

VEU

VILLANOVA ENGINEERING UPDATE

COLLEGE NEWS

ENGINEERING A SUSTAINABLE FUTURE

In the past 10 years, Villanova University's College of Engineering has established itself as a national leader in the field of Sustainable Engineering. "The integration of education, research and service, across the undergraduate and graduate curricula, is a defining feature of our sustainability initiatives, which are guided by the Augustinian principles of truth, unity and love," says Gary A. Gabriele, PhD, Drosdick Endowed Dean of Engineering. While the topic of sustainability has only recently permeated the mainstream, the notion of ensuring "Enough, For All, Forever" has long been one of the College's guiding principles.

Defining the Scope of Sustainability

The UN Brundtland Commission defines sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

To define sustainable engineering, William Lorenz, director of the College's Sustainable Engineering graduate program, points to the program's core methodology, which says:

In order to transition our global economy to live off nature's income rather than continue to deplete nature's capital, we will utilize whole-systems thinking through a life-cycle lens to:

- Eliminate negative impacts on environmental, social and economic systems
- Calibrate for social justice issues
- Filter for the resilience of systems
- Evaluate the interdependence of issues within and among systems

Academics

The College's commitment to Sustainable Engineering is perhaps most visible in its flagship Master of Science graduate program, which launched in 2010 and recently expanded to include doctoral students. A unique, college-level program, the MSSE trains professionals from a variety of engineering and science disciplines how to approach systems and processes through a holistic, life-cycle lens that balances environmental, economic and technical considerations with issues of social equity and justice. Now the College's second-largest graduate program, Sustainable Engineering complements internationally renowned undergraduate and graduate programs in domains that are core to sustainable resource management: water resources and environmental engineering (urban stormwater, water quality), biomass conversion (renewable energy) and thermal-fluid sciences (energy efficiency).

Research

The College's sustainable engineering research portfolio has grown in parallel to its impressive educational offerings. Within the MSSE program, students are conducting graduate thesis research that cuts across disciplines. Jarrod Bridge '16 MSSE, for example, worked with advisors from Sustainable Engineering,

Electrical Engineering and Biology to compare the holistic impacts of biomimetic batteries to current battery technologies. All students in the program have at least two advisors to provide them with unique, multidisciplinary perspectives.

In addition to broad research areas within sustainable engineering, the College has a number of centers whose focuses are more targeted. Among them is the Center for Energy-Smart Electronic Systems (ES2), a National Science Foundation Industry/University Cooperative Research Center, which brings academics together with their counterparts in industry to increase the energy efficiency of the world's IT backbone, the data center. With a national reputation in thermal and fluid sciences, Villanova teams with ES2 partner schools—Binghamton University, the lead institution; Georgia Tech; and the University of Texas at Arlington—on various projects from Verizon, Comcast, Facebook and other member companies whose competitiveness depends on greener operations. Villanova's ES2 site director is Alfonso Ortega, PhD, the James R. Birle Professor of Energy Technology.

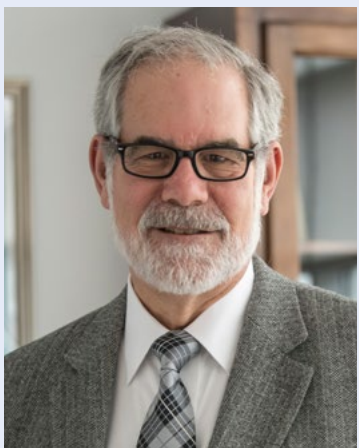
Equally successful, Villanova's Urban Stormwater Partnership has received considerable acclaim for its work in managing stormwater and improving water quality through "green infrastructure" approaches, both locally (City of Philadelphia) and internationally (Panama). This team—including Robert Traver, PhD, PE, D.WRE, FEWRI, FASCE, '82 MS, founding director; Andrea Welker, PhD, PE, professor and Associate Dean of Academic Affairs; and Bridget Wadzuk, PhD, '00 CE, associate professor—also has transformed Villanova's campus into a living lab—partnering with Campus Facilities to not only make the campus "greener," but to demonstrate the performance of systems, like rain gardens and green roofs, in managing flooding and improving water quality. VUSP's work has led to significant support from the NSF, the Environmental Protection Agency and the William Penn Foundation, among others.

(Continued, Page 2)



VUSP faculty at the campus's constructed stormwater wetlands: Andrea Welker, PhD; Erica Forgiione '12 CE, '15 MSWREE, EIT, Water Resources Laboratory director; Assistant Professor John Komlos, PhD; Bridget Wadzuk, PhD; and Robert Traver, PhD.

MESSAGE FROM THE DEAN



As you spend time with this issue of the VEU, you'll find a couple themes emerging. First and foremost is the issue of sustainability and more specifically, sustainable engineering. In Pope Francis' encyclical "Laudato Si," On Care for Our Common Home, educators are called "to promote a new way of thinking about human beings, life, society, and our relationship with nature." The articles in this publication demonstrate the many ways the College is engaged in doing just that.

In addition to academics and research, service learning and student activities, I have been involved in a priorities conference on sustainability for all engineering deans of Catholic universities. In January, the EDCU gathered to develop and prioritize a set of recommendations for curricular and research projects that provide an opportunity to make a profound and lasting difference in the area of engineering for sustainability. The resulting list of recommendations will guide the EDCU as it plans collaborative educational programs, research efforts and advocacy.

The second theme that emerges in this issue of the VEU is that of collaboration and connections. From corporate partnerships through the RISE Forum to the relationship between the University Career Center and the College's Career Compass program, you'll find numerous examples of the ways in which our students and faculty are working with others to ignite change across campus and around the world.

On a less serious note, this issue is filled with wonderful, amusing and sometimes painful classroom memories from alumni who share memories of a college course they will never forget. And, our current undergraduates share the myriad ways they're involved in University activities, from arts and athletics to service and social organizations.

Enjoy the VEU!

Gary A. Gabriele, PhD
Drosdick Endowed Dean
College of Engineering

Engineering A Sustainable Future (continued from Page 1)

In addition to ES2 and VUSP, the Villanova Center for the Advancement of Sustainability in Engineering supports a sustainable future through interdisciplinary research on alternative and renewable energies, biomass conversion technologies, environmental engineering and sustainable infrastructure and materials. VCASE faculty researchers also host industry and community outreach activities to foster and enhance a culture of sustainability.

Service

The Villanova Engineering Service Learning program also demonstrates the College's commitment to sustainable engineering. VESL prepares students to approach international development problems from a whole-systems perspective, ensuring that proposed solutions not only are technically sound, but culturally appropriate, complement the natural environment and are resilient in the long term.

Active collaboration with in-country partners is key to that resiliency. Since 2011, when the VESL program was formally established, engineering students and faculty have worked on 36 projects with 15 partners in 11 countries, including the United States. VESL Director Jordan Emilio '98 ME, '06 MSWREE says, "Empowering local communities is essential to creating sustainable solutions."

In fall 2016, VESL began working with the Sustainable Engineering program to sponsor a cohort of graduate students on the new International Development track. Led by Iain Hunt '15 MSSE, students on this track conduct research

in collaboration with VESL partners and lead teams of undergraduates on international service trips. "We aim to prepare a generation of engineers as leaders poised to make an impact on a global stage," says Hunt.

"The engineering profession has a proven history of responding to the critical issues of the time," says Lorenz, "Villanova's sustainable engineering program is a reflection of the complexities of the early 21st century. It asks engineers of all disciplines to step back and see the whole-systems nature of what we do." ■



As director of the Center for Energy-Smart Electronic Systems, Alfonso Ortega, PhD, with Kamran Fouladi, PhD, adjunct professor of Mechanical Engineering, has helped establish Villanova's national reputation in electronics cooling and thermal and fluid sciences.

ALL RISE

A membership-based network for executives and technical leaders, the RISE (Resilient Innovation through Sustainable Engineering) Forum's mission is to accelerate the identification and application of data-driven solutions that will help its members increase the sustainability of their organizations and secure a competitive advantage in the marketplace by reducing costs, managing risk, fueling growth and enhancing reputation. The underlying goal is to use sustainable engineering principles to drive resilient innovation across the value chain.



Students in the Master's in Sustainable Engineering program conduct research and present findings to RISE Forum corporate partners.

solutions from a sustainability framework ultimately leads to reduced waste, improved efficiencies and new ways of doing things, which all benefit the company's bottom line.

