today and how technology in the future could change.” Piscitelli found a biomimetic solution inspired by whale fins that would reduce drag and improve lift, increasing the fuel efficiency of the plane. This proven method is successfully used on wind turbines today. She also explored a recyclable composite material called a reversible thermoset, a solution that further fueled her curiosity.

Motivated by the prospect of new solutions, Piscitelli worked closely with Dr. Lee, who specializes in polymers and plastics. With the knowledge she gained in his classes and her experience with Boeing, she decided to take her research a step further and continue her studies in Villanova’s PhD program this fall. With a concentration on polymers and plastics, she plans to do her thesis on recyclable composite materials.

Now, a teaching assistant in his biomimicry course, Dr. Lee applauds Piscitelli’s strong interest in research and says, “Alicia impressed me right from our first meeting and others saw it too. John Bourgeois, the lead project manager for Boeing, called Alicia ‘the kind of intern Boeing had only dreamed about.’”

With a newfound appreciation for the aerospace industry, Piscitelli hopes to pursue this career path after obtaining her doctorate. She says, “Boeing wants to improve and become an environmental steward, and that’s where sustainable engineers like me come in! Every company can play a role in helping to change the world.”



***Piscitelli not only studies sustainability, she practices it in her daily life. A few years ago, she began making her own skincare products after considering the impact beauty products and packaging have on the environment. She researched less harmful replacements and learned how to make her own alternatives. “It’s a lot of fun, kind of like cooking. I enjoy trying different ingredients and seeing what works and what doesn’t.” She adds, “Creating a no-waste cosmetic company someday would be really cool.”***

# ONE UNDERGRADUATE ENGINEERING DEGREE: COUNTLESS CAREER PATHS

In “Not Everyone With a STEM Degree Chooses a STEM Job,” which appeared in *U.S. News & World Report*, the College of Engineering’s Drosdick Endowed Dean Gary A. Gabriele, PhD, wrote, “We are getting very talented students that come with a breadth of experiences, and what we’ve tried to do is make sure they have a chance to pursue all their various passions while, at the same time, making sure they get a good engineering education. We cast this as more of ‘we’re not training you to be an engineer; we are giving you an engineering education with which you can do a lot of different things.’”

Dean Gabriele’s experience and perspective are supported by U.S. Census Bureau statistics, which find that 74 percent of employed civilians ages 25-64 with at least a bachelor’s degree in a STEM field are not employed in traditional STEM occupations. The following is a sampling of Villanova Engineering alumni who have pursued “different” paths.

## Creative Cats

### John Fisher ’97 EE, Founder, Winding Way Records

After a traditional STEM career that included founding an electrical engineering and manufacturing firm, Fisher launched his own recording company, Winding Way Records. A musician himself, his goal was to help other musicians get a fair deal that includes keeping their license rights and 70 percent of the profits.

*“In addition to the technical skills, starting up a record label also requires good writing skills and strong ethics, integrity and a philosophical viewpoint as a core value. I received those rarely taught skills at Villanova, too!”*



(above left) John Fisher ’97 EE, Founder, Winding Way Records  
(right) Vinny Grosso ’97 ME, Professional Entertainer

(below left) Danielle A. Maniscalco ’05 ME, Energy Officer for North America, U.S. Department of State  
(right) Tom McIntyre ’69 EE, Retired CEO for catalog marketing company



### Vinny Grosso ’97 ME, Professional Entertainer

A professional magician, Grosso has worked with Penn & Teller and appeared on “America’s Got Talent.” He currently is co-creating and producing a Las Vegas show. When not performing, Grosso manages the tours of fellow entertainers all over the world.

*“I always wanted to be a magician; my senior design project was a magic trick, a levitation. Also, I earned a special minor that blended communications and theatre classes that I thought would be most relevant for my goals.”*

## Government Connections

### Danielle A. Maniscalco ’05 ME, Energy Officer for North America, U.S. Department of State

Maniscalco joined the Foreign Service after completing a master’s in international affairs and energy management and policy from Columbia University. She has worked in the State Department’s Office of Energy Exporting Countries and served in the Executive Secretariat. Currently, she is an energy officer for North America in the Bureau of Energy and Natural Resources.

