SPRING 2015

VEU
VILLANOVA ENGINEERING UPDATE

VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING

# SMALL BUT MIGHTY: NANOTECHNOLOGY RESEARCH GAINS STRENGTH AT VILLANOVA

Since its birth in the early 1980s, modern nanotechnology has seen rapid research growth worldwide, including here at Villanova University. Defined as the study and application of matter on an atomic, molecular and supramolecular scale, this burgeoning technology already has begun to have an impact on our lives. Its potential use across nearly all disciplines of science, engineering and technology is evidenced by recent breakthroughs reported in academic journals around the world:

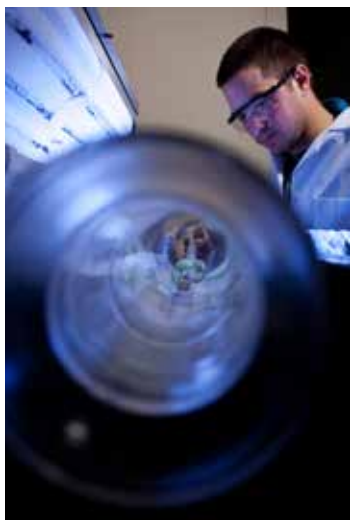
- Nanosensors that detect heart attacks before they happen
- Nanomaterials to improve protection of soldiers
- Carbon nanotube membranes for purifying sea water
- Gold nanoshells and lasers to destroy cancer tumors with heat
- Silver nanoparticles to kill bacteria

In the College of Engineering, Mechanical, Chemical, Electrical and Computer Engineering faculty are pursuing a variety of related applications, and have received a number of national research grants to support their work:

- $324,709 from the National Science Foundation (NSF) for "Thermal Transport in Nanoenhanced Phase Change Materials" (2009–2013)
- A $60,000 one-year grant from the Nanotechnology Institute for the study of low-temperature mechanical reinforcement of nanoparticle thin films (2011)
- $325,483 from the NSF for Development of Enhanced Performance Energy Storage Materials Using Tailorable Percolation Networks of Nanofibers (2012–2015)

## NSF Grant Supports Cutting Edge Technology

In fall 2014, a team of Villanova Mechanical Engineering faculty earned the College's most significant nanotechnology award to date: A $412,106 Major Research Instrumentation grant from the NSF for "The Acquisition of Atomic Layer Deposition Device for Nanoscale Materials Development Research."



A chemical vapor deposition method is being used to grow nanomaterials.

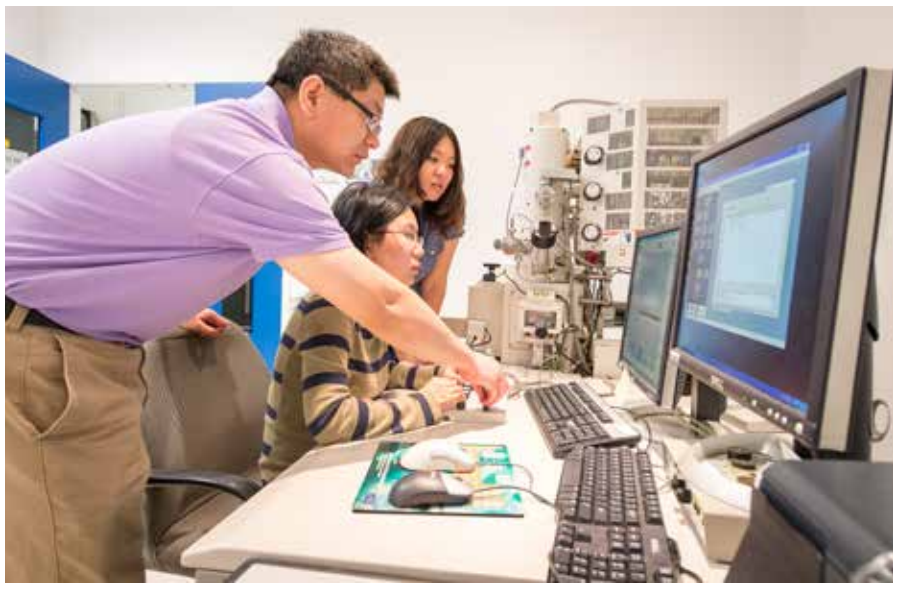
Put in simplest terms, the atomic layer deposition device creates a thermal or plasma thin film material with atomic precision, enabling critical new research areas. Under the direction of Professor Amy Fleischer, PhD, '91 ME, '96 MSME, the Villanova Atomic Layer Deposition facility will be established in the Center for Engineering Education and Research (CEER). The new device will join the College's existing nanotechnology instrumentation in the Nano-Bio-Mechanical Characterization Laboratory directed by Associate Professor of Mechanical Engineering Gang Feng, PhD, and the Nanomaterials and Surface Science Laboratory led by Randy Weinstein, PhD, Associate Dean of Academic Affairs and professor of Chemical Engineering.

Working with Dr. Fleischer on this project are Mechanical Engineering colleagues Dr. Feng and Calvin Li, PhD, assistant professor. The project also involves Daeyeon Lee, PhD, a Chemical Engineering professor from the University of Pennsylvania; and Xuemei Cheng, PhD, a Bryn Mawr College Physics professor. "This facility will serve as a regional center, enabling collaborative research and development between faculty and student researchers in three different areas of expertise, and at three distinct types of institutions," says Dr. Fleischer. Gary A. Gabriele, PhD, Drosdick Endowed Dean of the College of Engineering, adds, "This latest award places Villanova in the ranks of research institutions nationwide that are on the cutting edge of this emerging technology."

> "Having the latest instrumentation for nanotechnology research is practically a requirement for bringing the best faculty on board, which is what we must do to stay competitive as we transition into a doctoral/research university classification."
>
> —Gary A. Gabriele, PhD, Drosdick Endowed Dean, College of Engineering

## Current Nanotechnology Research

Examples of nanotechnology research currently being conducted at the University include Drs. Feng's and Daeyeon's layer-by-layer assembly process to fabricate multifunctional nanostructured thin films for optical use. Their goal is to make ultrathin films more robust and scratch resistant for use as anti-fogging and anti-reflection coatings commonly applied to eyeglasses. Dr. Feng also is working



Using a state-of-the-art scanning electron microscope, Associate Professor Gang Feng, PhD, Mechanical Engineering, and his doctoral students, Di Zhang and Yue Xu, investigate synthesized nanomaterials.

on characterizing individual nanomaterials (nanowires, nanotubes, nanoshells and nanoparticles) so they can be accurately and quickly evaluated for designing high performance nano-systems. In addition, he is pursuing nanomechanical characterization and modeling of hard tissues to develop target-specific therapeutic treatments that may alter bone microstructure to prevent fracture. Associate Professor of Mechanical Engineering Ani Ural, PhD, also is looking at fracture behavior as related to the structure, distribution and material properties of micro- and nanostructural-components of bone.

Drs. Fleischer's and Li's research is focused on nano-enhanced phase change materials for advanced energy systems. A few of Dr. Fleischer's specific projects include the effect of graphene folding on thermal conduction in nanocomposites, viscosity of nano-enhanced energy storage materials and heat flow at nanoparticle interfaces. Dr. Li is working on nano to centimeter multiscale hierarchical structures for two-phase change heat transfer and nano-enabled thermomagnetic energy conversion.

Also in the Department of Mechanical Engineering, Professor Sridhar Santhanam, PhD; Associate Professor Kei-Pen Jen, PhD; and Professor and Department Chair C. Nataraj, PhD, are researching nanostructured ceramics to enhance manufacturing technologies. Nanostructured ceramics offer the possibility of enhanced strength and toughness which make them excellent candidates for a variety of applications.

The following Villanova Engineering faculty also are conducting nanotechnology research:

### Michael A. Smith, PhD, '99 MSChE, associate professor, Chemical Engineering

- Effects of self-assembled nanostructured silica surface roughness on the behavior of vanadium oxide

### Randy Weinstein, PhD, Associate Dean of Academic Affairs and professor, Chemical Engineering

- Use of graphite nanofibers as catalysts for chemical reactions
- Creation of self-assembled monolayers (layers that are one molecule thick) for the lubrication of small devices and use as corrosion inhibitors

### Aaron Wemhoff, PhD, associate professor, Mechanical Engineering

- Development and application of molecular dynamics modeling toward analysis of nanosystems

### Noelle Comolli, PhD, associate professor, Chemical Engineering

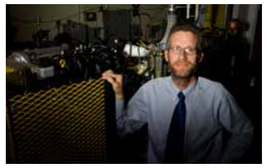
- Development of customizable tumor-targeting nanoparticles

Considering the relative infancy of the field and the progress already being made, the possibilities presented by nanotechnology are limitless. Dr. Feng says, "Our fundamental understanding of the relationship between the nanostructure and the functional behavior of nanomaterials will ultimately enable us to design and fabricate multifunctional nanomaterials for a variety of advanced applications, from energy conversion and storage to water purification and biomedical applications—uses that impact our everyday lives." ■

## ENGINEERING RESEARCH GRANTS

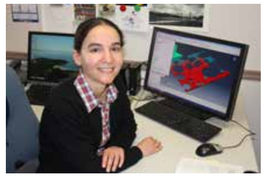
In addition to nanotechnology, engineering faculty are conducting research in a variety of other fields. The following were awarded research grants this academic year:

**Jacob Elmer, PhD, assistant professor, Chemical Engineering**, was awarded a three-year, $174,000 grant through the National Science Foundation's (NSF) Division of Chemical, Bioengineering, Environmental, and Transport Systems and the Biotechnology, Biochemical and Biomass Engineering Program for "Manipulating Epigenetic Mechanisms to Enhance Transgene Expression." Dr. Elmer's work is focused on making the bacterial DNA that is used for gene therapy look more like a human chromosome, thereby preventing negative epigenetic responses that turn off the foreign genes.