Merck, Praxair and SCTE/ISBE agree that the RISE Forum brings value to their organizations by enhancing their sustainability efforts and initiatives. Lange says, "Merck has been involved with RISE for three years, and the students have come up with a number of exciting ideas for which the technologies are at the earliest stages of development."

Equally important, the RISE Forum also enhances the educational experience of students in the College of Engineering's Sustainable Engineering graduate program. Karl Schmidt, MSSE faculty fellow and director of the RISE Forum, notes, "The forum provides a unique opportunity for our graduate students to apply sustainable engineering tools and methodologies to 'real-world,' company-defined problems. He says, "While they gain valuable experience in operationalizing the concepts learned in the classroom, forum members benefit from the integrated, whole-systems perspective the student teams bring to their sustainability challenges."

The RISE Forum has 10 members who are at various stages of development with respect to corporate sustainability. For worldwide industrial gases leader Praxair, sustainable development is embedded in the company's culture and its principles. Riva Krut, vice president and chief sustainability officer, notes, "Years ago, you'd look at sustainability after the fact. Now it's integrated into every step of the decision process from inception to commercialization."

Pharmaceutical giant Merck is similarly committed to sustainability in "just about everything we do," according to Associate Vice President Brian Lange '88 ME. Merck's website states, "We have focused our environmental sustainability strategy on improving the efficiency of our operations, designing for the environment, and reducing the impacts and risks in our value chain."

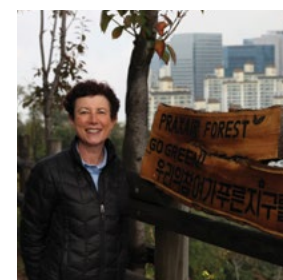
One of the forum's newest members, the Society of Cable Telecommunications Engineers and its global arm, the International Society of Broadband Experts, has a specific program—Energy 2020—designed to address sustainability issues in its industry. "The RISE mission aligns with the goals of Energy 2020, which helps cable telecommunications operators manage power, density and performance growth in ways that are beneficial for their businesses, their customers and the environment," explains Chris Bastian, senior vice president and chief technology officer of SCTE/ISBE.

At Praxair, research and development are critical to advancing sustainability initiatives. Dante Bonaquist, R&D senior corporate fellow, explains that new technology is about improving the way they develop their products and identifying new uses for those products. "We ask, 'How do we use our intellectual assets and a sustainability mindset to provide solutions to industry challenges?'" Approaching

According to Bastian, the RISE Forum is providing SCTE/ISBE with an entirely new set of resources that can help the organization drive energy planning and achieve its goals on schedule. MSSE students are partnering with the organization to develop and pilot an energy assessment tool for so-called "edge facilities" designed to help the cable industry manage power consumption in a more sustainable manner.

At Praxair, Bonaquist credits Villanova students with bringing new perspectives to its industrial gas-delivery business. "As the oldest part of our business, we're so close to it that things can be overlooked. Students discovered opportunities that surprised people. Villanova students have helped us expand our thinking and look at things in fresh ways." He goes on to describe the students as "very diligent, very intelligent and highly motivated" and applauds them for stimulating innovative thinking, unbiased by certain practices.

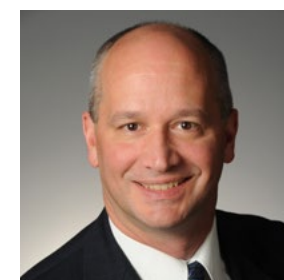
When asked why sustainable engineers are important to the future of the industry, Krut notes: "If you're interested in the long-term sustainability of anything, engineers are the ones with the tools, the alphabet, grammar and language to put together the solutions, not just at the policy level, but at the practical level. I don't believe we can figure out our way to sustainable solutions without engineers." Bonaquist adds, "At first blush, the challenges we're facing—from climate change to sustainable resources—look very complicated with many variables. But engineers are used to taking complex problems and breaking them down into simpler problems that can be addressed." Krut adds simply, "Sustainable engineers are crucial." ■



Riva Krut, vice president and chief sustainability officer, Praxair



Dante Bonaquist, R&D senior corporate fellow, Praxair



Chris Bastian, senior vice president and chief technology officer of SCTE/ISBE

UNIVERSITY CAREER CENTER STRENGTHENS COLLEGE'S CAREER COMPASS PROGRAM

"I know of no other engineering school in the country with a program like Career Compass," says Frank Falcone '70 CE, '73 MSWREE, AP, PE, D.WRE, Villanova Engineering's director of professional development and experiential education. Launched in fall 2016 with the freshman class, the College's new professional development curriculum is unique in its breadth and depth as it will explore more than 25 topics, facilitate internships and establish mentorships for all undergraduate engineering students.

Acknowledging that such an ambitious program requires a level of expertise and capacity that the College alone does not possess, Falcone proudly points to the University's Career Center, a key collaborator on the project. Under the leadership of Executive Director Kevin Grubb, the Career Center's involvement in Career Compass goes well beyond resume writing and interview prep to include big-picture conversations that are driving the program forward.

"The Career Center has always had a very good relationship with the College of Engineering," says Grubb, "but now we're having much deeper and deliberate conversations about the intricacies of the program, and how we're going to educate students on the many topics required to prepare someone for a full-fledged career today." Grubb says he and Falcone—along with Gayle Doyle, the College of Engineering's Coordinator of Undergraduate Student Programs, and Beth Cahill, Assistant Director of Career Development for the University Career Center—are enjoying the opportunity to be creative and to think more strategically and holistically.

If you're interested in becoming involved as a mentor, contact Frank Falcone at Frank.Falcone@Villanova.edu or 610-519-7920.

If your company is interested in recruiting Villanova engineers for internships or jobs, contact Maureen Piotti of the Career Center at Maureen.Piotti@Villanova.edu or 610-519-7891.

Career Compass is a collaborative effort between Frank Falcone, Beth Cahill, Kevin Grubb and Gayle Doyle.

"The challenge," Falcone explains, "is that we're preparing students for careers that have changed dramatically in the past 20 years." Where an engineering degree once meant day-to-day design work, today's graduates are looking at management and leadership positions in a variety of industries. The Career Center's relationships with employers in every field gives engineering students an important advantage as they navigate their options.

That change in the job market has led Career Compass and the Career Center to develop a "Professional Plans Prototype" workshop. During this valuable exercise, freshmen will answer a series of five introspective questions on their way to developing early ideas for their career paths. Perhaps the most important question they will reflect on is, "What types of problems do you want to solve?" This approach to career planning is much more creative and open-minded than the age-old question, "What do you want to be?" Grubb explains that it also takes into account this generation's need for "work with purpose," and Falcone appreciates that it asks students to think big. "We need people whose goals are to cure cancer, walk on Mars and solve world hunger."

From professional plan prototypes and resume building, to mentorship programs and internship experiences, it's evident that the partnership between the College of Engineering and the Career Center has never been stronger. "It's the mindset and the knowledge that the Career Center brings to the program that makes it viable," says Falcone. Grubb adds, "The knowledge that we both bring to the table strengthens this program exponentially." ■



COLLEGE EXPANDS ENGINEERING ENTREPRENEURSHIP PROGRAM

Building on the success of its engineering entrepreneurship minor, Villanova's College of Engineering introduced a new engineering entrepreneurship graduate certificate (GCEE) in fall 2016 and will launch the Engineering Entrepreneurship Summer Institute (E²SI) in 2017. Engineering Entrepreneurship Director Ed Dougherty '69 EE, '86 MSCS explains how changes in the marketplace demand these new skills:

"Engineering approaches too often focus solely on technology. That type of work is being outsourced to other countries. US engineering needs to also focus on the marketplace, the economy and global societal needs at all levels. Our nation's true competitive advantage is, and will increasingly be, its creative capacity and ability to produce paradigm shifting innovations."

GRADUATE CERTIFICATE

- Through the GCEE program, graduate students will:
- Learn how to design and develop innovative products and services to meet the needs of the marketplace
 - Assess the viability of potential business opportunities
 - Understand issues surrounding intellectual property and its protection
 - Understand how to raise funding, especially for start-up companies
 - Understand supply chain issues and global marketing
 - Understand how to market products and services
 - Gain practical, hands-on experience in entrepreneurial activities

The certificate consists of two required courses— Business Basics for Engineers and Management for Engineers—and three courses chosen from a slate of 10 existing courses for a total of 15 credits. Master's degree students can earn the GCEE as part of a graduate program of study, or the certificate can be singly pursued.



