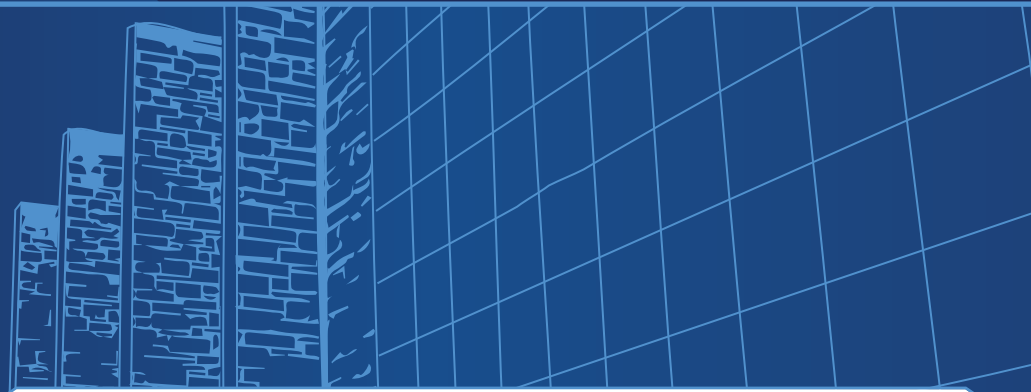




VILLANOVA ENGINEERING UPDATE



VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING

EQUIPPING ENGINEERS WITH AN ENTREPRENEURIAL MINDSET

Between 2007–2009, the Kern Family Foundation awarded Villanova University College of Engineering \$124,000 to implement the Kern Entrepreneurship Education Network (KEEN) initiative at Villanova. The grants also were used to provide students with access to new intrapreneurship development and intercollegiate entrepreneurship opportunities. Beginning in fall 2014, a \$439,000 Kern Family Foundation grant will support the College’s goal of exposing all engineering students to entrepreneurially minded learning at the University, in the KEEN network, and beyond.

Gary A. Gabriele, PhD, Drosdick Endowed Dean, College of Engineering, defines an engineer with an “entrepreneurial mindset” as one who exercises curiosity about the surrounding world and defines problems, opportunities and solutions in terms of value creation. He explains, “Entrepreneurially minded engineers consider societal, technological, and economic trends and seek creative ways to apply them in order to provide solutions to problems that will drive new economic growth and benefit society.” Producing entrepreneurially minded engineers is a strategic initiative for the College of Engineering, and with generous assistance from the Kern Family Foundation, a great deal of progress has been made in this regard. The College has imbedded KEEN-based entrepreneurship into its engineering curriculum, created the popular Engineering Entrepreneurship minor and forged partnerships with nearly all of the KEEN institutions. Through the Helping Hands Dense Network collaboration with the University of Dayton, the University of Detroit Mercy and Baylor University, Villanova engineering students have had the opportunity to engage in joint senior design projects with peers at partner universities. In addition, Villanova has leveraged support from the Kern Family Foundation to raise additional funds for entrepreneurial activities in the College and across campus.

With this new grant, the College of Engineering will embark upon a two-year plan to increase substantially the infusion of entrepreneurially minded engineering skills into



Villanova’s multidisciplinary engineering team debates design details prior to its final presentation at the Innovation Encounter competition at Lawrence Tech.

core undergraduate courses. In combination with the College’s strategic initiative to expand the use of the inverted classroom model in its core curriculum (see “Flip It; Flip It Good!”), the new grant will help faculty introduce KEEN entrepreneurially minded learning modules into their course exercises. The goal is for students not only to become proficient in an engineering topic, but also to be curious about how what they are learning can be used to solve new problems. These modules will impact all undergraduate engineering majors, nearly 1,000 students, at Villanova.

FLIP IT; FLIP IT GOOD!

“Achieving academic distinction by being recognized as a leading engineering college in the transformation of engineering education in the U.S.,” has long been the vision of Gary A. Gabriele, PhD, Drosdick Endowed Dean, Villanova University College of Engineering. That transformative vision calls for classroom and lab experiences that emphasize student responsibility for their learning with faculty focused on mentoring, as well as increased opportunities for students to experience the professional practice of engineering. This year, the College took a major step toward a new approach to classroom learning by “flipping” four courses.