Chrysler awarded **James Peyton-Jones, PhD, associate professor, Electrical and Computer Engineering**, and Jesse Frey, PhD, associate professor of Mathematics, $224,000 for a two-year study of "Stochastic Knock Analysis and Control."

The Villanova Center for the Advancement of Sustainability in Engineering (VCASE) received a $194,583 grant from the Pennsylvania Department of Environmental Protection. **John Komlos, PhD, assistant professor, Civil and Environmental Engineering**, will serve as principal investigator for the project, which includes a forensic analysis and retrofit of an aged infiltration trench stormwater control measure.



The NSF granted **Ani Ural, PhD, associate professor, Mechanical Engineering**, $324,259 for her research on "The Role of Suppressed Bone Turnover in Cortical Bone Material Composition, Organization and Fracture Resistance." The goal is to better understand the effects of osteoporosis treatments on bone quality and to determine the possible causes of atypical femoral fracture. ■

## RECOGNITION FOR COLLEGE'S COMMITMENT TO ENTREPRENEURSHIP

In January 2015, The Kern Family Foundation recognized the College of Engineering's achievements in the Kern Entrepreneurial Engineering Network (KEEN) by presenting Drosdick Endowed Dean Gary A. Gabriele, PhD, with the 2014 Dean's Award. Edmond Dougherty '69 EE, '86 MSCS, assistant professor, Electrical and Computer Engineering and director of the Engineering Entrepreneurship program, received the 2014 KEEN Outstanding Faculty Award.

In presenting the awards, KEEN Program Director and Team Leader Steve Hasbrook cited Dean Gabriele's exceptional leadership both at Villanova University and within KEEN, noting "We hope that others will be inspired by how quickly your institution has made progress toward institutional and Network goals." Hasbrook also recognized Dougherty's "success and commitment to building a strong Network dedicated to instilling the entrepreneurial mindset in engineering students."

Since 2007, The Kern Family Foundation has donated more than $1.2 million to the College of Engineering. The awards have supported Villanova's implementation of KEEN, launch of the popular Engineering Entrepreneurship minor, and new intrapreneurship development and intercollegiate entrepreneurship opportunities. The Foundation's most recent gift, $439,000 in 2014, is funding a two-year plan to increase the infusion of entrepreneurially minded engineering skills into core undergraduate courses. The College's strategic use of the inverted classroom model also is supported by this latest award. This type of transformation is a priority for Dean Gabriele, whose long-range goals include establishing a Center for Innovation in Engineering Education at Villanova University. ■

See also: *"3-D Printing Competition Teaches Lessons, Raises Funds for Charity"* and *"College Sponsors its Second University Innovation Fellow,"* both on page 7.

Drosdick Endowed Dean Gary A. Gabriele, PhD, and Edmond Dougherty '69 EE, '86 MCMS, assistant professor, Electrical and Computer Engineering and director of the Engineering Entrepreneurship program, accept their KEEN awards.

## WHO DO YOU KNOW?
### MEET COLLEGE OF ENGINEERING STAFF

As lab manager, Chris Townend oversees daily operations of Mechanical Engineering labs and the machine shop.

**Q:** What specific responsibilities do you have as lab manager?
**A:** I am involved in materials properties and thermal-fluids testing, and mechanical design and fabrication. I also configure and calibrate advanced data acquisition systems and sensors.
**Q:** How long have you been in this position?
**A:** I came to Villanova engineering in 1986 after I earned my Bachelor's degree in Engineering at Temple University.
**Q:** What's your favorite thing about your work?
**A:** I really enjoy mentoring and guiding students in their work. It's especially exciting to assist researchers with complex experimental problems.
**Q:** If you could offer students one piece of advice, what would it be?
**A:** Don't wait too long to return to school if you're contemplating earning a graduate degree. If you wait a decade like I did it's hard getting back in the groove. You forget a lot of math over those 10 years!
**Q:** What are your hobbies and interests?
**A:** Fly fishing, camping and hiking. Anything outdoors.
**Q:** What would people be surprised to know about you?
**A:** When I was elementary school age I lived in France for a couple years. I actually learned to drive on the Peugeot 404 that we bought there and brought back to the U.S. with us.
**Q:** Can you tell us about your family?
**A:** I live in Media, PA with my wife, Johanna ('96 CON). I have two lovely daughters— Abigail, 16, and Leila, 9. We have a calico cat named Pumpkin who harasses Bella, the beagle. ■

"Chris offers valuable expertise in making things work, whether it be in senior design projects or research experiments. The department's success in these areas would not be possible without his help."
-Aaron P. Wemhoff, PhD, associate professor, Mechanical Engineering





## DEAN'S MESSAGE

In the 2013-2014 Annual Review we introduced Villanova University's next major initiative: Evolving into a Doctoral/Research institution in a way that is uniquely Villanovan. In that article, we considered what the transition means for the College of Engineering, and I was quoted as saying, "We're building on what we already have; adding to the energy that's generated by the exchange of ideas, opportunities for research and a general sense that you're something bigger than yourself." In this issue of the VEU, you will find exciting examples of the ways in which we're strengthening our exceptional undergraduate experience by leveraging the opportunities generated by our graduate programs, research centers and teacher-scholar faculty.

These articles point to every aspect of Villanova Engineering, from our leading faculty researchers in nanotechnology and signal processing, to the memorable experiences of our first-year students, and the ways in which they intersect. You'll be impressed by the collaborative work being done by undergraduates, graduate students and faculty, whether publishing and presenting research, or bringing engineering solutions to bear on human needs around the globe. You'll applaud the corporate partners and generous alumni who are helping us transform engineering education.

The VEU has much to celebrate. Enjoy!

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

## STRATEGIC PARTNER SPOTLIGHT: HARRIS CORPORATION

Chairman, President and Chief Executive Officer William M. (Bill) Brown '84 ME, '87 MSME

Engineering education, research and service rely on the partnerships the College of Engineering forms with corporations, foundations, government agencies and NGOs. Harris Corporation, led by Chairman, President and Chief Executive Officer William M. (Bill) Brown '84 ME, '87 MSME, a member of the Engineering Advisory Board, is one example of the College's multifaceted relationships.

A leading global provider of communications and information technology products, software and systems, Harris' 13,000 employees are "dedicated to developing best-in-class assured communications®" for governmental and commercial customers in more than 125 countries. During the course of its 120-year history, engineering and innovation have been the core drivers of the company's success, which makes Harris an ideal strategic partner for the College.

Throughout the past two years, Harris has supported the ongoing professional development of Villanova engineering students, including recruitment for summer internships and entry-level positions, career sessions and networking events and support for the Society of Women Engineers and the National Society of Black Engineers. More recently, Harris has contributed significant time and resources to engage our students in the "professional practice" of engineering through engineering design projects.

### Senior Capstone Design Collaborations

Harris' Government Communications segment is sponsoring a two-year capstone design project that will involve students from Mechanical Engineering and Electrical and Computer Engineering. The goal is to develop an underwater rover vehicle that employs sonar technology to create a 3-D map of the seafloor.

The company's RF Communications segment is sponsoring a one-year design project for a team of Electrical and Computer Engineers. The team is tasked with modifying a commercial-off-the-shelf quad-rotor helicopter with advanced image and digital signal processing technology to identify and track specific ground-based objects to direct the unmanned system's flight path, allowing it to fly autonomously.

### Villanova Summer Innovation Incubator (VSII)

The Harris Foundation awarded the College a grant to pilot the Villanova Summer Innovation Incubator (VSII), a new initiative for summer 2015.

Four multidisciplinary engineering student teams have been competitively selected to participate in this two-month, campus-based accelerator program for which they will receive stipends, a project budget and free room and board to build prototypes of their own design to meet an unmet societal or technological need of their choosing. VSII is designed to: (1) foster an open, highly collaborative environment where self-directed teams of engineering students pursue innovative solutions to challenging problems and (2) explore the benefits of this "inquiry-based learning" model for inclusion in the undergraduate curriculum.

The capstone design and VSII projects directly engage students in the engineering design process, providing them with an invaluable opportunity to learn engineering by practicing engineering in a real world context. Partners like Harris make this possible. ■

## WARD LECTURE PROVIDES INSIDER'S PERSPECTIVE ON WIRELESS TECHNOLOGY

On February 13, College of Engineering alumnus Anthony J. Melone '82 EE addressed the Villanova community as the 2015 Patrick J. Cunningham Jr. and Susan Ward '80 Endowed Lecture Series speaker. His presentation, "The Evolution of Wireless Technology," reflected his 30 years of experience in the telecommunications field.

As Executive Vice President and Chief Technology Officer of Verizon Communications, Melone is responsible for the company's technology roadmap, including overall platforms integrity and architecture, network strategy and product development. He also manages Verizon's overall network engineering and operations functions. Given his vast experience, Melone's lecture provided an insider's perspective on the world of wireless and how technology has transformed the way we communicate and access information. After revealing the exciting possibilities that lie ahead in an untethered world, Melone took questions from students and faculty on topics ranging from signal interference and net neutrality, to cybersecurity and which degrees or minors should be pursued to get hired in this sector.


While on campus, Melone also spent time with a select group of Electrical and Computer Engineering undergraduate and graduate students, offering industry insight, educational recommendations and career guidance. Kate Novak '16 EE was intrigued to learn more about the Federal Communications Commission's wireless auctions. "I didn't realize that these companies actually buy wireless spectrum," she says. Liesl Krause '16 EE appreciated hearing, "There is no 'right' career path for everyone, only what is best for you."