ENGINEERING ENTREPRENEURSHIP SUMMER INSTITUTE (E²SI)

This new, accelerated program allows undergraduates to earn a minor in engineering entrepreneurship through a condensed seven-week summer session, rather than over the traditional three-year period.

"It is no longer enough to come out of school with a purely technical education; engineers need to be entrepreneurial in order to understand and contribute in the context of market and business pressures." (Nelson and Byers 2010)

E²SI challenges students to further develop their problem-solving and creative-thinking skills while applying fundamental engineering principles. Students gain hands-on learning experience in product design and development, prototyping, technology trends, financial management and market analysis. They also:

- Develop and implement solutions necessary to transform ideas into action
- Identify and manage risks through analysis, problem solving, creativity and flexibility
- Develop leadership, business and management skills to run and strengthen any enterprise
- Understand the principles of existing and emerging technologies and how they apply globally

While the value of the engineering entrepreneurship minor or certificate is obvious for engineers who start companies soon after graduation, the skills learned are just as relevant for success in established enterprises. Dougherty says, "Students with entrepreneurial training are better prepared to become effective team members and managers and can better support their employers as innovators." ■

Amanda Kelly, Kern Entrepreneurial Engineering Network program coordinator, and Ed Dougherty discuss the program's spring workshops.

WHOM DO YOU KNOW? MEET COLLEGE OF ENGINEERING STAFF

As Manager of Academic Policy and Procedures, Nancy O'Connor is often the first College of Engineering staff person that new students meet.

Q: How long have you been with Villanova?

A: I have been with Villanova since 1986, except for a two-year hiatus from 1999 to 2001.

Q: What specific responsibilities do you have as manager of academic policy and procedures?

A: I support the various College of Engineering academic processes, for example, assisting new freshmen with their Advanced Placement choices and their implications, developing and managing the online degree audit system rules, and tracking college enrollment and retention data.

Q: What is your favorite thing about your work?

A: I enjoy seeing the students grow in four years from being eager, new freshmen to graduates who are well-equipped to join the professional world.

Q: If you could give students one piece of advice, what would it be?

A: I would advise them to hone their time management skills so that they will do well in their academic programs while having time to experience the many great activities and opportunities available at Villanova.

Q: What are some of your hobbies and interests?

A: Family events, travel, music and some dabbling in poetry.

Q: What is one thing people would be surprised to know about you?

A: I was once invited to compete on the television game show Bowling for Dollars.



Jonathan Adams '20 ChE discusses his schedule with Nancy O'Connor.

“EVERY ORGANIZATION HAS A ‘GO TO’ PERSON: Nancy O'Connor is our go to person in the College of Engineering. Whether it's helping track new academic policies, new curricular requirements, transfers, AP credits or counseling a student who has made a bad choice regarding academic integrity, Nancy provides all of that with a hard-edged softness and grace that everyone loves. Her work touches every undergraduate student. But most importantly, every six years, Nancy helps guide the College through our important accreditation process. Her quiet but firm guidance has resulted in stellar reviews by the visiting committee about the quality of our reports. Her love of Villanova and Villanova Engineering is uplifting for all of us in the College who get to work with her every day.”

Gary A. Gabriele, PhD
Drosdick Endowed Dean of Engineering

STUDENT DEMONSTRATES COMMITMENT TO SUSTAINABILITY



In addition to serving on the PESC, Thomas also is engaged in the Environmental Leadership Learning Community as a student facilitator. He leads weekly discussions, helping freshmen contribute to the conversation about environmental issues.

“Some people think sustainability is not for them. They picture tree huggers or hippies,” says Thomas Saldutti '17 CE. Thomas is neither a tree hugger nor hippy, but sustainability—protecting the needs of future generations—has been one of his passions since middle school. He demonstrates his commitment as a member of Villanova University's President's Environmental Sustainability Committee.

Directed by Villanova's Sustainability Manager Liesel Schwarz (a graduate student in the Sustainable Engineering program), the PESC is a collection of interdisciplinary working groups of professors, staff and students all dedicated to the topic at hand. The committee serves to assist Schwarz in executing her campus sustainability projects, while at the same time helping members pursue their own ventures.

For his part, Thomas has been involved in the free Nova Bike Share program and zero waste games, which aim to divert at least 90 percent of game day waste from the trash, via recycling or composting. Thomas also has volunteered for Earth Day events, including Earth Day of Service.

While he's worked on nearly every sustainability project on campus, Thomas is most passionate about his proposed campus garden. Not your typical community garden, VCARE (the Villanova Center for Agricultural Research and Education) would provide garden plots to faculty across campus for use in research and courses. Villanova University President the Rev. Peter M. Donohue, OSA, PhD, '75 CLAS has given verbal approval for the concept. Ever the optimist, Thomas already has laid out the engineering plans for the site. “We're now talking to facilities about a location and researching sources of funding,” he says. “VCARE can be the cover page for everything Villanova is involved with from a sustainability perspective,” suggests Thomas. ■

Time and distance are no longer obstacles to earning your graduate degree! The College's E-Learning program's flexible options include:

- Streaming classes live in real time from anywhere in the world
- Joining your classmates on campus if your schedule permits
- Accessing the archived lectures and materials at anytime

Plus, choose from more than 100 courses to custom tailor your degree path!

THE COLLEGE OFFERS 9 MASTER'S DEGREE PROGRAMS

- Biochemical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Cybersecurity
- Electrical Engineering
- Mechanical Engineering
- Sustainable Engineering
- Water Resources and Environmental Engineering



The College also offers 15 graduate certificates, as well as a full- or part-time PhD program with more than 80 students currently enrolled.

VILLANOVA ENGINEERING

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ALL THIS AND ENGINEERING, TOO!

There's a common misperception that engineering majors are too overworked to possibly enjoy the University's many extracurricular activities. In fact, there are literally hundreds of College of Engineering students who prove otherwise. From athletics and the arts, to service and student government, engineering students are involved in countless ways. Here is just a sampling of our engaged undergraduates.

Caitlin Callahan '19 ME

Activity: Women's club soccer (defender) and club lacrosse (goalie)

Years involved: I've been playing lacrosse and soccer my entire life.

Time commitment: With soccer in the fall and lacrosse in the spring, I probably devote six to eight hours a week between practices and games.

“Managing the engineering curriculum with two club sports is all about time management. Sports are an outlet for me to get away from schoolwork, so I make every effort to get everything done in order to go to practice.”



Mechanical Engineering sophomores are well-represented in club lacrosse: Lauren Tschirch (first row, far left), Caitlin Callahan (third row, fourth from left) and Joan Condron '19 ME (third row, third from left).

Lucia DeNicola '17 ME

Activity: Varsity rowing

Years involved: Since freshman year of high school

Time commitment: In season (September–November and February–May), 20 hours of practice per week; out of season, eight hours a week. With individual workouts, on average, about 16 hours a week. Races can last three to 13 hours a day.



Lucia DeNicola '17 ME, varsity rowing

“It is difficult to be an engineering major and a part of the rowing team, but it's all about balance. Waking up at 4:45 a.m. has taught me great time management skills. Having practice every morning before class has helped my work ethic immensely. I am very competitive in my sport, and I transfer that to the classroom.”



Austin Hake '18 ChE at the Inter-Hall Council's annual Water-Ice Social.

Austin Hake '18 ChE

Activity: President of Inter-Hall Council, also a member of the Student Alumni Association (SAA) and president of Phi Sigma Pi honor fraternity

Description: Inter-Hall Council builds community across campus by bringing people together for large interactive events, while developing individual residence hall relationships through the efforts of smaller councils. The SAA is under the umbrella of the

Advancement Ambassadors Program whose main function is to enhance student-alumni interaction.

Time commitment: Roughly five hours a week

“This year, junior year, it was harder to balance extracurriculars, school, sleep, free time and work. It requires a clear prioritization of activities and ability to keep track of deadlines. Yes, it is difficult, but many people at Villanova are involved because we recognize that while academics are the focus, it is important to participate in other activities we enjoy to have a proper balance and contribute to the community.”