**What Is a Flipped Classroom?**

The flipped classroom, also known as the inverted classroom, shifts the focus from one-directional lectures filled with facts, theories and equations, to one that is problem-based, real-world oriented and experiential. In a flipped classroom, basic knowledge is covered outside of class time. Instructors may record lecture material and provide downloadable notes or visuals, and students are accountable for reviewing the material on their own time. Not only does this require students to take responsibility for their own learning, but it frees up valuable class time for inquiry-based tasks and greater interaction between faculty and students.



In the flipped classroom, students have more time to focus on problem-solving with faculty involvement.

**In the Flipped Classroom ...**

- ✓ Valuable classroom time is available for experiential opportunities and problem-solving.
- ✓ Faculty and students are able to engage and interact.
- ✓ Instructors have more time to share their own professional experience and wisdom.
- ✓ Students must take responsibility for their own learning.

**The College of Engineering Experiment**

In 2013–2014, the College flipped four fundamental courses. Introduction to Electronics and Analog Electronics (Electrical and Computer Engineering), and Statics and Solid Mechanics (Mechanical) both chose to introduce the inverted approach in specific course modules, while Mechanics I (Civil Engineering) and Thermodynamics II (Chemical Engineering) fully inverted their classes for the entire semester. A complete transformation was found to be more effective, according to Randy Weinstein, PhD, Associate Dean of Academic Affairs. “The inverted classroom should be introduced at the very beginning of a course and maintained throughout so students can adjust to a new style of learning,” he explains. And, it is an adjustment.

Students initially grumble about what they perceive to be additional work, but ultimately acknowledge that they learn more in the process, and the work load is just shifted, not increased substantially. Instructors also are hesitant about the new approach. “Faculty are tentative because it requires extra time to prepare and record material. They also are concerned that their courses will receive lower ratings from students because they have to work harder,” says Dr. Weinstein. “They question whether students are really learning more or more effectively,” he adds.

To that question, Dr. Weinstein answers “yes.”

*(Continued on Page 2)*

## FLIP IT; FLIP IT GOOD! *(Continued from Page 1)*

For his own Thermodynamics II course, Dr. Weinstein compared course and teacher survey responses averaged from five sections between fall 2010–2012 (traditional lectures), to those averaged from two sections in fall 2013 (flipped). When asked a series of more than 20 survey questions gauging course value, quality of teaching and course material, the inverted classroom outscored or equaled the score of the traditional approach. In no case did the inverted classroom result in a lower score.

Most importantly, impressive results were seen in student grades and enhanced material comprehension. The chart below indicates that students whose grades represented the bottom third of the class average, showed the greatest improvement in the flipped classroom (nearly a 7 percent increase). The class average as a whole increased more than 2 percent.

STUDENT GRADES	TRADITIONAL	INVERTED
Class average	79.34	82.02
Top 1/3 class average	89.21	89.37
Bottom 1/3 class average	67.63	74.52

With the use of technology, the course instructor is able to determine whether students are participating in the online learning that is required of them. The number of views per day, and even the hour at which they're most engaged, can be tracked. The performance of individual students can be compared to the number of times they view the material (though, at this point, the amount of time spent watching was not measured). When a certain lecture receives considerably more views than others, the instructor can infer that this particular material was more challenging and may require



In the flipped classroom, there are more opportunities for student-faculty interaction.

more time to review and discuss in the classroom. “The ability to review, pause and rewind the recorded material as often as needed, is another tremendous advantage of the inverted classroom,” says Dr. Weinstein. It is also the benefit most cited by students in their surveys.

“I was able to learn at my own pace. I could pause and review, or go back to hear something again.”

—Thermodynamics II student, fall 2013

### Moving Forward

Students who experienced this new learning method in Mechanics I will move to Mechanics II, which will be delivered in the same manner. “That will give us an even better picture of how well students are learning via this method,” notes Dr. Weinstein. In the next academic year,

four additional flipping projects will be implemented, bringing the total to eight and increasing the opportunities for assessment. Dr. Weinstein estimates that within five or six years, the majority of freshmen, sophomore and early junior year courses will be inverted. “This is the future of engineering education,” he says.