Since earning his bachelor's degree in electrical engineering in 1982, Melone has remained involved in the life of the College. He served as a member of the Engineering Advisory Board, provided assistance to the Nicaragua Nova Mobile Health project, and was instrumental in bringing Verizon on board as a member of Villanova's Center for Energy-Smart Electronic Systems. In recognition of his contributions to both the College and the profession, Melone was awarded the Engineering Alumni Society's prestigious J. Stanley Morehouse Award in 2010.

### About the Ward Lecture

*The Ward Lecture Series is made possible by a generous gift from College alumna Susan Ward '80 ChE and her husband Patrick Cunningham. The objective of the series is to provide Villanova engineering students with exposure to the nation's leading technical experts from various engineering disciplines. Since the inaugural lecture in November 2010, industry leaders have presented on interactive digital games and human expression, space flight, the expansion of the Panama Canal, design and innovation, and large-scale engineering project management. Lectures are recorded and available in the News Room on the College website.* ■

## COLLEGE BOASTS NATIONALLY RANKED ONLINE GRADUATE PROGRAM

Villanova University College of Engineering was recognized among the nation's top schools in the "Best Online Graduate Engineering Programs" ranking by U.S. News & World Report. This marks the first year for the College in the publication's annual "Best Online Programs" rankings. In addition to earning the #27 overall ranking (out of 80 programs), the College ranked #13 in the "Student Engagement" category, and also ranked highest among Delaware Valley engineering schools.

In order to be considered for the USNWR rankings, a school's degree-granting programs must be offered mostly or entirely online. Ranking of online engineering programs is based upon factors such as academic reputation among peer institutions, faculty credentials, student services and technology, student engagement and admissions selectivity.

### Villanova Engineering's E-Learning Difference

Launched in fall 2003, the College's E-Learning program allows students to complete any of its nine master's degrees entirely online, with identical course material, instructors and semester pacing as students in the on-campus classroom. Whereas many institutions deliver online courses via recorded lectures, Villanova's online graduate engineering program offers synchronous learning. Students can participate in real-time with on-campus classmates by logging in from anywhere in the world. Students who cannot participate in real-time can access archived class material at their convenience, 24/7. Course lectures can be accessed years from now, providing students with a virtual reference library. The College also offers all graduate students the flexibility to take classes on campus when it fits their schedule, and online when it doesn't. Since 2008, E-Learning student enrollment has seen steady growth.

**E-LEARNING AT A GLANCE**


of graduate students enrolled in E-Learning program


enrollment growth 2009–2015


graduates (2012–2014) who would recommend the E-Learning program


The College of Engineering's E-Learning program incorporates the latest technology.

Gerard Jones, PhD, '72 ME, Senior Associate Dean of Graduate Studies and Research, explains what sets the College's program apart: "Whether they're in the classroom or online, our knowledgeable and dedicated faculty and staff are student-focused and committed to presenting world-class technical content that is relevant and cutting-edge, and can be used immediately in the workplace."

> "I would have been hard-pressed to complete my degree without the E-Learning option, and I found the recorded lectures and online tools to be a tremendous help in learning and retaining the material."
>
> -Jeff Naumick '14 MS in Water Resources and Environmental Engineering

Each of the College's master's degree programs— Biochemical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Cybersecurity, Electrical Engineering, Mechanical Engineering, Sustainable Engineering and Water Resources and Environmental Engineering—can be completed online, as well as the majority of certificate programs. Interested students can view sample E-Learning course presentations at **engineering.villanova.edu\elearning**. ■

## GRADUATE STUDIES AT A GLANCE (FALL 2014)

**TOTALS ENROLLED**

**MASTER'S PROGRAM**

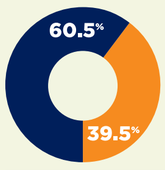

**26.2** Percent female vs. national average of 23.9%

**DOCTORAL PROGRAM**


**29.2** Percent female vs. national average of 22.4%

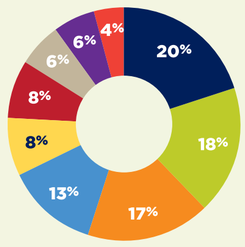
**ENROLLMENT GROWTH**


2009–2015




- Full-time
- Part-time

**MASTER'S DEGREE STUDENTS BY PROGRAM**




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

**AVERAGE AGE**

**28**

**HIGHEST PERCENTAGE OF FEMALE STUDENTS**

**46.1** Master's of Sustainable Engineering

VU MAG COVER

### WATCH YOUR MAILBOX!

The Spring 2015 edition of Villanova Magazine includes "The Engineering Evolution," a four-page feature detailing the ways in which the College is emerging as a premier institution for education and research. A second article describes the College's "Panamanian Connection."





## INTERNATIONALLY RECOGNIZED AND HONORED: MOENESS AMIN, PhD

After three decades in Villanova University's Electrical and Computer Engineering Department, and more than 10 years leading the Center for Advanced Communications (CAC), Professor Moeness Amin, PhD, has compiled a long list of accolades and professional accomplishments. A quick look at his curriculum vitae reveals more than a dozen of the highest awards and distinctions, 700-plus papers, 18 book chapters and two books, 17 plenary talks, 13 international partnerships, numerous contributions to industry associations, and more than $20 million in research grants. If that weren't impressive enough, in the past academic year, Dr. Amin added to his resume three of the most distinguished awards of his career.

In December, Dr. Amin learned that he was the receipient of the Institute of Electrical and Electronic Engineers (IEEE) Signal Processing Society's Technical Achievement Award. In naming him one of 2014's two awardees, Awards Board Chair José Moura cited Dr. Amin's "fundamental contributions to signal processing algorithms for communications, satellite navigations and radar imaging."

In February 2015, Dr. Amin was again honored when he was elevated to Fellow by the European Association for Signal Processing (EURASIP) in recognition of his "contributions to signal processing for radar and satellite navigation." Each year, EURASIP elevates a select group of up to four signal processing researchers to receive the association's most prestigious honor. Most often bestowed on those from Europe, of 32 EURASIP Fellows, only five, including Dr. Amin, are from the United States, making the distinction particularly impressive. Dr. Amin also is a Fellow of the IEEE, the International Society of Optical Engineering and the Institute of Engineering and Technology.

Most recently, in April, Dr. Amin received the 2015 IEEE Warren D. White Award for Excellence in Radar Engineering. Administered by the IEEE Aerospace and Electronic System Society, the award typically is presented to those working in the defense industry or government research labs. Only twice since its inception in 1999 has the honor been bestowed on academics. Villanova University joins the University of Southern California and Georgia Institute of Technology on this short list.

When asked about his latest achievements, Dr. Amin recognizes CAC students (including four doctoral candidates and two master's degree students), faculty and staff in the CAC and the Department of Electrical and Computer Engineering. "I have to thank Drs. Fauzia Ahmad and Yimin Zhang, CAC research professors, for their outstanding contributions in radar which underlie my citations," he says. Dr. Amin also expresses gratitude to collaborators Drs. Robert Caverly, Ahmad Hoorfar and Bijan Mobasseri. "They've worked with me on through wall radar imaging for many years and made seminal contributions to this area."

> "These are three of the highest honors that I have received in my career. They speak volumes to the CAC's international standing and recognize our immense efforts in advancing research and technology in the broad area of signal processing."
>
> —Moeness Amin, PhD, director of the Center for Advanced Communications and professor of Electrical and Computer Engineering

Gary A. Gabriele, PhD, Drosdick Endowed Dean of Engineering, lauds Dr. Amin's accomplishments: "It is a credit to all the effort, long nights, long flights, long meetings and hard work Dr. Amin has put into the CAC, and to the many contributions of the faculty, researchers, students, and staff. We are all very proud!"

As Villanova transitions to a doctoral/research university classification, this award demonstates the high caliber work already taking place in the College of Engineering. Dr. Amin explains, "These honors typically are bestowed upon those from the world's top research institutions, which confirms that Villanova faculty can achieve in research and scholarship, as much as, and even more than, their colleagues in leading research universities." ■

Dr. Amin (3rd from left) and Fauzia Ahmad, PhD, research associate professor and director of the Radar Imaging Lab (fourth from left) with members of the NATO task force on Sensing Through Walls during a December 2014 meeting at Villanova.

### NEWSWORTHY

Between May 2014–May 2015, Dr. Amin and the Center for Advanced Communications produced nearly monthly headlines:

**MAY '14**

**Assisting the Elderly Living Alone**
TheVerge.com and DailyMail.com feature Dr. Amin's research in Through-Wall-Radar-Imaging (TWRI).

**Meeting of NATO Task Force**
CAC is only academic entity representing U.S. on North Atlantic Treaty Organization (NATO) Sense Through-the-Wall Technologies task force, which was formed in 2005.

**JUN '14**

**Technologies Help Seniors**
TWRI research reported in Wall Street Journal.

**JUL '14**

**Invited European Talks**
Addresses groups in Germany and Spain on topics of radar imaging and sparse signal and array processing.

**Record 42 Papers**
Published in one academic year.

**AUG '14**

**Publishes Second Book on Radar**
*Compressive Sensing for Urban Radar*

**SEP '14**

**Best Presentation Award**
For "Nonstationary Interference Excision for GPS Receivers Using Sparse Construction Techniques" at Institute of Navigation Conference.

**"X-Ray Vision is Here"**
Interviewed for NOVA Next on PBS.

**OCT '14**

**CAC Signs MOU**
Memorandum of Understanding (MOU) with Wesley Enhanced Living, a non-profit serving the aging, will help CAC improve radar data monitoring of the elderly.

**Keynote Address**
International Radar Conference in Lille, France.

**NOV '14**

**Australian Research Council Award**
$450,000 to support collaboration between CAC and University of Wollongong, Australia on "Enhanced Through-Wall Imaging using Bayesian Compressive Sensing."