Ellari Hillard '17 ChE

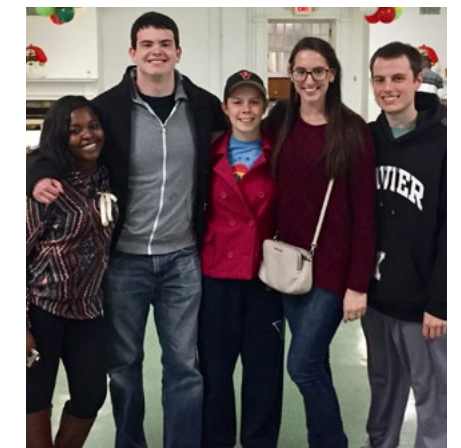
Activity: Board president and Villanova chapter president of SREHUP, the Student Run Emergency Housing Unit of Philadelphia

Description: Founded by Villanovans five years ago, SREHUP is a multi-university organization. The Villanova chapter consists of about 20 students who come to the shelter and help by preparing and serving donated meals, cleaning up and spending time with the residents. “Part of what makes SREHUP great is that student volunteers actually share a meal with the residents and talk around the dinner table, which facilitates community between college students and individuals experiencing homelessness.”

Time commitment: Volunteer two to four times a week and spend about two hours a day doing SREHUP-related work

“Chemical engineering is hard work and SREHUP is an enormous time commitment, so I find it helpful to plan everything in my agenda on Sunday evening for the upcoming week. I use my time efficiently and deal with school assignments or shelter problems as soon as I can, and everything always gets done. Knowing what to prioritize is key.”

SREHUP volunteers Kanyinsola Odujio '19 CLAS, William Dewey '17 CLAS, Grace Horner '17 ChE, Ellari Hillard '17 ChE and Mark Breault '17 ChE



Ed Keenan '20 CE

Activity: Club curling lead

Description: In curling, players slide stones on a sheet of ice toward a target area, which is segmented into four concentric circles. Points are scored for the stones resting closest to the target.

Time commitment: Four hours of practice every Friday. Competitions last all weekend.

“It is a very easy sport to balance with engineering since practices are on Fridays. Group project work and weekend tournaments, however, can be a challenge.”



Ed Keenan '20 CE, club curling

Neil MacDonald '17 ChE

Activity: Copy desk chief, The Villanovan

Years' experience: Wrote for my high-school paper and worked my way up to running it by senior year. Have been on the staff of The Villanovan since I was a freshman.

Time commitment: Six to 10 hours a week

“While it definitely takes practice to balance coursework with an extracurricular activity, I view my campus involvement as a way to take a break from being so immersed in engineering and to contribute to the campus community at large. I have really enjoyed my newspaper experience because it allows me to meet other students and become familiar with all corners of the campus.”



Neil MacDonald '17 ChE (center), at The Villanovan.

Matt Massina '19 CpE

Activity: Club quidditch

Description: Formed at Villanova in 2009, quidditch is a co-ed contact sport with a unique mix of elements from rugby, dodgeball and tag. A quidditch team is made up of seven athletes who play with brooms between their legs at all times. Other colleges and community teams meet in tournaments. Villanova plays in at least two tournaments in the fall in order to meet the qualification for regionals. Teams who win at regionals advance to the World Cup in the spring.

Years playing: Began as a senior in high school

Time commitment: Two to three hours a week

“Practice with the team doesn't feel like an obligation because I enjoy it so much, and having practice on weekend afternoons is perfect timing as it usually does not interfere with study time.”



Matt Massina '19 CpE, club quidditch

Nicole Palazzo '18 ME

Activity: Choreographer for Nova Noise, Villanova's tap dance group
Years dancing: I have been dancing ever since I could walk, and I have studied many different styles of dance from ballet and modern to jazz and hip hop. I've been a Nova Noise choreographer since spring of my sophomore year.
Time commitment: Rehearsals twice a week for one to two hours, sometimes adding in extra rehearsal times before performances. We perform two to three times per semester.

"Dance has always been a great stress reliever and outlet for my creativity, and I am very glad to continue doing what I love with other Villanovans, some of whom are also engineers!"



Nicole Palazzo '18 ME (front row, center), Nova Noise

Kevin So '17 CE

Activity: Villanova Singers all male vocal choir
Years singing: Began singing my freshman year. Before college, I was an instrumentalist (piano and trumpet).
Time commitment: About three hours a week for choir rehearsal, but a lot more for additional practice and personal learning time.

"Music is an incredibly time-consuming hobby, not only in terms of rehearsals and practices, but also learning how to write, structure lyrics, word play, rhyme schemes and coming up with topics. That's on top of learning the technical aspects like using music software, recording and basic production."



Kevin So '17 CE, musician

Numerous Villanova Engineers

Activity: The Villanova Band
Time commitment: Four hours of practice each week, plus performances at all home football and basketball games, and travel to tournament games. Additional performances at a variety of events.



Third row: Tyler Meluch '19 ME (Santa hat), Dan Grover '19 ChE, Erik Cox '19 CE, Middle row: C.J. Medora '18 CE, Chris Bowers '20 ME, Andrew McNamara '17 ChE, George Russell '18 ME, Caitlin Berner '17 CpE, Tyler Mullin '18 ChE, William Lawlor '17 CpE, Collin Larkin '18 ChE
 Front row: Jenny Kraynik '20 ChE, Alanna Reitz '17 ChE, Victoria Henck '17 CE, Andrew Meluch '16 ME, '20 MSSE, Reed Watkins '19 ME, Alec Garino '19 CE

COLLEGE'S GRADUATE CLUB PROVIDES OPPORTUNITY TO CONNECT AND UNWIND

In fall 2014, Villanova's College of Engineering formed the CEER Graduate Club with a goal of creating a sense of community among the College's graduate students. Open to all full-time and part-time graduate students, the club has grown to approximately 50 active members in less than two years.

Given the research-oriented nature of their work, full-time students spend much of their time in labs and have very little interaction with students outside of their departments. The club offers an outlet to step away from their work and network with their peers across the College's nine different engineering disciplines and in the other colleges at Villanova.

The club hosts monthly on-campus events including morning coffee socials, afternoon pizza parties and movie nights. Club leadership also organizes social outings throughout the year such as a night out at a Philadelphia Union game or participating in the St. Thomas of Villanova Day of Service.

Club Treasurer Sean Coffey, PhD candidate, enjoys being a part of the club noting, "I like how it connects students. It allows us to meet people

from different departments that we may not have met otherwise." Coffey believes the club offers a chance to decompress saying, "Many of us get caught up in our research, and this club gives us a break with fellow graduate students so we don't burn out."

Outside of the networking aspect, club leadership takes pride in its responsibility to represent all graduate students within the College of Engineering in front of the faculty and the administration. Last academic year, the board members helped to coordinate the graduate student orientation, and welcomed new students to campus. Club president Tamara Lozano, PhD candidate, recalls, "As an international student, it can be hard to fit in when you come from a completely different place, not knowing anyone. Having this club to welcome me, introduce me to people and force me to get out of the lab, brings a lot of joy to my grad school routine. I take special care in welcoming new students because I know how it feels to be the newbie."

With a goal of involving more students in the coming years, Lozano shares, "We plan to introduce professional development activities that will help increase the visibility

of Villanova's Engineering graduate students across campus and around the Philadelphia area." The club also has new social activities planned for the months ahead, which include basketball viewing nights to support the Villanova men's basketball team and an astronomy night event at the observatory on campus.

Gerard "Jerry" Jones, PhD, Senior Associate Dean of Graduate Studies and Research, is pleased that the club has been successful and looks forward to watching it grow throughout the

coming years, "I am delighted to see how the graduate students have embraced the new club. Our intent was to connect students, but it has developed into so much more. The growing success and interest in the club is due to the dedication, vision and hard work of the club's leadership team, including Tamara, Sean and Chris Mansour. They are such a cohesive group. I look forward to the club's bright future." ■



CEER Grad Club

FROM WATER RESOURCES MANAGEMENT IN NICARAGUA ...

Villanova Engineering PhD candidate Andrew Golato was initially drawn to service work when his co-worker Tim Masterson told him about the James A. Masterson Foundation, which he had established to honor his late brother Jim, a Villanova alumnus. The organization's mission is to "help people in crisis" and at the time was raising money to buy water filters for families and communities in developing countries. When asked if he wanted to get involved, Golato welcomed the opportunity and was brought onto the foundation's advisory board. Shortly thereafter, he embarked on his first service trip to Colombia where he and Tim traveled to remote locations and distributed 150 filters, which provided more than 10,000 people with clean drinking water.

This life-changing experience made a strong impression on Golato, leading him to initiate a meeting with the College's Director of Villanova Engineering Service Learning Jordan Ermilio, who recruits student volunteers to travel and support the initiatives of Villanova's service partners around the globe.