*“I have called upon the problem-solving and systems-oriented skill sets I gained at Villanova throughout my career. My analytical skills help inform U.S. foreign policymakers of what is happening in the economy of a country in which I’m serving.”*

## A Focus on Finance

### Tom McIntyre ’69 EE, Retired CEO for catalog marketing company

In the early years after graduation, McIntyre’s professional interests evolved from systems programming to using systems to solve business problems. In 1987, he was named chief financial officer for the worldwide BMG Entertainment Division of Bertelsmann. In 2002, he became CEO of a midsize catalog marketing company. Since retiring, he has worked with young entrepreneurs and their advisory boards, helping to refine their business plans and raise capital.

*“Throughout my career it was the problem-solving skills that I developed as a student that allowed me to enjoy the nontraditional career path that was perfect for me.”*

## Legal Eagles

### Jan Hoynacki ’68 ME, Retired General Counsel, Rheem Manufacturing Company

After graduation, Hoynacki spent a year with the Hamilton Standard Division of United Technologies Corporation working on a valve in the environmental control system of the lunar module. Finding such a narrow focus uninspiring, he set his sights on law school. His first position was as an in-house corporate lawyer for UTC. He spent 25 years with the company before being named general counsel of Rheem Manufacturing in 1998.

*“I attribute much of my success to my Villanova engineering degree. I was able to interface with the R&D and engineering departments of these businesses to better understand their goals and objectives.”*

### Ned McMahon ’91 ME, Partner, Ohlandt, Greeley, Ruggiero & Perle, LLP

McMahon “gets to play with other people’s good ideas every day,” helping protect them with patents so they can launch or build businesses. In order to practice before the U.S. Patent Office, one must possess a technical degree and pass a separate bar exam—the only field of law where this is necessary.

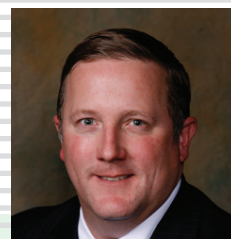
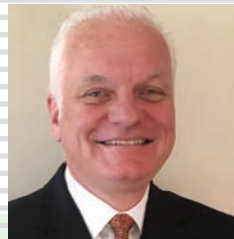
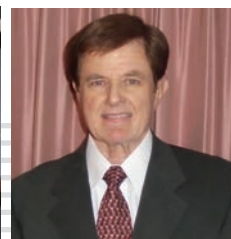
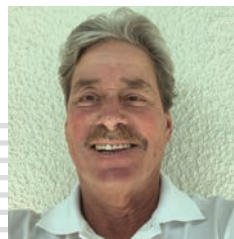
*“Engineering taught me how to solve problems whether they are technical, legal or business problems.”*

### Michael Senape ’96 CE, Lawyer, Senape & Associates

Senape has been successful in pursuing monetary settlements for clients in premises liability cases dealing with defective conditions in concrete sidewalks, asphalt parking lots, exterior wood stairways and more.

*“My Villanova education prepared me to think as an engineer while wearing my lawyer hat.”*

(below left) Jan Hoynacki ’68 ME, Retired General Counsel, Rheem Manufacturing Company  
(center) Ned McMahon ’91 ME, Partner, Ohlandt, Greeley, Ruggiero & Perle, LLP  
(right) George Gorman III ’63 ME, Owner, Dunkin Donuts



(above left) John Healey ’85 CE, Owner, Impact Expertise, LLC  
(center) Michael Senape ’96 CE, Lawyer, Senape & Associates  
(right) Gayle D’Abate ’90 EE, Owner, Tomfoolery Brewing

## Business Builders

### Gayle D’Abate ’90 EE, Owner, Tomfoolery Brewing

After 25 years working for the Federal Aviation Administration as a systems specialist, D’Abate established Tomfoolery Brewing, a craft brewery in southern New Jersey. There, she applies her engineering know-how to build and maintain the systems needed to brew and package the company’s beer.

*“Of course, when something breaks down or doesn’t work right, I’m the one they call to figure out how to fix it.”*

### George Gorman III ’63 ME, Owner, Dunkin Donuts

After a lifetime working for the U.S. Navy and other government organizations in a variety of engineering positions, Gorman researched, designed and managed the construction of his own Dunkin Donuts franchise.

*“Having an engineering degree wasn’t really necessary for many of my jobs, but it certainly qualified me, and the fact that it was from Villanova gave me a lot of respect from those that I dealt with.”*

### John Healey ’85 CE, Owner/Founder, Impact Expertise, LLC

For more than two decades, Healey served in nearly every capacity at Johnson & Johnson, including president of J&J Consumer France. He left to become President-North America, of Sabert Corp., a global food-service packaging company. In 2017, Healey founded Impact Expertise, which provides on-demand and interim executive services to owners of small to midsize companies.