**DEC '14**

**Third Technical Achievement Award**
Receives IEEE Signal Processing Society's Technical Achievement Award.

**JAN '15**

**Police Use of TWRI**
NPR Marketplace Tech Podcast, "New Tools Let Police See Inside Peoples' Homes."

**FEB '15**

**Fourth Fellow Grade**
Elevated to Fellow by European Association for Signal Processing.

**APR '15**

**Excellence in Radar Engineering**
Receives 2015 IEEE Warren D. White Award for Excellence in Radar Engineering from IEEE Aerospace and Electronic System Society.

## TAKING IT TO THE STREETS, AND RAILS, AND PORTS, AND AIRFIELDS...

For four decades, until his retirement in 2002, Civil and Environmental Engineering Professor Emeritus James Schuster, PhD, '58 CE, '61 MSCE was the face of transportation engineering at Villanova University. In 2008, the College of Engineering found a new voice for the transportation program when it hired Assistant Professor Leslie Myers McCarthy, PhD, PE. Five years later, the program grew even stronger with the hiring of Clare Booth Luce Assistant Professor Seri Park, PhD, PTP.

Both Drs. McCarthy and Park came to the College with a passion for transportation engineering and more than 15 years of professional experience. Dr. McCarthy spent much of her early career with the Federal Highway Administration (FHWA), while Dr. Park's experience includes port and interstate design work with Tetra Tech, a nationally renowned transportation consulting company. This industry experience, combined with their years in academia, have resulted in numerous federal research grants, which have led to invaluable hands-on experiences for many Civil Engineering students interested in the transportation field.

Recent graduates Paul Casazza '14 CE and Douglas Allen '14 CE are two students who benefited from their professors' research opportunities. As seniors they worked on grant-related projects, which subsequently led to published papers on which they are credited as co-authors. Casazza recommends all undergraduates pursue these types of opportunities. "Working with Drs. McCarthy and Park was an extremely valuable experience. It not only had me interacting with my professors outside the classroom, but also gathering insight from working professionals in transportation departments across the country," he says.

> "Professional experiences differentiate our students to both employers and graduate programs."
> –Leslie Myers McCarthy, PhD, PE, assistant professor, Civil and Environmental Engineering

In addition to her research, Dr. McCarthy teaches a senior capstone course in transportation. This spring, her group of 11 students worked on "Designing Upgrades of the National Highway System Connectors to Intermodal Freight Facilities in the Philadelphia Area." The team conducted an evaluation of infrastructure, alignment and operations design, focusing on roadway and bridge blueprints for connectors between three ports and the neighboring interstate highways. In April, three of the students presented their recommendations and designs at a meeting of the Goods Movement Task Force of the Delaware Valley Regional Planning Commission—the project sponsor and client.

The ports and interstates that were a focus of this senior capstone project also connect, literally and figuratively, to another transportation topic that Dr. McCarthy is passionate about: railways. In recent years the rail industry has found new life with the country's energy production boom. As this growth has benefited railroad companies,

Seniors working on the capstone project in transportation paid a visit to the Balzano Port Facility at the Port of Camden, NJ. To the right of Dr. McCarthy is Mr. Jay Jones, deputy executive director of the Balzano Facility and Mr. Michael Ruane, transportation planner in the Office of Freight and Avaiation Planning at the Delaware Valley Regional Planning Commission.

it has also presented the challenge of a shrinking workforce. "Many railway engineers are at or nearing retirement age," explains Dr. McCarthy, who sees this as an opportunity for the College of Engineering. "The time is ripe for universities to academically invest in railway engineering."

Villanova has taken steps in that direction. Five undergraduate courses now incorporate modules related to railway engineering, and two graduate courses are dedicated to it. From 2011-2013, railway-related projects were among the senior capstone design options, and last year the senior-level Professional Practices for Engineers course involved a local grade crossing study.

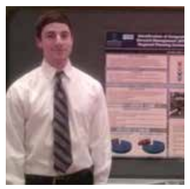
In 2014, the University was named one of 14 affiliate members of NURail Center, a rail-focused, seven-university consortium under the U.S. Department of Transportation. Members are recognized for their commitment to improving and expanding rail education, research, workforce development and technology transfer. Villanova currently is the only school in the Philadelphia region with affiliate status, and Dr. McCarthy hopes the College further establishes itself as a leader in this field. "I would like our next step to be an academic partnership with a railway company like CSX; the resulting research opportunities would be mutually beneficial." ■

## TRANSPORTATION ENGINEERING SUCCESS STORIES

Villanova undergraduates, graduate students and alumni are making their marks in transportation engineering. Dr. McCarthy notes: "These success stories demonstrate that Villanova University is recognized by national industry groups as a leading research institution in the transportation field. Students benefit from the investments we're making in this program."

Doctoral candidate Maria Guercio, Department of Civil and Environmental Engineering, tests asphalt mixtures in the lab.

**Ms. Maria Guercio**, a PhD student in the Department of Civil and Environmental Engineering, was honored at the annual Transportation Research Board (TRB) international conference for completion of the Airport Cooperative Research Program (ACRP) Graduate Research Fellowship. Guercio is the first Villanova student to win this 12–month, $10,000 award, which is presented each year to no more than 10 students from the U.S. and Canada. Her research, "Quantifying the Performance of Energy Conscious Materials in Flexible Airfield Pavements," will be published in the Journal of the Transportation Research Board.



Jonathan Mize with the poster of his research for the Delaware Valley Planning Commission.

After being accepted into the U.S. Department of Transportation's Summer Transportation Internship Program for Diverse Groups (STIPDG), **Jonathan Mize '15 CE** spent summer 2014 interning as a transportation engineer assistant with the Office of Infrastructure Research & Development, within the FHWA. Jonathan is the fifth student from the College to be accepted in the STIPDG program in the past five years. In addition to his internship, research that Jonathan conducted with Dr. Park was presented at industry conferences and published in the January 2015 edition of the Journal of the Transportation Research Board.

Alumnus **David Mensching '10 CE, '11 MSCE** distinguished himself as an undergraduate, having worked with Dr. McCarthy on a National Academy of Sciences-funded project, which resulted in a synthesis publication that was distributed to 5,000 transportation professionals worldwide. As a graduate student, he presented research at industry meetings, and worked on a TRB committee, an opportunity typically reserved for practicing engineers with doctoral degrees. Mensching's experience earned him a doctoral fellowship at the University of New Hampshire where he currently is completing his PhD in Civil Engineering Transportation. His success in the program has led to a prestigious National Research Council post-doctoral fellowship, which he will use to spend two years conducting research for the FHWA.

Dave Mensching '10 CE, '11 MSCE presents at the Association of Asphalt Paving Technologists annual conference in March 2015.

**Kimberley Musey '15 CE** was awarded a Suzanne Axworthy Undergraduate Scholarship from the Philadelphia chapter of WTS, Women's Transportation Seminar, an international organization dedicated to building the future of transportation through the global advancement of women. As an undergraduate researcher for Dr. Seri Park, Kimberley worked on improving the safety of horizontal curves through high friction surface treatments. Post-graduation, Kimberley hopes to continue working with Dr. Park and plans on earning an interdisciplinary master's degree in structures and transportation. ■

Kimberley Musey '15 CE (left) is presented with a scholarship from Erica Antoine, PE, a member of the executive board of directors of WTS, Philadelphia.



# VEU

VILLANOVA ENGINEERING UPDATE

## COLLEGE CAMPAIGN UPDATE

Center for Engineering Education and Research (CEER) Expansion—Proposed Exterior

***"Engineering students come to Villanova expecting a degree. But our goal is to give them an education that will ignite their heart, inspire their mind, illuminate their spirit and last them a lifetime."***

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

FOR THE GREATER GREAT®
THE VILLANOVA CAMPAIGN TO
IGNITE CHANGE

## College of Engineering Receives Three Leadership Gifts Totaling $19 Million

Villanova University's College of Engineering has received three leadership gifts totaling $19 million in fiscal year 2015, which closes on May 31. The cornerstone is a $13.5 million commitment from Jan and Paul J. Varello '65 CE, which marks the second-largest gift ever made to the University. Part of the University's $600 million campaign, For the Greater Great®: The Villanova Campaign to Ignite Change, these philanthropic investments will support the College's focus on innovative engineering education and help ensure its future for generations to come.

"We are tremendously grateful to these donors for their generosity and dedication to Villanova," says the Rev. Peter M. Donohue, OSA, PhD, University President. "These gifts reflect a desire by Villanova alumni and friends to play a key role in charting the University's future by expanding the academic opportunities for current and future engineering students."

Today's engineering students demand a dynamic learning environment, and the College is committed to redefining the way its students learn through innovative academic initiatives—from flipped classrooms to solving real-world problems through service-learning experiences across the globe. These leadership gifts will empower the College to realize its vision and achieve critical campaign priorities, including Faculty and Student Support, Facilities, Academic and Programmatic Initiatives, and Endowment.

"These gifts are an investment in the future of the College of Engineering, providing a strong foundation upon which we will achieve our vision and sustain our commitment to a premier engineering education built upon our Augustinian ideals," says Gary Gabriele, PhD, Drosdick Endowed Dean of Engineering at Villanova University.

**The three leadership gifts to the College of Engineering include:**

- **$13.5 million commitment—a blend of a cash and estate gift—from Jan and Paul J. Varello '65 CE, CEO of Sterling Construction Company Inc.**, the largest ever made to the College of Engineering. It will support the Engineering Dean's Strategic Initiatives Fund, empowering successive deans to direct funds toward high priority needs, from faculty and student support, to academic programs, to infrastructure and equipment. The size and scope of the gift will fuel the College's continued evolution as a premier institution for engineering education in the 21st century.