As a result of their meeting, Golato was appointed a leader for the College's 2016 fall break trip to Nicaragua. The goal of this trip was to support a

long-term community initiative to provide greater access to clean water. Golato, Ermilio and seven students traveled to Waslala, where they worked with community members to help survey and test the water. Upon arrival, they were greeted by a familiar face,

Golato recalls, "The community welcomed us into their homes, cooked meals for us and treated us as family; there was instant absorption into the culture and community when we arrived." Reflecting on the work, he says, "This project opened the eyes



Doctoral candidate Andrew Golato in Nicaragua with Heryel Erwin Jr., godson of Iain Hunt, the College's international development initiative manager.

Adam Butler '15 ME who has been living in Nicaragua, fully immersed in the project since fall 2015.

of many students on the trip. Some were, for the first time, applying the engineering concepts they learned in class to real-world issues."

On the last day of the trip, the Villanova team joined together with the community for a big dinner with dancing. While the community was grateful for the work the students had done, Golato insists, "The students are the real beneficiaries of this work. Not to downplay our role, but we have the chance to discover a new culture, apply our engineering skills and help the community execute this project; it's a humbling experience."

Back on campus, Golato and his teammates are busy wrapping up the final deliverables, which include a recommendation for a computer model of a water-distribution system, a cost-benefit analysis, two site maps and a how-to guide. A follow-up trip is scheduled for spring 2017.

Golato appreciates the opportunity he says he only could have found at Villanova. He knows it will be an advantage as he applies for teaching positions at area universities after earning his doctorate this May. He notes, "VESL gave me a greater perspective on what I thought was a narrow career path. Being a professor can be about more than teaching and research; you can have truly global impact." ■

... TO STRUCTURAL HEALTH MONITORING AT VILLANOVA

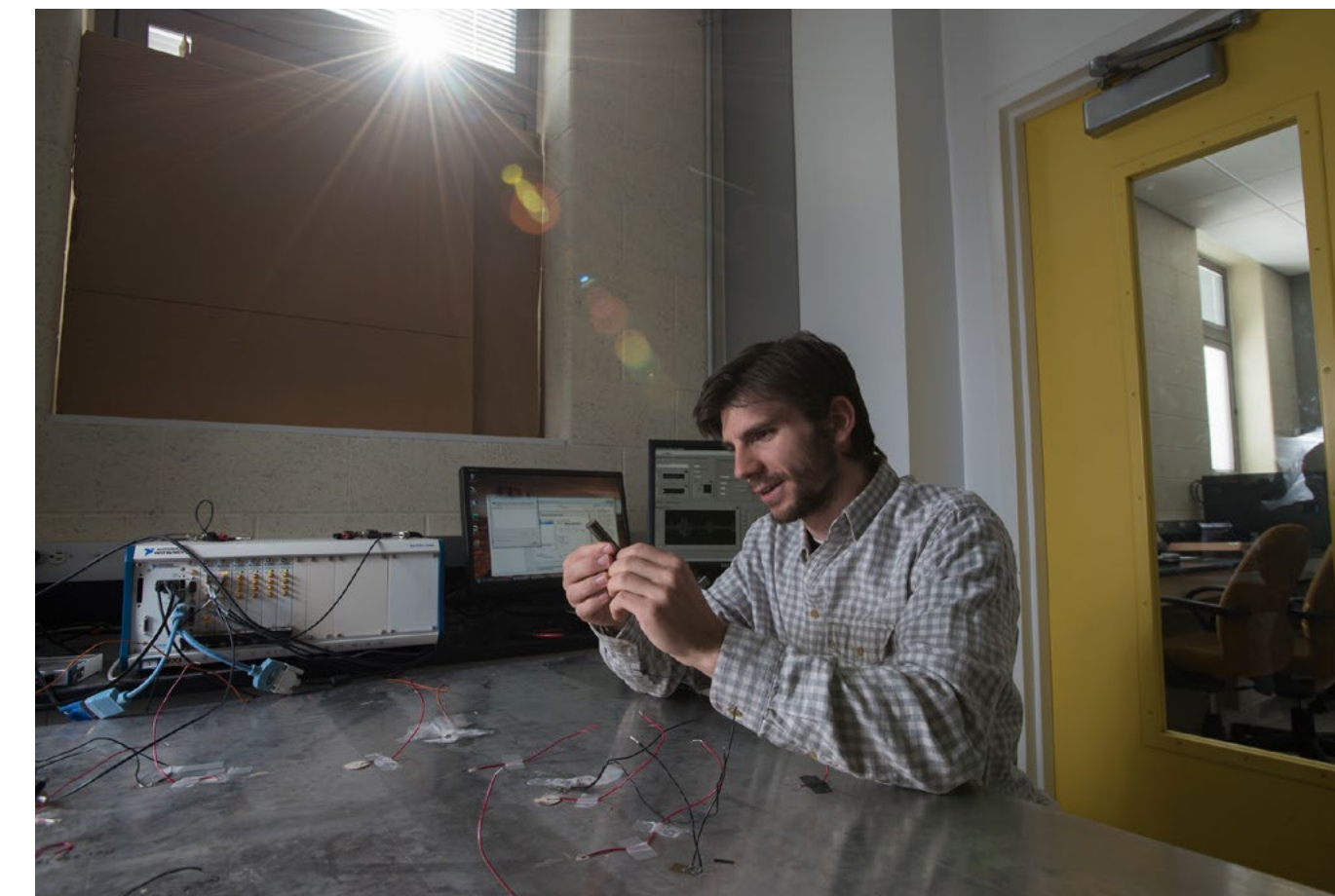
Given the service projects he's worked on, one might assume that PhD candidate Andrew Golato is a civil or environmental engineer pursuing his doctorate in the area of water resources. In fact, Golato's service experiences are unrelated to his academic pursuits, which lie in the area of structural health monitoring, a subfield of non-destructive testing that allows for real-time, in situ monitoring.

For those unfamiliar with the field, Golato offers an analogy, "Your car has a check-engine light, which monitors your engine to ensure all components function

properly. When one is failing, the light turns on, and a mechanic connects a computer to the car, and the computer identifies the faulty component."

In Golato's work there is a system of piezoelectric sensors, which constantly transmits a prescribed ultrasonic wave into the pipe or plate being inspected. If a flaw (crack, hole, corrosion, sediment build up, delamination) is detected, the propagating acoustic wave will be scattered by that flaw. A series of piezoelectric sensors functioning as "receivers" obtain that scattering and record it. The recorded scattered wave is then applied to a computer algorithm that Golato wrote, which uses prior knowledge of model-based scattering physics and wave propagation to provide the coordinates of the damage. The output is an image of the inspected plate or pipe on a computer screen with any and all damage properly located to within 10 mm.

Golato is advised by Villanova University Mechanical Engineering Professor Sridhar Santhanam, PhD, and Temple University's Fauzia Ahmad, PhD, an associate professor of Electrical and Computer Engineering. He also works with Center for Advanced Communications Director Moeness Amin, PhD. ■



Andrew Golato inspects a steel rod used in an ultrasound-based defect localization scheme for thin plates.

VESL: BEYOND A ONE-TIME ADVENTURE

By Andrew Lee '19 ME

When Villanova students participate in service learning projects, our partners and community members aren't the only ones who benefit. Students learn a lot. For example, I learned that when you're going to survey terrain for a clean-water source, don't drink the water. Looking at my friend John Clements '18 ME, bottles full of tap water in hand, we shrugged and said, "I guess if we go down, we go down together." Boy did we go down.

In spring 2016 I had the pleasure of traveling to the beautiful community of Kasquita, Nicaragua. Our team was going to survey terrain for a gravity-driven water system that would supply 71 households, two schools, four churches and a local clinic. In three days, with a passionate crew of students, faculty advisors and local community members, we surveyed nearly 7 kilometers of terrain over a 340-meter elevation change. Every step, community members led the way, clearing foliage, showing us the right path, knocking down plantains and sugarcane for snacks, and sharing in laughter.

But, we weren't just there to work on the water system. When we returned to the larger community of Waslala, we hosted a science day for children. My mom is a first-grade teacher, but I've never seen kids as excited as when they were recreating water systems out of straws and cups, munching on marshmallows while building spaghetti towers, and launching bottle rockets into the sky. What a joy it was to hear our planning pay off.

When we returned to Villanova, we consolidated our water-system data and discussed preliminary designs. Just a few months after our return, we had the opportunity to present the Kasquita project to Aqua America, a water utility company that generously supports Villanova's Engineering Service Learning work in Panama and Nicaragua. After our presentation, I was saddened to think that this may be my final involvement with the project.