## ENGINEERING ALUMNI INTRODUCE STUDENTS TO THE FINANCIAL SECTOR

BY JIN CHOI '14 CLAS

A recent report from the Pew Research Center found that 60 percent of science and engineering majors say their current jobs are very closely related to their fields of study. Less than 45 percent of majors in other fields report the same. While engineering careers are the obvious choice for most College of Engineering majors, some choose to go in different directions.

This spring, Villanova students were invited to a unique panel discussion on “Alternative Career Paths: Engineers in the Financial Sector.” Participating on the panel were alumni Robert Catalanello '86 EE, managing director, Foreign Exchange, Credit Agricole; Timothy Arcuri '93 ChE, managing director, Cowen & Company; Casey Simmons '01 EE, senior associate, Investment Management, Adveq; and Will Dooley '12 EE, analyst, Client Analytics Group, BlackRock, Inc.



Tim Arcuri '93 ChE listens as Robert Catalanello '86 EE shares advice on working in the financial sector.

The alumni shared their professional experiences and spoke specifically about how their engineering degrees have played a role in their financial careers. While they took different paths to get where they are today, each panelist agreed that majoring in engineering proved to be an advantage. “Engineering teaches you to think analytically,” said Robert Catalanello. “It presents you with real-life situations with real consequences, and that sets you apart.” Panelists also noted that an engineer’s combination of technology skills and ability to problem-solve is a crucial aspect of

working in the financial sector. Timothy Arcuri, the only panelist without a business minor or MBA, told the audience he doesn’t feel held back by the lack of a business degree: “I was hired because I could think. That’s what engineers are taught to do.”

“I considered going into engineering, and now I’m almost feeling limited by my decision to major in finance!”

—Elizabeth Olvey '17 VSB

In addition to sharing their personal stories, panelists also provided students with advice on breaking into the financial field. They stressed the importance of doing research beforehand and gaining a thorough understanding of the industry. To prepare for interviews, Casey Simmons recommended, “Definitely do your research on the person you’re interviewing with, and demonstrate your passion for the field.” Will Dooley suggested that students stay on top of the financial market by reading key industry publications and going on informational interviews.



Nearly 100 engineering students attended the panel discussion, as did Computing Science majors and undeclared freshmen.

When students asked what they could do to impress employers, the panelists encouraged them to take writing and public speaking courses to improve their communication skills. “Writing is definitely the biggest weakness of most engineers. It’s important to be able to communicate an idea in written form,” said Dooley. The panelists also suggested students take as many courses as possible outside of the engineering discipline and engage in more creative initiatives, such as blogging, to create a more comprehensive application. They named electromagnetics, organic chemistry, design courses and signal processing as courses that taught them to think outside the box, a valuable asset in the financial world.

“I have been trying to decide if I want to go in this direction, and it was good to know that I don’t necessarily need an MBA to pursue a career in finance.”

—Ryan French '14 ME

Students were advised to pursue careers in emerging fields such as clean water and energy, the advanced materials industry and, in particular, startup companies. “Startups are a great way to start a career. CEOs respect someone who has been in their shoes and developed a product. Engineering provides a great basis,” said Simmons.

Perhaps the afternoon’s best piece of advice came from Catalanello who emphasized, “Make sure you enter the financial sector because you love it; it’s not an easy industry to work in.”

## DEAN'S MESSAGE

This past spring's inaugural issue of the VEU featured an article about the University's entrepreneurial activities. Related competitions and awards of recognition, the Engineering Entrepreneurship program, and even our 2013 Patrick J. Cunningham Jr. and Susan Ward '80 Endowed lecturer, Mike Nuttall, reflected our campus-wide interest in originality, creativity and entrepreneurship. In this issue's cover story, you will learn how a new grant is helping the College of Engineering establish the classroom as the next great frontier for our entrepreneurial spirit. Evidence of our innovation in engineering education, the related cover story titled (with apologies to Devo), "Flip It; Flip It, Good!" shares highlights from our foray into the inverted classroom.

Also in this issue, we are pleased to recognize what is just a sampling of the impressive accomplishments of our students and faculty. This past academic year saw a record number of external grants, and a corresponding surge of interest and publicity around faculty research. Our students are engaged both in and outside of the classroom: building race cars, teaching engineering to high school students and winning design competitions. And together, our faculty and students are doing truly remarkable work in countries around the world.

Finally, I hope you enjoy catching up with two of our alumni in "Where Are They Now?" a new feature suggested by one of our readers. I know you will be pleased to see how Villanova Engineering alumni continue to make us proud.