- **$3 million commitment from Denise and John P. Jones III '72 ChE, retired chairman and CEO of Air Products and Chemicals Inc.**, to establish the Jones Family Student Learning Commons in a planned expansion of the Center for Engineering Education and Research (CEER). The patio of CEER will be enclosed and converted into a state-of-the-art Student Learning Commons. Students will flock to this 4,600-square-foot communal atrium to study in groups, work on multidisciplinary team projects, and attend seminars and guest lectures. The space will be an ideal venue in which the College and University can host special events.

- **$2.5 million commitment from Nance Dicciani, PhD, '69 ChE, Villanova trustee and retired president and CEO of the Specialty Materials Division, Honeywell International Inc.**, to establish the Nance K. Dicciani PhD '69 Endowed Chair in Chemical Engineering. The funds will enable the chair to attract top-notch faculty, invest in curricular development, and raise Villanova's visibility as a leader in research and scholarship in critical and emerging areas of chemical engineering. ▲

*"We are grateful that these distinguished alumni have chosen to reinvest their success in Villanova's future. Their generosity has helped us take a great leap forward in our campaign and will dramatically enhance the opportunities Villanova can provide to its engineering students and faculty."*

–Michael J. O'Neill, Senior Vice President for University Advancement

**Villanova launched the public phase of its campaign in Oct. 2013, and as of May 10 has raised $431 million toward its $600 million goal. For more information on the Villanova Campaign to Ignite Change, visit www.forthegreatergreat.com.**

## From Small Beginnings to Historic Gift, Varellos' Generosity Gives Back

Paul Varello had a choice to make. He enrolled at Villanova University in 1961 to play football, but when he arrived for registration, he learned that the rigorous athletics schedule meant that he couldn't pursue an equally rigorous engineering degree. In order to play football, he'd have to choose a different major. So, Varello decided to become a Villanova engineer.

That decision was a defining moment in Varello's life, setting him on the path to an illustrious engineering career—he currently serves as CEO of Sterling Construction Company Inc. Varello and his wife Jan have brought this success back to Villanova, making a historic $13.5 million gift to the College of Engineering.

Varello credits his Villanova education for teaching him not only the fundamentals of engineering, but also the foundation for a purposeful life. "I learned to value the Augustinian tradition and the call to do something in service to others. The larger lessons I learned at Villanova have stayed with me my whole life," he says.

Varello didn't have an easy student experience. He went to class and studied hard, and he worked every summer and break period to afford the tuition. His experience taught him diligence and determination, and gave him an appreciation for the academic opportunities he had at Villanova. Since graduation, Varello has supported the University every year. "In my younger days, I didn't have a lot of money for discretionary spending, but I believed it was important to give back even then," he says. "I'm fortunate that today I can continue to help Villanova, but in an even more meaningful way."

Paul Varello '65 CE and Jan Varello

While many major gifts support specific needs, such as endowing a faculty chair position or funding the construction of new facilities, the Varellos chose to direct their gift to be used at the dean's discretion. The endowed fund will provide the College with perpetual support, and will be used wisely to ensure that Villanova Engineering continues to lead the way in academic innovation and research.

The Varellos were inspired to structure their gift in this way based on their confidence in the leadership and direction of the College. "Dean Gabriele is an outstanding leader who understands engineers and who knows how important it is to graduate engineers who not only have a good education, but also a sense of commitment to society," Varello says. "Dean Gabriele manages to convey that important goal in everything he does."

The Varellos also hope that their gift will reinforce the College's rightful place on the national stage.

> "We want to see the College of Engineering continue to grow and to be recognized as one of the premier engineering schools in the nation where the best and brightest high school students want to come to Villanova because they know the College's reputation."
> – Paul Varello '65 CE

Varello remains an active part of the Villanova alumni community. This June, he'll return to campus for his 50th Reunion. In all of the encounters he's had in his career, Varello says he can always tell when he's face to face with a fellow Wildcat. "Villanovans are different people in the most positive way," he adds. "When you meet another Wildcat, you know immediately." ▲

COLLEGE CAMPAIGN UPDATE

## A Newly Envisioned CEER

The College of Engineering continues to introduce innovative educational opportunities that emphasize hands-on, experiential and collaborative learning, which require new physical spaces. The Center for Engineering Education and Research (CEER) expansion will provide the infrastructure the College needs to reach its fullest potential.

The three-part expansion includes the construction of a Student Learning Commons and Innovation Lab, both of which have been funded through the campaign, and an Engineering Hub that will provide a home for the College and free up valuable laboratory space.

The latest addition to the expansion plan is the Career Zone, which will provide a dedicated place for students and alumni to go for assistance in job and internship placements. ▲

Jones Family Student Learning Commons

Atrium


Career Zone

Concourse

Engineering Innovation Lab

KSS Architects

## Campaign Priorities

For the Greater Great®: The Villanova Campaign to Ignite Change is an opportunity to dramatically enhance the resources, experiences and advantages the College of Engineering provides to its students.

Villanova Engineering strives to be a leader in innovative engineering education. The College already is ahead of many national trends, including the percentage of women enrolled in the engineering program and the number of women on the College's faculty. The College offers master's degrees in sustainable engineering, bioengineering and cybersecurity and created a minor in engineering entrepreneurship, which is now the College's most popular minor. But there's even more the College can do, must do and is doing to offer a premier student experience. **The College of Engineering has a goal to raise $50 million as part of the campaign, and as of May 10, 2015, it has raised $42.7 million toward that goal**.

**FACILITIES**
The most critical and visible components of the College's campaign are capital and infrastructure improvements to the Center for Engineering Education and Research (CEER), the College's flagship teaching and research facility.

**FACULTY SUPPORT**
Villanova Engineering's success rests on having strong, effective leaders and mentors who inspire students to fulfill their greatest potential. Endowed faculty positions are essential in securing and retaining this pivotal academic leadership.

**STUDENT SUPPORT**
Villanova already is setting the standard for student participation in research as 53 percent of undergraduate engineers pursue independent research opportunities or work with faculty members on research projects. With additional funding the College can provide more avenues for students to earn academic recognition before graduation—a rare opportunity not readily found at other universities. The College is equally committed to enhancing research opportunities for graduate and doctoral students, so they can contribute to the wealth of knowledge and technical advancements being made in the field of engineering.

**CENTERS OF EXCELLENCE**
The College of Engineering's Centers of Excellence combine theory, practice and research. These knowledge hubs define the College's specialties, add depth to the engineering curriculum and deliver opportunities for interdisciplinary work. Most importantly, they give faculty a platform to further academic innovation and contribute to the global discourse on engineering education.

**ACADEMICS AND PROGRAMS**
Today's savvy and enterprising engineering students demand a dynamic learning environment, and the College is responding to these needs by redefining how, when and where students learn.
Initiatives include:
- Expanding the College's highly sought-after programs, including its undergraduate minors in entrepreneurship, biomedical engineering and mechatronics
- Introducing more "flipped classrooms" to the curriculum
- Providing more opportunities for engineering students to learn and exercise professional skills
- Preparing students for careers that will make an impact in local communities and global markets through expanded service-learning opportunities

**LAB ENDOWMENTS**
Engineering labs require constant maintenance and frequent upgrades. A lab endowment for each of the College's four departments will provide the essential resources to ensure that students and faculty have a cutting edge environment in which to learn and conduct research.

**For more information about how you can participate in the campaign, contact Cindy Rutenbar, director of development, at cynthia.rutenbar@villanova.edu or 610-519-6973.**

*"Our job is to educate engineers. Some might say that's a simple task; something Villanova has been doing for over 100 years. But engineering education is changing and about to take a big leap. Out in front will be Villanova Engineering."*
– Randy Weinstein, PhD, Associate Dean, Academic Affairs; Professor, Chemical Engineering

## Alumni, University Leaders Gather for Campaign Celebration

On April 15, the College of Engineering proudly hosted a celebration of For the Greater Great®: The Villanova Campaign to Ignite Change. More than 130 guests attended and enjoyed a night of food, drink and conversation at the Villanova Conference Center.

University leaders shared in the evening, including University President The Rev. Peter M. Donohue, OSA, PhD, '75; Gary A. Gabriele, PhD, Drosdick Endowed Dean of Engineering; Michael J. O'Neill, Senior Vice President for University Advancement; and John Hartner '85 ME, chair of the College of Engineering Campaign Committee and a member of the College's Advisory Board. They provided updates on the College's campaign progress and their vision for Villanova's leadership in innovative engineering programs. In addition, faculty members Randy Weinstein, PhD, professor, Chemical Engineering and Associate Dean of Academic Affairs, and Amy Fleischer, PhD, '91 ME, '96 MSME, professor, Mechanical Engineering, along with graduate student Alex Poultney '14 ME presented brief talks on flipped classrooms, women in engineering and service-learning experiences, respectively, points of distinction and pride for the College of Engineering.

Joseph Lamack '87 ChE, Thomas Sanzone '68 EE, and Amy Fleischer, PhD, '91 ME, '96 MSME, professor, Mechanical Engineering

Matthew Marquardt '86 CE, James Schuster, PhD, '57 CE, '61 MSCE, professor emeritus, Civil Engineering, and Courtney Brown '15 CE

Paul Belanger '93 ChE, Nance Dicciani, PhD, '69 ChE and Dorothy Skaf, associate professor and department chair, Chemical Engineering

Students Alex McMullen '15 ME, Edward Zhu '15 ME, graduate student Alex Poultney '14 ME and Alexis Parrillo'15 ChE

Tricia Hartner '84 CLAS, Edward McCarthy '65 ME, and John Hartner '85 ME

University leaders, faculty, staff and students spoke at the celebration.