Fast forward to October 2016 when Jordan Ermilio, Villanova Engineering Service Learning director, visited my Fluid Mechanics class to discuss a new project. Divided into teams, we were each assigned a community for which we would be tasked with designing a gravity-driven water system. When I received my

group's specific project and opened the Google Earth file, it didn't matter that I had a Dynamics test the next day; I couldn't help but smile as memories from the previous spring came flooding back. Everything I was learning in class meant so much more when I knew it would be helping Edgar, Julia, Eduardo and so many more I had met in Kasquita. As I worked, I recognized the school building that we



Back row: Adam Butler '15 ME; Aidan Buckley '17 ME; John Clements '18 ME; graduate student Justin O'Brien; Brian Cullinan '17 CE; Andrew Lee '19 ME; Erwin Taleno, Water for Waslala (now part of WaterAid America); Iain Hunt '15 MSSE, manager, International Development Initiative, Sustainable Engineering; Kasquita community member
Front row: former Villanova student Jacqueline Townshend, Caroline Zielinski '19 ChE, Michael O'Brien.

had slept in each night; the creek we had bathed in; and the houses of those who had been so hospitable during our stay.

"My involvement has allowed me to become a better engineer with a more global perspective."—Andrew Lee '19 ME

This is where VESL trips differ from simple service or mission trips. They are not just one-time adventures; they represent an investment in a project. These projects start in communities, are supported by students and benefit all. Our investment doesn't stop when the trip ends, but instead is integrated into our entire time here at Villanova. My involvement with the project is not only helping the people of Kasquita have access to clean water, but it has allowed me to become a better engineer with a global perspective. I hope to return to Kasquita one day so that I may drink the water with the incredible people I met; this time without fear. ■

UNIVERSITY'S NEW TELEVISION SPOT FEATURES ENGINEERING PROJECT

Since 2013, four Villanova Engineering faculty and more than 25 Villanova Engineering students have worked on a low-cost humanitarian explosive ordnance disposal robot capable of operating in low-income countries, like Cambodia. In January 2015, after conducting field trials in that country, the latest prototype was determined ready to undergo redesign for production. Produced in collaboration with Golden West Humanitarian Foundation, this project is the basis for the University's new 30-second television commercial, which airs nationally during Villanova basketball games. The commercial begins with images of global crises and challenges, and goes on to explain how Villanovans are providing solutions.

"Given Villanova's new national ranking, we wanted to continue showcasing our academic excellence and Augustinian tradition," says Ann Diebold, Vice President for University Communication and Marketing. "We chose this College of Engineering story for several reasons—it differentiates us; it is academically impressive; and it clearly shows how Villanova's faculty and students are igniting change around the world."

In addition to appearing during basketball games, the EOD robot commercial aired on CNN, in airports nationwide on Thanksgiving and President's Day weekends. It is also being featured on social media. The commercial can be viewed on the College's website at engineering.villanova.edu/EODrobot. ■



The University's new television spot was produced by Bowstring Studios, which was founded by two Villanova Engineering graduates: Enrique Mendoza '00 CE and Sean Quinn '00 CE, '10 MBA.

THANKS FOR THE MEMORIES!

We asked Villanova Engineering alumni to share their most memorable College courses and were overwhelmed by the number of responses! Some recalled the class that taught them a valuable lesson; others described an unforgettable professor; and many remembered the course they would most like to forget!

Because we did not have room in this publication to include all submissions, we're going to feature them on Facebook for "Throwback Thursdays" beginning May 4.

My most unforgettable professors were Amalotti, who taught Mathematics, and "Bucky" Slavin, who taught Alternating Current. Amalotti had "Amalotti's Bank." Each test had five questions, each worth 25 points. It was possible to attain a score of 125 so those extra points were in our bank for us to draw on for the balance of the semester.

"Bucky" had an uncanny ability to remember each of our homework assignments. Bumping into him two days before graduation, he informed me that he could not report my final grade unless I turned in the answer to a problem that was assigned three months before ... and then he told me the exact problem!

—Phil Piro '50 EE



J. Stanley Morehouse, PhD, Dean, College of Engineering, 1938-1961

When I was a student, we took a two-week break at Christmas and had exams in January. Before I left campus, I asked Professor J. Stanley Morehouse, the College dean and my Thermodynamics teacher, for copies of some past final exams. He gave me five, and I spent countless hours working on those old exams at home. I came back and took the Thermodynamics final. My preparation allowed me to obtain a 99 on the final, which Dean Morehouse told me was the highest mark any student had achieved. I

received an "A" in that course, and my first job was working for Pennsylvania Power and Light in power plants with my knowledge of thermodynamics.

—Gerald J. Ratchford '58 ME

Freshman Physics was one course that awoke me to the fact that I needed to put in a huge amount of work to be successful. Professor William G. Driscoll was in an alternate universe. There was no nonsense in his delivery, and you were responsible for every bit of it when you were tested every Friday in a pop quiz. We joked that doves were released from the stage as he spoke. Having done well enough in high school to win a full scholarship to Villanova, I was shocked when I began to get quiz grades of 9 or 16 or 27 on the basis of 100 as a perfect score. This jolted me into a very serious approach not only to Physics, but all my other courses. So I appreciate Professor Driscoll's test traumas early in my learning curve.

—Tom Curran '62 ME

Professor William Driscoll, chairman of the Physics department, will never be forgotten by any of my classmates. He was an extremely serious individual who told us, with a straight face, that we all should be in bed every night by 11 p.m. so as to get a good eight hours of sleep. His serious demeanor added special humor to comments he would occasionally make while lecturing, such as, "Remember, every couple has its moment."

—Steve Callanen '63 ME



Sallie Lipan Callanen '65 CON and Steve Callanen '63 ME, May 1963

For me, hands down, the most unforgettable course was a two-credit speech course. It was a College of Engineering requirement, not an elective, and taught in the Theatre department. In the first speech I gave to my classmates, I found that the expression "knees knocking" was real, not just hyperbole. I improved after that. The course made a real difference in my presentation skills in my first job and throughout my career. I don't know what that says about my engineering skills, but I can talk a good game.

—Nick DiMarino '63 ChE

In 1967 when I started at Villanova Engineering there were five women in our class. Only two of us graduated. Women had to wear dresses and the guys coats and ties (yes, all day every day). As engineering students, we had many labs and often times I needed to change into pants because of what we were doing. One afternoon as I left a late lab (5:30 p.m.), I was "caught" by the dean of women who told me to go back into Tolentine and change into my dress. Since there were so few women on campus, it was impossible to float under the radar.

As most people know, engineers get very few electives. My senior year I decided to take a philosophy class. Of course the class was closed, so I needed to get permission from the department head to take it. I told him I either could take this class or Reinforced Concrete II. He told me it was the best request he had ever had and let me in the class. I should have taken Reinforced Concrete II; I would have gotten a much better grade.

—Joyce MacCombie Curtis '71 CE

My most vivid memory was Professor William Driscoll's Physics class freshman year. He was by far the toughest grader and made it a point to tell us on the first day that one out of every three would fail. That was his 37th year teaching at Villanova. After one exam halfway through the semester, I was sure I had done the impossible: scored a 100 on one of his exams. A few days later I got my results; a 77. I had only received 10 out of 33 points for one of the three problems. I reviewed the scoring, and was sure my answer was correct so I went to see him. He looked at the paper and said, "Mr. Ricart, I gave you a problem with input values of two significant digits. You gave me an answer to five significant digits. You created precision that did not exist." I never forgot my non-perfect score, and it developed my interest in measurement uncertainty, which served me well in my career.

On my way out of the final exam, there were two students walking ahead of me: one happy-go-lucky and another looking like the weight of the world rested on his shoulders. I was sure I knew which of the three of us had been the semester casualty. Finally, the sad one said to the other, "I flunked; my dad's going to kill me. How about you?" The reply was, "Oh yeah, I flunked too." His friend replied, "Aren't you worried about your dad?" He answered, "Nah, he and my uncle both flunked this guy's class 25 years ago."

—Fernando Ricart '74 EE



Glenn Reitmeier '77 EE in Villanova's Electrical Engineering lab, 1976

My most memorable Villanova Engineering course was Digital Signal Processing taught by Dr. S.S. Rao. As with all of the courses taught by Dr. Rao, it was extremely challenging and went very deeply into the subject matter. The wisdom among his students was that "you can't study for a Rao test" because no matter how many end-of-chapter problems you mastered, there was always one tricky question on the test that really challenged your deep understanding and ability to apply the subject matter.