*“My ability to solve complex business issues, plan and execute new systems, integrate technology with consumer insights, and optimize manufacturing, operations and supply chain organizations has come directly from what I learned at Villanova.”*

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**Drosdick Endowed Dean,  
Villanova College of Engineering:**  
Gary A. Gabriele, PhD  
**Assistant Dean of External Relations:**  
Keith Argue  
**Editor/Writer:** Kim Shimer  
**Contributing Writers:** Megan Amis,  
Keith Argue, Amanda Crisafulli,  
Daniel Fetsko '19 CE, Jonathan Gust,  
Amanda Kelly  
**Designer:** Villanova Creative Services  
**Photographer:** Paul Crane  
**Address Updates:** Send to  
[alumni@villanova.edu](mailto:alumni@villanova.edu)

**Questions or comments?** Send them to  
Kim Shimer, Director of Communications  
at [kimberlyshimer@villanova.edu](mailto:kimberlyshimer@villanova.edu)



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## alumni news



(top left) Catherine Honohan '11 CE, '15 MBA, Salesforce.com Product Manager  
(center) Joseph "Joe" Krackeler, PhD, '59 ChE, Real Estate Investor  
(right) Samantha Schafer '17 ChE, Project Analyst, Tyson Foods  
(bottom left) David Whitehouse '98 CpE, Vice President, SapientRazorfish  
(center) Nicholas Lupisella '10 ME, Associate Director, U.S. Marketing, Merck  
(right) Marie Maguire '69 EE, Co-founder, Caramanico Maguire Associates

### Catherine Honohan '11 CE, '15 MBA, Salesforce.com Product Manager, Comcast

As a product manager on Salesforce.com's Comcast account, Honohan works with sales operations teams to determine strategy, features and enhancements for the company's software. She then interfaces with developers to see them built and customized.

*"My engineering degree taught me how to be resourceful and problem solve when the answers aren't readily available."*

### Joseph "Joe" Krackeler, PhD, '59 ChE, Real Estate Investor

After spending two decades with Raychem Corporation and then serving as a technical consultant in the polymer chemistry field, Dr. Krackeler's varied professional experiences have included owning a baseball lithograph company, founding a cheesecake company, and serving as an instructor in chemistry and in property management. He also has been a successful real estate investor in the San Francisco Bay area for more than 40 years. In the fall, Dr. Krackeler played in the USA 80+ vs. Canada 80+ Ice Hockey Championship in Ottawa—a game the U.S. won 3–2.

*"My Villanova professors were instrumental to my success. As all chemical engineers of my vintage, I have fond memories of my thesis advisor Professor Robert White."*

### Nicholas Lupisella '10 ME, Associate Director, U.S. Marketing, Merck

Lupisella leads Merck's go-to-market strategy for patients on a recently launched brand, Renflexis. An advisor to the College's Career Compass program, he speaks with students about identifying and getting the right job.

*"An engineering degree opens endless doors because it helps you think in a logical and structured way that can be applied across industries, functions and organizations."*

### Marie Maguire '69 EE, Co-founder, Caramanico Maguire Associates

Industry engineer, psychotherapist, author, entrepreneur, mentor, clinical supervisor and project manager are just a few of the job titles that Maguire has held over her long and industrious career. For the past 30 years, she and her husband have owned Caramanico Maguire Associates, a sales development consulting firm. She also has been a licensed family therapist for 35 years.

*"The problem-solving and thinking-outside-the-box skills I gained in engineering helped me be innovative throughout my career."*

### Samantha Schafer '17 ChE, Project Analyst, Tyson Foods

Schafer supports Tyson's Poultry Marketing Team using her engineering background to analyze data and evaluate how the company's products are doing in the marketplace.

*"I use the group work skills I gained at Villanova to effectively communicate with customers and cross-functional team members."*

### David Whitehouse '98 CpE, Vice President, East Region Strategy & Consulting Lead, SapientRazorfish

Whitehouse began his consulting career with Arthur Andersen. Twenty years later, at SapientRazorfish, he leads multi-disciplinary strategy, creative and technology teams in delivering digital business transformation engagements for Fortune 100 companies.

*"Oddly enough, the core skills I learned in design thinking from engineering, I apply now more than ever before!"*



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