## 3-D PRINTING COMPETITION TEACHES LESSONS, RAISES FUNDS FOR CHARITY

BY REBECCA WATSON '15 CLAS

Junior engineering students in Assistant Professor Ed Dougherty's Entrepreneurship Practicum had the opportunity to see their innovations give back to the community. Dougherty '69 EE, '86 MSCS, director of the Engineering Entrepreneurship minor program, and George Simmons, director of Villanova's Multidisciplinary Design Laboratory (MDL), devised a competition in which student teams were challenged to design and create products that could be fabricated using 3-D printing. The MDL acquired a 3-D printer in 2013, and the competition was crafted to both "help students learn about the capabilities of the printer and promote the use of 3-D printing in general," says Simmons. Teams then marketed and sold their products to the Villanova community, donating profits to the charity of the winning team's choice.

Simmons explained that the real challenge of the competition was to make a product that could be profitable off a 3-D printer, which is more cost-effective for the creation of prototypes than the manufacturing of products. 3-D printing can cost up to seven dollars per ounce of support material used, so product pricing can add up quickly. "The products designed for this competition had to be kept simple," says Simmons. "You need something that is low in production cost and high in market value."

Incorporating lessons from their entrepreneurship courses, teams took their products to market. Together they raised more than $5,000, with the top-earning team taking in more than $4,000. After deducting production costs, $2,000 from the competition was donated to the Leukemia & Lymphoma Society, the charity chosen by this year's victorious "Team Magneto."

Team Magneto, led by William Landis '16 CpE, designed and produced intricately detailed magnets featuring the University's famous church façade. They significantly outsold their competitors by meeting with administrative staff to gather feedback on product improvements and marketing. Drosdick Endowed Dean Gary A. Gabriele, PhD, recommended design tweaks that cut down on production costs and University President The Rev. Peter M. Donahue, OSA, PhD, '75 CLAS, led the team to a campus contact who placed a large order of magnets to use as alumni donor gifts. Team Magneto chose the Leukemia & Lymphoma Society as the competition's benefactor in support of William's fight with lymphoma only a year ago. "I was going through chemotherapy while I was at school," says William, now cancer-free, "and I wanted to give back to the charity that has done so much for me and others going through similar experiences."

All told, this year's entrepreneurial competition more than doubled the success of the previous year, and Simmons and Dougherty look forward to the innovations of next year's student teams.

Team Magneto: David J. Kelly '16 ChE, William Landis '16 CpE and Jason D. Tavoletti '16 ChE (not pictured: Abigail G. Buckenheimer '16 ME)

Left: Detail of church magnet

## COLLEGE SPONSORS ITS SECOND UNIVERSITY INNOVATION FELLOW

In yet another example of its commitment to entrepreneurship and innovation in engineering education, the College has sponsored its second University Innovation (UI) Fellow. Mechanical Engineering sophomore Erik Koehr is one of 123 students from 52 U.S. higher education institutions to have been named a Fellow by the National Center for Engineering Pathways to Innovation (Epicenter). Epicenter is funded by the National Science Foundation and directed by Stanford University and VentureWell.

The UI Fellows program empowers students in engineering and related fields to become agents of change at their schools. They work to ensure that their peers gain the knowledge, skills and attitudes required to compete in the economy of the future. To accomplish this, the Fellows advocate for lasting institutional change and create opportunities for students to engage with entrepreneurship, innovation, creativity, design thinking and venture creation at their schools.

With minors in Business and Engineering Entrepreneurship, Erik is equipped to take on this challenge. In an op-ed piece he wrote about his mission as a Fellow, Erik tasks our educational system with giving students the tools they need for what lies ahead:

> "We need to show people new paths into the future and we need to provide them with the resources and support to help them discover their passion. Once a passion is discovered, the educational system needs to empower students to transition from their studies to rewarding careers that benefit society. In this way, we will create lasting positive societal change and help enable personal career satisfaction."


Erik Koehr '17 ME (second from left) with three of Epicenter's 123 new University Innovation Fellows.

Erik's priorities for Villanova include addressing the perception of innovation and entrepreneurship at a school that, in his opinion, encourages a more traditional educational path. His specific ideas include establishing an Innovation Council Board that can operate in tandem with the Villanova Entrepreneurial Society, developing a comprehensive Entrepreneurship Minor program, and creating a "maker space" on campus in which students of all disciplines will be able to collaborate.

# STUDENTS FIND TEAMWORK REWARDING

The College of Engineering is home to many accomplished students, from undergraduates who publish in leading industry journals, to doctoral candidates who earn internationally competitive fellowships. Beyond their individual achievements, however, Villanova engineers also understand the importance of teamwork. The success of RobotX, Nova Racing, the Steel Bridge club and senior capstone design teams are evidence of strength in numbers.

## RobotX

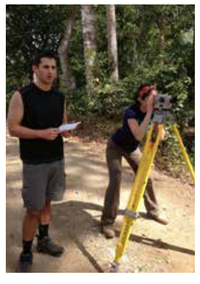
In October 2014, students from Villanova University and Florida Atlantic University—Team WORX—traveled to Southeast Asia where they represented the United States as one of three American teams in the inaugural Maritime RobotX Challenge. The students had spent a year outfitting a Wave Adaptive Modular Vessel capable of intelligently navigating the seascape of Marina Bay, Singapore.

While hardware issues ultimately kept Team WORX out of the final round, Villanova team leader C. Nataraj, PhD, professor and chair of the Mechanical Engineering Department, found much to be happy about, including the team's four prizes. "Earning first place and a $5,000 prize for Land Based Judging was, in my opinion, the greatest achievement," says Dr. Nataraj. "The judges looked at each boat's design, control systems, software, and basically the science behind the work. To have placed first in the static judging tells me that if a company had to choose one boat to replicate, it would likely be ours. Hardware issues can be fixed, as long as the science is sound." The team also earned awards for its website and design presentation, and received a special prize for "learning the difference between theory and practice."

Members of Team WORX proudly display their awards from the Maritime RobotX Challenge in Singapore.

## Structural Capstone Design Team

For their Structural Design Capstone project, 2014 Civil Engineering seniors Laura Boisclair, Jonathan Callans, Paul Casazza, Patrick Abou-Chrouch and Roberto Vilanova chose to design a bridge to provide year-round access to the Cañazas Water Project's dam in Torti, Panama. During the rainy season, water rises 15 feet above the base of the river, cutting off the crossing and access to the dam, which in turn cuts off the water supply to upstream residents.



Jonathan Callans '14 CE and Laura Boisclair '14 CE surveying on site in Torti, Panama

In January 2015, the recent graduates learned that they had been selected as one of three finalist teams in the 2015 SEI (Structural Engineering Institute) Student Structural Design Competition. On April 23 at Structures Congress in Portland, Oregon, the finalists presented their projects before a panel of judges. Villanova's team placed third and was recognized at the SEI/ASCE (American Society of Civil Engineers) Award Luncheon.

## Steel Bridge Team

In April, Villanova's Steel Bridge team competed in the Mid-Atlantic Region Steel Bridge Challenge held at Pennsylvania State University. Tasked with designing and building a 1⁄10th scale steel bridge, Villanova's team placed fourth, just one spot away from making it to the national competition. The team's truss bridge placed third overall for strength, behind two arch bridges.

The American Institute of Steel Construction and ASCE gives each team a set of restrictions, including weight, size and support systems. During the competition, teams have 30 minutes to successfully construct their designs using pre-fabricated "members" or parts, which also must comply with size requirements. Completed bridges, which are approximately 20 feet long, are then judged on speed of construction, weight of the bridge, number of team builders, bridge weight allowance and general aesthetic design.

Villanova's team, led by Matthew Arnold '15 CE, worked on part design and fabrication since the fall semester, a task made easier by the addition of 10 new members. Matthew thinks the newly expanded team will benefit the club in years to come. "We've established a strong group of young members to inherit the club next year and have provided a framework for our members going forward."

Members of Villanova's Steel Bridge team in action at the 2015 Mid-Atlantic Region Conference.

## Formula SAE

Though the event for which they prepare all year—the Michigan Formula SAE Race—doesn't take place until mid-May, the Nova Racing team enjoyed the spotlight this past winter at the Philadelphia Auto Show. This was Villanova's first time displaying the Formula SAE car at the annual event. Team captain Albert Montemuro '15 ME contacted the organizers personally to have Nova Racing added to the school race car displays, which included Temple University, the University of Pennsylvania and a Philadelphia public high school.

The opportunity led to a great deal of media coverage, with three newspapers and one network television station interviewing the team about the process of building a racecar from the ground up each year. Albert was especially pleased with the television coverage. "ABC News actually did their filming in front of our car, which meant we were in many of their background shots. I took that as a compliment!" ■

Team Captain Albert Montemuro '15 ME discusses Nova Racing with visitors at the Philadelphia Auto Show.







# ENGINEERING FRESHMEN REFLECTIONS

In September, the College's communication assistant Rebecca Watson '15 CLAS interviewed freshmen engineering students from across the country. She asked them to share something special that they had brought from home, and to talk about plans for their first year of college. In March, Rebecca revisited those students for an update and to learn what advice they would offer to next year's incoming class.

### Christopher Austin
Mechanical Engineering
Hometown: Philadelphia, Pennsylvania

Christopher is passionate about automobiles. Fittingly, he is a Precision Castparts Corporation Scholar whose immediate plans included joining the Nova Racing team. He also joined the baking club, and has found a group of friends to unwind with. While he's adjusted well to life on campus, he notes, "I get a lot of phone calls from my mother." Academically, Christopher looks forward to hands-on projects with faculty. He tells incoming freshmen: "It's okay to get a little lost. You just have to be willing to ask questions to find your way again."