I didn't know it or appreciate it at the time, but that course was the foundation for my career. After graduating in 1977, I joined RCA Sarnoff Labs and did research work in digital video signal processing, resulting in over 50 patents and culminating in the development of the digital HDTV standard. The Digital Signal Processing course and Dr. Rao's mentorship at Villanova was truly the beginning of my career path.

—Glenn Reitmeier '77 EE

The defining course of my Villanova Chemical Engineering degree was undoubtedly Dr. Robert White's Stoichiometry course. I had transferred into Chemical Engineering from General Science, only begrudgingly permitted by a very skeptical Doc White. After receiving a 10 percent (yes, 10 percent) on my first quiz, I was even more determined to prove him wrong. Doc White taught that there was no excuse for "stupid" errors. An error was an error, and many stupid errors have been the cause of serious engineering failures. He taught discipline and, yes, perfectionism.



Former department chairs J. Clothier, PhD, Electrical Engineering; R. White, PhD, Chemical Engineering; J. Gallen, PhD, Civil Engineering; and G. Auth, PhD, Mechanical Engineering

After that first quiz, I spent many nights in the library. In addition to working through all of the homework problems, I found all of the old Chem E textbooks and worked all of the problems in those as well. I did every problem I could find, checked my answers and made many "stupid" errors until I had no more "stupid" errors to make. To this day, I double check my data and my answers. As we heard many times, there is no partial credit in the real world.

—Anne Roby '86 ChE



Young Chun, PhD, retired associate professor, Mechanical Engineering

There were many memorable courses and professors—Drs. Harrington, McAssey, Kroos* and Marston—but the one that was most memorable was Dr. Young Chun's Optimal Design class. After a particularly harrowing test, I was confident that I had the right answer to at least one of his questions. When I got the results, I noticed that I had made a mistake on the last step of that question, subtracting rather than adding two results. He gave me zero points for it. I approached him after class, pointing out that I had all the higher level math correct, and had just made a dumb mistake on the last step. I asked if I could receive partial credit. He then said something that has stuck with me to this day: "Mr. Palmé," he said without a hint of humor in his eye, "If you designed a bridge, and the bridge fell down, would you expect to receive partial credit?" His statement was a powerful reminder of the importance of checking my work!

-John Palmé '88 ME, '91 MSME

Two of the Engineering courses that most influenced my career were Thermodynamics I and II, both taught by Dr. Charles Marston. Building upon his professional experience and outstanding knowledge of thermodynamics, he was able to both inspire my overall interest in energy and laid the groundwork for my future. Using what I learned in those classes, I first went on to earn a PhD with a concentration in combustion, and then entered the world of academia, where I have taught those thermodynamics courses many times. These courses also started me on the path that culminated in writing my own textbook in thermodynamics. If those courses had not been as interesting and well-taught as they were, I really don't know what I would have worked on. But I do know that because of those courses, I've had an exciting and rewarding career.

-John Reisel '89 ME, PhD

I thoroughly enjoyed my education at Villanova and have many positive experiences to reflect upon, but the most memorable was actually a stern lecture to the entire Heat Transfer class from a very disappointed Dr. Edward McAssey. It was my junior year and by then many of us had come to terms with producing low test scores and being rescued by the Gauss curve for a passing grade. We were not always applying ourselves to the fullest of our capabilities. One particular test was so bad that Dr. McAssey couldn't ignore the results and had to let us know what was on his mind. I don't recall the entire speech or how long it lasted, but the part that stood out for me is that "In real life it is not acceptable to get a 'C'. You cannot build a bridge and have it only work 70 percent of the time!"



Edward McAssey, PhD, professor emeritus, Mechanical Engineering

-Richard Wall '90 ME

I will never forget my Intro Level Physics Class with Dr. Shaw. This "weeder class" went from more than 100 students to less than 40 by the end of the semester. I was mortified when I got one of the lowest grades in the class on the first exam (initially, I was unable to find my score/name because the highest grades were at the top—which is precisely where an overconfident student such as myself was looking). I thought that engineering was not for me at that point and that I would have to transfer schools, or even worse, become a business major. But, alas, I became focused, took advantage of office hours, enrolled with a tutor and completely changed my studying habits. I finished with one of the highest grades in the class on the last two exams and the final, and made Dean's List that semester.

-Francis Homer '03 CE

I will never forget ME2505 with Professor James O'Brien*. We had a design competition to build a robot that could navigate a maze and extract a peg that was in the center of the maze. I remember working tirelessly with my group until we were able to achieve the goal repeatedly dozens of times. On the day of the competition, the lighting in the room (CEER 001) was very dim, and our optical sensors kept malfunctioning. Our robot kept driving into a wall! I learned a lesson that I will never forget: It is incredibly important to test designs in different settings, with different inputs and different initial conditions, as many times as possible!

-Frank Ligor '06 ME



Shawn Gross, PhD, Professor, Civil and Environmental Engineering

The most memorable course for me was my senior capstone course. I worked with four other students to design a bridge in Torti, Panama, where I traveled over spring break to acquire survey and geotechnical data. This course helped me realize that I wanted a future career in structures, specifically bridge construction. I was lucky enough to find a job right after graduation with The Conti Group constructing a new bridge over Gallant's Channel in Beaufort, N.C. I was involved in all aspects, from pile driving to setting girders, and I have to thank Villanova for sparking my interest in bridge construction and helping me to find my calling in the engineering world.

-Laura Boisclair '14 CE, EIT



Laura Boisclair '14 CE, EIT



Amy Fleischer, PhD, professor and chair, Mechanical Engineering, and Kristen Leigh Shannon '15 ME at commencement

My toughest and most memorable engineering course was Thermal Fluids System Design with Dr. Amy Fleischer*. We had three big projects throughout the year, as well as three tests. I spent numerous late nights in CEER working on our projects with my three teammates. We were able to apply what we had learned in previous years, which justified all the late nights and countless hours in those classes as well. The best part, though, was that there was no one right answer, as is the nature of design. It was an extremely demanding course, but also helped me grow tremendously.

-Kristen Leigh Shannon '15 ME

As an Electrical Engineering major, everyone said that Signal Processing would be the hardest class I'd ever take, so sitting in Dr. Kevin Buckley's* class that first day was terrifying. I'd just finished an internship I didn't love and didn't really know where to go from there. The first day, Dr. Buckley started talking about Signal Processing being used by engineers to improve medical technologies, and as soon as he said that, something clicked. I knew that I wanted to use my degree for that purpose. Signal Processing ended up being one of the most fascinating courses for me and I'll never forget that class, especially as I begin my PhD program working on MRI technologies.

-Liesl Krause '16 EE



Liesl Krause '16 EE and Kevin Buckley, PhD, professor, Electrical and Computer Engineering

My favorite class was Statics with Dr. Shawn Gross*. After suffering through all of the intro classes freshman year (especially chemistry), it was great to walk into a class that centered on math and physics—my two strengths. Earning an A in the class was rewarding and I also enjoyed the spring break trip to Amigos de Jesus in Honduras the following semester.

-Catherine Honohan '11 CE

A SELF-DESCRIBED SERIAL ENTREPRENEUR



David Buscher, '67 EE (Villanova, 1967)

If it had existed when he was a student, **David Buscher '67 EE** would have thrived in Villanova University's Engineering Entrepreneurship program. Even without the benefit of formal coursework to guide his ventures, Buscher did well for himself as a businessman, and he didn't wait until graduation to get started. As an engineer for the campus radio station, he got into the business of demo tape recording. His first client? Fellow Villanovan Jim Croce and his band the Haversens. Buscher then formed Stage Crew, a pay-as-you-go group

of Villanova students who managed the stage requirements of acts that performed on campus, including Peter, Paul and Mary; the Kingston Trio; and Simon and Garfunkel.

Managing the needs of musical entertainers wasn't Buscher's only foray into entrepreneurship at Villanova. More closely related to his studies, he served as chief engineer for the Psychology department, helping to design experiments that had mechanical or electrical components. The Speech department also utilized Buscher's talents in developing instructional television capabilities, which at the time were new to the University.

Not surprisingly, leadership opportunities followed Buscher after graduation. His first job, with Harry Diamond Laboratories (HDL—now the Army Research Lab), took Buscher to Vietnam in a civilian position. There, at the age of 22, he served for four months in the Science Advisor's Office and for a time was the acting Science Advisor for the Army, an opportunity he describes as "the most intense learning experience of my life." He spent 11 years with HDL and earned an MSEE degree at the University of Maryland, after which he joined Johns Hopkins University Applied Physics Lab where he also was

involved in government defense work, this time through the Navy. During his 17 years with Johns Hopkins, Buscher traveled the world, learning what life was like at sea and solving difficult problems without the tools he might have had on shore. He also earned his master's degree in Systems Engineering at Hopkins and taught in the engineering school for 10 years while working at APL.