Enjoy the VEU!

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

## BENJAMIN FRANKLIN MEDAL RECIPIENTS RECOGNIZED IN COLLEGE-HOSTED SYMPOSIA

In April, the College of Engineering proudly hosted two symposia featuring the 2014 Benjamin Franklin Medal recipients in Electrical Engineering and Mechanical Engineering.

Director of the Center for Advanced Communications, Moeness Amin, PhD, hosted Electrical Engineering laureates Shunichi Iwasaki, PhD, of the Tohoku Institute of Technology in Sendai, Japan; and Mark H. Kryder, PhD, of Carnegie Mellon University in Pittsburgh, Pa. Drs. Iwasaki and Kryder were cited for the development and realization of the system of Perpendicular Magnetic Recording, which has enabled a dramatic increase in the storage capacity of computer-readable media. Symposium speakers

from industry and academia addressed various aspects of the system, and the event culminated with presentations by the laureates. Dr. Iwasaki spoke to "Perpendicular Magnetic Recording to New Civilization—From Science to Technology," and Dr. Kryder presented "The Implementation and Future of Perpendicular Recording Technology."

Professor and Mechanical Engineering Department Chair, C. Nataraj, PhD, welcomed Professor Ali Hasan Nayfeh, PhD, recipient of the 2014 Benjamin Franklin Medal in Mechanical Engineering. Dr. Nayfeh is a distinguished professor emeritus at Virginia Polytechnic Institute and State University in Blacksburg, Va., and a distinguished professor at the

University of Jordan in Amman, Jordan. Recognized for his novel methods of modeling complex engineering systems in structural dynamics, acoustics, fluid mechanics and electromechanical systems, Dr. Nayfeh anchored a unique symposium on the development of perturbation methods in nonlinear dynamics. Invited presentations by seminal contributors covered the history of the development of the field of nonlinear dynamics, many of them stemming from Dr. Nayfeh's contributions, as well as wide-ranging applications to engineering systems analysis and design.

Founded in 1824, The Franklin Institute's Awards Program has long been recognized as the oldest, and most



Electrical Engineering laureate Shunichi Iwasaki, PhD, with Director of the Center for Advanced Communication, Moeness Amin, PhD.

comprehensive, science and technology honor bestowed in the country and around the world. Laureates of The Franklin Institute are brought to Philadelphia each spring for a weeklong series of events and activities aimed at connecting and celebrating the laureates' remarkable accomplishments with area students and the community.

## COLLEGE OF ENGINEERING BY THE NUMBERS

### FALL 2013 UNDERGRADUATE STUDENTS

**991**  
Total enrollment

**30**  
Percent female  
(vs. national average of 18.2%)

**69**  
Number of University honor students

**91**  
Percent of freshmen who returned as Sophomores

**20**  
Percent ethnic minority

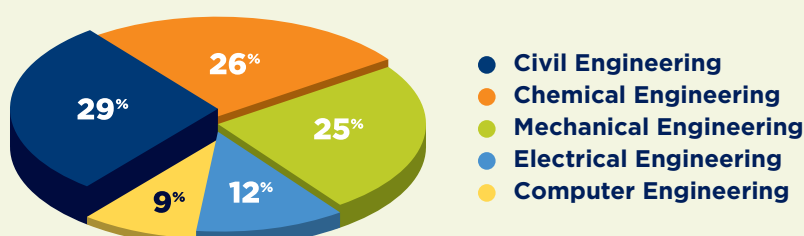
**96**  
Percent in the top 25% of their high school class

### CLASS OF 2013 OUTCOMES

**58,329**  
Average starting salary

**97**  
Percent of graduates employed full-time or in full-time graduate school

### UNDERGRADUATES BY MAJOR



### SAMPLE EMPLOYERS

Boeing  
Carrier Corporation  
Chevron  
Conti Group  
Dow Chemical  
GlaxoSmithKline  
Goldman Sachs  
JP Morgan Chase  
U.S. Navy  
Whiting-Turner Contracting Co.