### Evan Barnett
Mechanical Engineering
Hometown: Newton, New Jersey

Evan did not bring any keepsakes to Villanova. Instead, he brought along his twins—Dan, a Computer Engineering major, and Jacqueline, an arts major. Evan says he's happy that Dan, his "oldest and best friend," is with him on this journey, but both are pleased to be forging their own paths. Evan enjoys 76ers games, intramural sports and spending time with friends. "I took a year to settle in without any large time commitments so I could focus on schoolwork," Evan says, "but now I'm ready to be more involved." Evan's advice to incoming freshmen is to find a good group of friends. "They can help you out with things like homework, and keep you entertained."

### Emily Dailey
Mechanical Engineering
Hometown: Tulsa, Oklahoma

After her oldest friend was diagnosed with lymphoma, Emily began working with Joy in the Cause, which distributes stuffed animals—including Mavis the bulldog—to cancer patients across the country. Inspiring others, Emily, alongside her hall mates, spreads joy to patients by sending them hand-made Mavis dogs. Emily has joined multiple clubs, including the Campus Activities Team, Engineering Student Council, and her sorority, Pi Beta Phi. She credits these groups with her seamless transition to college life, and advises incoming freshmen to "work really hard and learn quickly to manage your time well!"

### Nina Hebel
Mechanical Engineering
Hometown: Kingwood, Texas

Nina wears her orange shoes almost daily as a reminder of a fifth grader who passed away when Nina was younger. They inspire her to live every day to its fullest. With this positive outlook, Nina easily adopted the Wildcat spirit. She joined the cheerleading team and a sorority. She loves the campus, and enjoys exploring downtown Philadelphia. "All the little moments with my friends have made me feel at home," she says. Her advice for incoming freshmen is to "keep an open mind with coursework, and take advantage of group project experiences."

### Elisabeth Louwers
Civil Engineering
Hometown: Whittier, California

Upon high school graduation, Elisabeth was given a necklace belonging to her grandmother who emigrated from Holland to America. It reminds her of the courage it takes to step out of your comfort zone. Elisabeth has become comfortable at Villanova. She's on the varsity water polo team and when she's not practicing or in class, she enjoys quiet time in her dorm room. Elisabeth dreams of studying in Spain, and offers incoming freshmen her recipe for success: "Stay busy with work and extra-curricular activities, and challenge yourself to try something new."

### Kelly Miller
Chemical Engineering,
minor in French, Business
Hometown: Denver, Colorado

Kelly arrived at Villanova with a charm bracelet linking her past, present and future. Charms include a wildcat paw print (the mascot for both her high school and Villanova), running shoes and cowboy boots. The bracelet reminds Kelly both of her Denver home and the new home she is building at Villanova. Kelly is involved with Special Olympics and Sidekicks, the committee which plans fundraising events for NOVA Dance. She has enjoyed her engineering classes, especially the mini-project on Biofuels. Kelly's advice to incoming freshmen is to find a group of engineering friends. "Studying becomes a lot easier and more fun in the company of others!"

### Maria Molina
Civil Engineering
Hometown: San Salvador, El Salvador

Maria came to Villanova with a gift from her cousin. "The small bucket is filled with essentials; it reminds me of my family's support," she says. That support helped Maria through a challenging first semester that she ultimately found rewarding. She reports, "I love the independence and responsibilities that come with life so far from home, and I have made wonderful memories." Many of those memories are from an Engineers Without Borders' service learning trip to Panama. Maria is excited about civil engineering and wants to focus on water resources. She adds, "I hope to become involved with campus research on the topic." She urges incoming freshman to find what they love. "It makes the work seem more like fun."

### Joseph Ssengendo
Mechnical Engineering
Hometown: Kampala, Uganda

In Uganda, Joseph taught English. On his last day, his students surprised him with hand-written letters wishing him well. They remind him of the difference he can make as a leader in his community. He hopes to one day be an ambassador for his country. At Villanova, Joseph joined the African Dance group, as well as Engineers Without Borders. He enjoyed his robotics mini-project, and Developing Countries course. "I like seeing engineering in action," he says. "What you do impacts others." His advice for incoming freshmen: "Relax a bit. Everything will progress as it should. Trust in yourself." Joseph has just one complaint: "Philadelphia winters are very cold."

### Sarrah Truong
Computer Engineering
Hometown: Bellingham, Washington

When they said their goodbyes, Sarrah's friend gave her a necklace with two linked circles. It reminds Sarrah that though they are on separate coasts, they are linked by the bond of friendship. Since arriving at Villanova, Sarrah has been involved in the Asian Students Association and the University's Ambassador program. She likes visiting Philadelphia and is fond of Reading Terminal Market's fresh produce and homemade sweets. Academically, Sarrah enjoyed the freshmen mini-projects, which applied theories from class to real-life situations. She looks forward to studying abroad, internship opportunities, and challenging coursework. Sarrah advises incoming freshmen: "Get to know your professors outside of the classroom, and don't forget to breathe, eat and have fun!"

## VILLANOVA ENGINEERS BRING STEM EDUCATION TO CAMBODIA

Service has long been one of the cornerstones of a Villanova University education. In the College of Engineering, it has taken a variety of forms, from regional STEM (Science, Technology, Engineering and Mathematics) education outreach, to global project-based learning experiences. This dedication, both to education and service, recently led to a unique STEM outreach opportunity, one involving middle school students in a rural community in Cambodia.

Since 2012, the College of Engineering has sent student and faculty teams to the remote Ratanakiri region where they have worked with the Caramanico Foundation Cambodia (CFC) to provide local children with access to a quality education. Established by Anne and Tom Caramanico PE, '71 CE, '83 MSCE, the CFC built the first Caramanico School in 2006. Today its four rooms serve 230 students in seventh through ninth grades. In summer 2014, Boratha Tan '16 ME, a Cambodian Villanova student, supervised the building of an adjacent preschool and kindergarten designed by Villanova engineers. It recently opened its doors to more than 70 students and is the only school of its kind in the province.

During the 2015 winter break, a Villanova team made the annual trip to the region, but with a new assignment: Develop and lead a series of science and engineering workshops for the school's eighth- and ninth-graders, nearly 130 students in total. Team leader Alex Poultney '14 ME, '15 MSME, volunteer advisor Ean Mulligan '09 ME, Elana Ames '17 ChE and Caroline Franchino '16 ME—prepared a variety of workshop activities including air-propelled rockets, rubber band cars, water sample testing and raft-building.

Racing rubber band cars.

The week culminated in a tower-building competition that required the CFC students to come up with their own ideas and work under a deadline. The top two winning teams, plus three exceptional student leaders, won a trip in mid-March to the first Cambodia Science and Technology Festival held in Phnom Penh, Cambodia.

Weeks after returning from Cambodia, Alex Poultney beams when describing the experience.

"During the rocket launch, students' faces reflect excitement, joy, surprise, amazement and even a little fear."
—Jordan Ermilio '98 ME, '06 MSWRE, director, Villanova Engineering Service Learning

He talks about Rithy, an exceptionally bright 10-year-old and the grandson of Monie, the CFC's in-country manager. "Rithy told me that the activities he participated in provided the most fun he had ever had, and he meant it," says Poultney. Fascination, excitement and a sense of discovery were nearly universal responses from the Cambodian students. Poultney recalls, "While we worked with individual groups, the others would come to the classroom windows to watch." Caroline Franchino adds, "Seeing the students' faces during the workshops was priceless. They enjoyed and learned more than I could have hoped." Perhaps the highlight of the team's experience was realizing that they had excited kids about science and engineering who may never have developed an interest in those areas otherwise.

Anne Caramanico credits the Villanova team with the students' undeniable joy. "The projects you selected could not have been better. Add to that your natural teaching ability and willingness to connect to the students, and you provided them with a truly life-changing experience." ■

## ENGINEERING STUDENTS BUILD EOD ROBOT

In 2012, a group of Villanova students and faculty traveling to Cambodia for a service project met Len Austin, chief of explosive ordnance disposal (EOD) for Golden West Humanitarian Foundation. That fortuitous encounter resulted in a partnership with the Foundation's regional office in Cambodia that has led to the development of a low-cost humanitarian EOD robot.

Based in the United States, but with offices all over the world, Golden West is a non-profit "dedicated to the development of innovative, appropriate technologies to overcome the operational limitations encountered by the humanitarian mine action community." One of the greatest challenges for countries like Cambodia, which is contaminated by landmines and unexploded ordnances, is the expense of high tech solutions for the disposal of these devices. While robots frequently are used by the military and other organizations, the cost—starting at $50,000—puts them out of reach for developing countries. Additionally, these robots cannot be serviced or repaired locally, another disadvantage.

Golden West Detection Technologies Manager Sambo Heang; James Convery '16 ME; Associate Professor of Mechanical Engineering Garrett Clayton, PhD; and Michael Benson '16 ME examine the interior components of the EOD robot.

Working together with Golden West Design Lab in Phnom Penh, Cambodia, Associate Professor of Mechanical Engineering Garrett Clayton, PhD, and teams of Mechanical Engineering students have dedicated themselves to the development of an effective EOD response robot with a price tag under $10,000 (USD). Students are challenged with the realities of product design, sustainability, infrastructure and economics in a developing country. Those who have traveled to Cambodia have had the opportunity to speak with local residents who live with the problem, as well as EOD specialists who are working to solve it, including Director of the Cambodia program and Design Lab, Allen Tan, a former U.S. Army EOD team leader. "It's so important to have that firsthand knowledge," says Villanova team member Michael Benson '15 ME, "Otherwise you can't understand the problem fully and what's needed to fix it."