In 1996, Buscher's entrepreneurial spirit led him to form a new company with other JHU engineers: Solipsis (Solutions and Information Processing Systems). Its cutting-edge software allowed multiple civilian and military radars to create a single-integrated air picture. The need for Solipsis's technology became painfully apparent on 9/11. Buscher recalls, "The government called that day and told us they needed our hardware and software



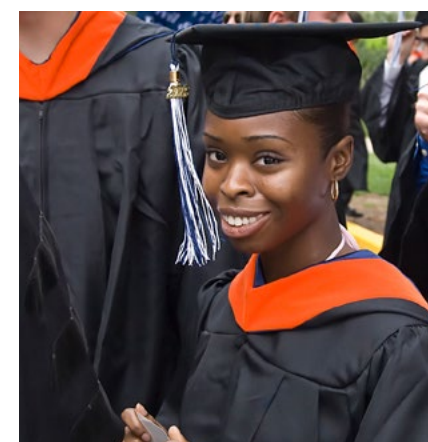
Buscher on a trip down the Colorado River

at various sites around the country." Practically overnight, the still-growing company had expanded nationwide. Two years later, Buscher and the company's co-founders became instant millionaires when Solipsis was sold to defense contractor and industrial corporation Raytheon. Buscher remained with the company for 12 years, while simultaneously expanding his empire, which included 14 different businesses, ranging from a Krav Maga (Israeli self-defense) business to a luxury day spa (co-owned by one of his five sons and daughter-in-law).

In 2012, Buscher became involved with solid oxide fuel cell research at the University of Maryland. The research led to a new business opportunity: Redox Power Systems, which, if successful, will revolutionize the distribution of energy using solid oxide fuel cells powered by natural gas. "I'm working on it every day, while enjoying my 10 grandchildren on the side," says Buscher.

When asked to share advice for today's students, Buscher says, "You've got to look at the big picture, even if you're only involved in a small part of it. Nothing is done in a vacuum; everything is part of a bigger whole." ■

LESSONS LEARNED AT VILLANOVA



Sharika Anderson, graduation, 2008

When Sharika Anderson decided to pursue Chemical Engineering at Villanova University, her goal was medical school. "I wanted to set myself apart from the competition by earning something other than a science degree," she says. Fortunately for the engineering community, it took only one internship—with National Starch and Chemical Company—to convince Anderson that a career in engineering was actually a perfect fit.

Subsequent internships proved equally valuable. Working at a manufacturing plant revealed that field was not for her, while an experience with the consumer products company Colgate-Palmolive foreshadowed her post-graduate career path. "I found it rewarding to work on something that you see on store shelves," she says.

Today Anderson works for Proctor & Gamble in Cincinnati where for eight years she has contributed to the research and development of many national products, from Gillette shave gel and Duracell batteries to Bounty paper towels and napkins. She admits, "I never intended to leave New Jersey, where my family is, including my 8-year-old brother, but P&G is so large that you can have many mini-careers with one amazing company." Leading multifunctional teams, integrating initiatives into manufacturing sites, reliability engineering and quality assurance are among the many experiences Anderson has had at P&G.

Anderson's varied experiences, along with life lessons learned at Villanova, have provided her with professional insight that she's happy to share with new and recent graduates. Perhaps her biggest piece of advice relates to community and relationships: "Villanova's tight knit sense of community taught me that the most important aspect of your career is relationship-building." She encourages young professionals to build that sense of community in the workforce, just like they had in school. "Then you'll be golden," she says.

Important lessons also were learned in Professor Vito Punzi's class. His course—Chemical Processes—was Anderson's first introduction to the discipline, and she remembers him being tough, "but he made me stronger." She credits Dr. Punzi for teaching her how to think, craft a hypothesis and develop solutions: All skills she uses on a daily basis. She says, "That thought process applies to any project you will ever work on."

"Like many students, Anderson initially struggled with her first Chemical Engineering course, but through our continued discussions and her hard work and perseverance she not only survived; she flourished! Once the 'light went on' it never went off as evidenced by her success in not only graduating from our program, but doing real well in the 'real world!'"—Professor Vito Punzi, PhD, Chemical Engineering



Anderson's career has included working on Bounty paper towels at Proctor & Gamble.

Similarly, Anderson believes in being strategic about actions to advance her career. When starting a new position, she recommends thinking about the chief contribution you want to make; what you want to be known for; and then developing action steps accordingly. She advises, "Decide where you think you want your career to end up, and choose the jobs and positions that will point you in that direction." ■

*Current faculty members



**VILLANOVA
UNIVERSITY**
College of Engineering

800 Lancaster Avenue
Villanova, PA 19085

www.engineering.villanova.edu



**Drosdick Endowed Dean,
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Designer: Villanova Creative Services
Photographers: Bowstring Studios, Paul
Crane, John Shetron, Kim Shimer
Address Updates: Send to
alumni@villanova.edu

Questions or comments? Send them to
Kim Shimer, Director of Communications
at kimberly.shimer@villanova.edu



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VILLANOVA ENGINEERING UPDATE

SPRING 2017

ADVANCEMENT

STUDENT INNOVATION FUND SUPPORTS FLIGHT SIMULATOR PROJECT

Last year, seniors Ryan Green EE, Terrance Howell CPE, Matthew Janny EE and Joseph Tordella CPE approached Edmond Dougherty, director of the Engineering Entrepreneurship program, with an idea. They wanted to build a flight simulator, an ambitious capstone project that went far beyond drafting plans and diagrams. The students—one a pilot—envisioned a simulator that would place the user inside a fully functional cockpit, complete with a moving platform to mimic the motion of flight. Dougherty could see the potential.

"It was going to be a multiyear project that would give the students real experience," he says, but it would also cost far more than most student projects. Dougherty turned to the Student Innovation Fund to make it possible.

Established by Arthur Metzler '86 ME, the Student Innovation Fund provides annual support for engineering entrepreneurship projects. The fund is helping students develop ideas ranging from a medical bracelet that stores health records in the cloud to a device that tracks when a hockey puck crosses a goal line. Dougherty also used funding to purchase a 3-D printer for students pursuing the engineering entrepreneurship minor.

"It's a real blessing for us. We teach students that you can make effective prototypes out of items as simple as Popsicle® sticks, but it makes the education so much more real and vivid to have projects come together with



Flight simulator: A pneumatic version of the flight simulator's motion base using Bimba actuators.

commercial components," Dougherty says.

Now seniors, the flight simulator teammates are bringing their concept to fruition. The Student Innovation Fund helped them purchase the parts for the inside of the cockpit and a set of actuators for the motion base.

As the project evolved, the team linked up with Frank Klassner, PhD, who manages the University's interactive CAVE (CAVE Automatic Virtual Environment). Using the CAVE's technology, the flight simulator will include 3-D visuals of flight to complement the physical instruments and motion base.

"It will be a fully immersive experience of what it's like to be in a cockpit," Ryan says.

The project has caught the attention of Jamie Hyneman of "Mythbusters" who works with College of Engineering

students and faculty on a variety of projects. Hyneman connected Dougherty and the student team with Bimba Manufacturing, which supplied a set of their high-performance actuators and pneumatic valves. Hyneman is providing a mechanical design for a more advanced motion base. "Using Jamie's more sophisticated motion platform design, the students will add their instrumentation to, eventually, produce an amazing immersive CAVE experience," Dougherty says. In return, Dougherty hopes to share what the students learn with Hyneman, to uncover potential new applications for the actuators.

As the pioneer team prepares to pass the project on to a new set of students, Dougherty sees opportunities to expand the project to new disciplines. He hopes to involve Mechanical Engineering students and those in the College's new Aeronautics minor.

Ryan is sad to be leaving the project as he and his team prepare for graduation, but he appreciates the experience he's gained. "It's good to start working with teams and groups—it's like a real job," he says. "We've been diving into the project and figuring out how to make it work. It was great to see it come alive."

Dougherty agrees. "It's a win-win-win: It's fun; it can be used in the CAVE; and students are learning from it," he says—and he's grateful for the gift that made it happen. "We couldn't have done it without the Student Innovation Fund." ■