### SAMPLE GRADUATE SCHOOLS

City College of New York  
Clemson University  
Marquette University  
Polytechnic University of Puerto Rico  
Stanford University  
Temple University  
University of Illinois  
University of Michigan  
University of Pennsylvania  
Villanova University

## RECOGNIZING EXCELLENCE: C. “NAT” NATARAJ, PhD

In Villanova University’s history, only three College of Engineering faculty have been recognized with the University’s prestigious Outstanding Faculty Research Award. The first was Moeness Amin, PhD, director of the Center for Advanced Communications. Ahmad Hoorfar, PhD, director of the Antenna Research Laboratory, was the second. And, in 2013, C. “Nat” Nataraj, PhD, professor and chair of the Department of Mechanical Engineering, and the Mr. and Mrs. Robert F. Moritz Sr. Endowed Chair in Engineered Systems, became the third recipient of this highly competitive award.

### Research

A member of the Villanova College of Engineering faculty since 1988, Dr. Nataraj is known internationally for his work in the area of dynamic systems and nonlinear dynamics. In 2002, he helped found the University’s Center for Nonlinear Dynamics and Control (CENDAC) and served as its inaugural director until 2007. CENDAC is home to the Dynamic Systems Laboratory, where Dr. Nataraj conducts research on modeling, control and diagnostics of nonlinear systems for a range of industries, including health care and the military. Other areas of scholarship for which he is recognized include unmanned vehicles, robotics and rotor dynamics.

Given his areas of expertise, Dr. Nataraj has received many grants throughout the years from sources including the National Science Foundation, National Institutes of Health, the Defense Advanced Research Projects Agency and the Office of Naval Research. This academic year alone, he has been awarded more than \$620,000 in

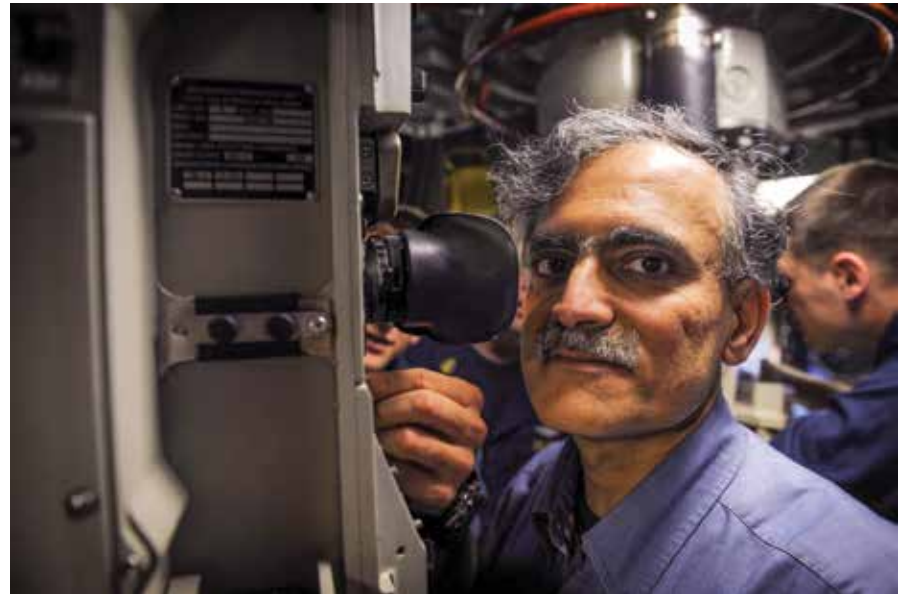
research funding. This financial support will be essential as he and a team of Mechanical Engineering students prepare to represent the United States in the first-ever RobotX Challenge in October 2014 in Singapore. His years advising the Autonomous Surface Vehicle team played a large role in Villanova being selected for this new competition. You can read more about the “monumental effort” involved with RobotX in the article “Villanova-FAU Team to Represent the U.S. in International Robotics Competition,” found in our News Archives at [engineering.villanova.edu](http://engineering.villanova.edu).

“I am deeply honored to have received this recognition for my work, particularly given the number of deserving faculty members who also were nominated.”