Throughout the past three years, 15 students have worked on the robot as their senior capstone project, each improving upon the last team's design. In January 2015, after conducting field trials of the latest prototype at Golden West's Applied Technology and Training Center, everyone agreed that the robotic platform is ready to undergo redesign for production. Dr. Clayton lists the objectives that have been met: "This model is made from low cost computer hardware, can be assembled in-country and repaired locally. It also fits into a suitcase so that it can be taken on a plane and deployed to different locations. The robot control interface has been designed for intuitive operation to enable users with a limited educational background." A Kickstarter campaign is expected to launch later this year to help bring the robot to commercial production. The goal is for the robot to be available for purchase by mid-year 2016. ■

"While this project has involved only Mechanical Engineering students to this point, I anticipate that Electrical and Computer Engineering students also will be brought on board. Interestingly, we have a student from our Master's in Sustainable Engineering program studying Golden West's explosive recycling program. It's great seeing multidisciplinary opportunities emerging from this relationship."
—Jordan Ermilio '98 ME, '06 MSWRE, director of Villanova Engineering Service Learning

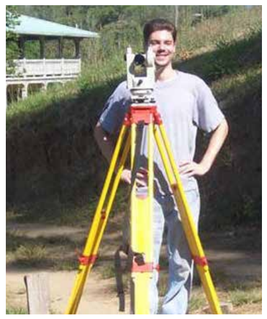




## WHERE ARE THEY NOW?

### Taking His Career to Great Heights
Andrew Blasetti '04 CE, '06 MSCE

In an article about international service learning in the Summer 2009 issue of the College of Engineering's magazine, Andrew Blasetti '04 CE, '06 MSCE wrote of his three unforgettable trips to Amigos de Jesús, an orphanage in Honduras. Five years later, when asked what was the highlight of his time at Villanova, Blasetti doesn't hesitate, "The service learning trips to Amigos de Jesus in Honduras with Drs. David Dinehart and Shawn Gross." He credits them with introducing him to structural engineering.



Professor and Chair Dinehart, PhD, and Associate Professor Gross, PhD, Department of Civil and Environmental Engineering, clearly pointed Blasetti in the right direction. Today, as an associate with Thornton Tomasetti, one of the world's leading structural firms, he heads a team of young engineers in designing what will become the Comcast Innovation and Technology Center in Center City Philadelphia. The December 5, 2014 issue of the Philadelphia Inquirer highlighted his team's work in a front page story.

Dr. Dinehart is not surprised by Blasetti's success or the attention he is receiving, "Andrew was one of the best students I've had in 16 years."

Blasetti has worked for Thornton Tomasetti since graduation, and says high-rise structures have been his niche since his earliest days with the firm. He recalls: "We were working on a number of projects with elite architecture firms, each having very unique geometries that had to be structured unconventionally. I had some ideas and successfully presented them to my supervisors." He has specialized in high-rises ever since.

Blasetti sees the ability to successfully communicate as one of an engineer's most valuable skills. "You may be a creative, innovative thinker with all the answers, but your ideas aren't worth much if you cannot share them effectively." For this reason, Blasetti encourages today's undergraduates to take advantage of the presentations their professors assign. "Most engineers shy away from presenting ideas to clients and supervisors, but presenting your designs in person will get you noticed, help build confidence, and set you ahead of the pack."

Andrew Blasetti (center) leads the team of structural engineers behind the new Comcast tower. They are (from left) Angela Heinze, and Villanova alumni Stephen Kane '11 CE, '12 MSCE and Lou Ross '11 CE. At right is their boss, Mark Coggin of Thornton Tomasetti's local office.



When asked where he thinks his career will take him, Blasetti says he can't imagine leaving the field of structural engineering. He hints, however, "I wouldn't be surprised if teaching on a professional level were to find its way into my career at some point." ■

*The Summer 2009 Villanova Engineering magazine featured Andrew Blasetti's '04 CE, '06 MSCE reflections on Amigos de Jesus in the article "Worldwide Classroom."*

### On the Right Track for Success: Jordan Mahoney (Sarruda) '09 ME

After most of the Class of 2009 had left campus and many had started their careers, Jordan Sarruda '09 ME could still be found on the grounds of Villanova University. Though fully prepared for the new challenges awaiting her, Sarruda had one more Villanova adventure ahead. "I stayed on campus for a few months after graduation, preparing with my women's track and field teammates for a regional meet that summer." A 2007 Big East champion in the 4 x 800 meters, Sarruda was looking forward to closing one chapter of her life with this last race, and beginning another in a full time position at Lockheed Martin.

The first three years of Sarruda's career were spent in Lockheed Martin's Engineering Leadership Development Program (ELDP), an elite training regimen for new employees. The ELDP enabled Sarruda to rotate through different functional roles, earn a Master's in System's Engineering, and develop a valuable professional network through leadership training and conferences. She credits her Villanova education with her success in the program, and points specifically to her senior capstone project experience: "I was fortunate to lead a very talented, multi-disciplinary group of engineers through a lifecycle project for which we proposed, developed, tested and manufactured a design prototype for a hydroelectric generator. Our hard work ensured our success both individually and as a team. In the end, one of the most valuable lessons I learned was what it meant to be a leader in engineering."

Senior Associate Dean for Graduate Studies and Research Gerard "Jerry" Jones, PhD, recalls Jordan as "One of the most delightful, genuine, positive-thinking, motivated, stimulating and talented students I have known."

After completing the ELDP, Sarruda moved into a permanent position involving integration and testing for Lockheed Martin's Aegis Ballistic Missile Defense. In 2013, she led a successful "Five for Five" streak of live, at-sea test events, a major accomplishment that resulted in the NOVA Award—Lockheed Martin's highest honor—for Sarruda and her team.

When asked if her life and career are what she imagined they would be, Sarruda confesses: "I do not think I could have ever imagined my life and career! I count my blessings." She acknowledges the support of her family, the coaches at Villanova who helped shape her goals and the teachers and classmates who pushed her to succeed, both through a shared vision and friendly competition. "Part of the beauty of my life and career is that it has always been paved by a certain amount of uncertainty. Less than a year ago, I married my wonderful husband, Lee Mahoney, and only months ago, I became an aunt to a beautiful baby boy. While I may not know exactly what lies on the road ahead, I feel I am ready for whatever comes my way." ■

On her wedding day, June 28, 2014, with husband Lee Mahoney.

*Jordan Sarruda's '09 ME photo and quote regarding her passion for track appear in "Here, There, and Everywhere," an article in the Summer 2009 Villanova Engineering magazine.*

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VEU
VILLANOVA ENGINEERING UPDATE

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VILLANOVA ENGINEERING UPDATE

SPRING 2015

VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING

# STUDENT SUCCESS STORIES

**From undergraduates to doctoral students, the College of Engineering attracts the best and the brightest. Here are just a few of our standouts from the past academic year:**

## Award Winning Worm Research

Villanova Undergraduate Research Fellow **Jack Dienes '15 ChE and Comp Sci** (dual major) worked with Assistant Professor Jacob Elmer, PhD, Chemical Engineering, to purify hemoglobins from different invertebrates (e.g. worms) and test them as potential blood substitutes. A poster of his work placed third in its division in the poster competition at the Academy of Chemical Engineering Annual Meeting.

## Engineers Week Winner

During Delaware Valley Engineers Week, **Richard Holden '15 ME** was awarded the Lewis A. Caccese Scholarship through the Philadelphia Engineering Foundation. Selection was based on academic performance, extracurricular professional and community activities, and the Dean's recommendation.

## Travel Grant to Australia Conference

**Branka Jokanovic**, a PhD student and research assistant in the Center for Advanced Communications (CAC), presented "Sparse and Cross-term Free Time-frequency Distribution Based on Hermite Functions" at the Institute of Electrical and Electronics Engineers (IEEE) International Conference on Acoustics, Speech and Signal Processing. She received a highly competitive travel grant to attend this flagship conference in Australia. *Jokanovic is seen in this photo with Moeness Amin, PhD, CAC director and professor, Department of Electrical and Computer Engineering.*

## Conference Paper Presentations

Doctoral student **Mahmoud Kabalan** presented a poster and paper at the IEEE Global Humanitarian Technology conference, for which he received conference participation support. He also had a paper accepted for the July 2015 IEEE Power and Energy Society General Meeting, which usually accepts less than 50% of submitted papers. *Kabalan (right) is seen in this photo with Pritpal Singh, PhD, chair and professor, Department of Electrical and Computer Engineering.*

## First Place in Paper Competition

CAC research assistant and PhD student **Si Qin** won first place for "DOA Estimation of Mixed Coherent and Uncorrelated Signals Exploiting a Nested MIMO System" in the student paper competition at the 2014 IEEE Benjamin Franklin Symposium on Microwave and Antenna Sub-systems. *Qin is seen in this photo with Yimin Zhang, PhD, research professor and director of the Wireless Communications and Positioning Laboratory.*

## Data Center Research Wins Awards

**Joseph Schaadt '15 ME** won best poster in the Undergraduate Research and Design Expo at the American Society of Mechanical Engineers International Mechanical Engineering Congress and Exposition. His research, "Load Capacity and Thermal Efficiency Optimization of a Research Data Center Using Computational Modeling," also earned him Villanova's Falvey Scholars Award for outstanding undergraduate research.

## Presidential Scholar Heads to Ireland

The U.S.-Ireland Alliance selected Presidential Scholar **Stephen Sechler '15 EE** for the 2016 class of George J. Mitchell Scholars. As a winner of this prestigious award, Sechler will study Bioengineering at Trinity College Dublin, engaged in research to develop improved auditory technology for the hearing-impaired.

## Engineers Place First in VSEC

Junior Chemical Engineering majors **Thomas Iervolino** and **Devin Good** were awarded first place and $5,000 in the 2015 Villanova Student Entrepreneurship Competition. Their concept—Vanquish Ink—is magnetically removable tattoo ink and the equipment needed for the removal process.