—C. Nataraj, PhD, recipient of the Villanova University Outstanding Faculty Research Award

### In the Classroom

Throughout his more than 25 years with the College, Dr. Nataraj has taught a dozen different courses and has supervised 30 undergraduate researchers, 25 master’s research theses and seven doctoral candidates. Today, he primarily teaches graduate courses in Nonlinear Dynamics, Rotor Dynamics and Vibration Analysis. Ali Jalali, one of Dr. Nataraj’s doctoral students, is working on the integration of physics-based modeling and machine-learning techniques in the design of clinical decision support systems. He describes his advisor as a great research mentor: “Dr. Nat helps you understand the big



C. Nataraj, PhD, professor and chair, Department of Mechanical Engineering, was selected as one of nine faculty members from institutions across the country to ride on the USS Pasadena, a nuclear submarine.

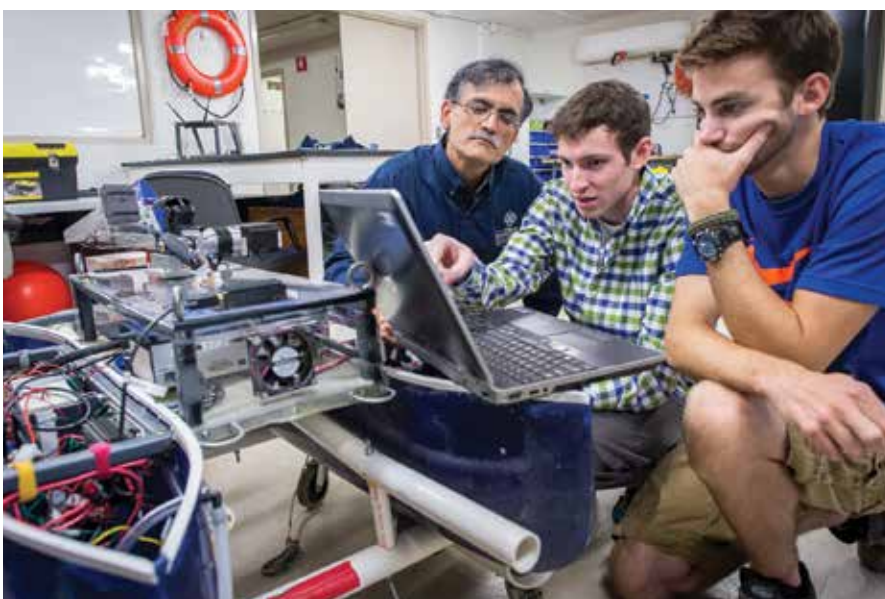
picture and then gives you the freedom to think critically and go deep into the problem. He spends a lot of time with his students and is available to discuss any obstacles we face.”

### Outreach

In addition to his work with Villanova students, Dr. Nataraj also makes time in his increasingly busy schedule for STEM (Science, Technology, Engineering and Math) outreach. He leads the College’s efforts to host and facilitate the annual Marine Advanced Technology Education (MATE) regional competition, through which hundreds of high school and college students put handmade remotely operated vehicles to the test in a daylong competition on campus. He also has been active in the development of curricular materials for SeaPERCH, a system of instructional materials that K–12 teachers and students can use to build their own robots.

### Industry Engagement

Within the engineering industry, Dr. Nataraj is an elected member of a number of prestigious technical societies and professional boards. He has been the chief organizer for many American Society of Mechanical Engineers (ASME) symposia throughout the past 15 years, including the largest conference in the world on rotor dynamics and control. He also has served on ASME’s Technical Committee on Vibration and Sound, and recently the Journal of Vibration and Control, International Journal of Advanced Robotic Systems and the Journal of Applied Nonlinear Dynamics invited him to join their editorial boards. Closer to home, Dr. Nataraj serves as chairman of the board of directors of the Turbo Research Foundation in Lionville, Pa., and as an elected member of The Franklin Institute’s Committee of the Sciences and the Arts.



Dr. Nataraj consults with Autonomous Surface Vehicle team members Anderson Lebbad ’16 MSME and Alexander Poultney ’14 ME.

### The Outstanding Faculty Research Award

Outside of those who have been nominated, very few Villanovans are aware of the level of competition for the Outstanding Faculty Research Award. Not simply “a recognition,” award nominees are selected based on their lifetime achievements. Candidates must submit a detailed research statement, complete CV (Dr. Nataraj’s is 55-pages long), and hundreds or thousands of pages of supporting documentation going back through the nominee’s decades of research (more than 3,000 pages, in his case). In addition to the personal materials, eight international scholars submitted confidential letters of reference to the award committee on behalf of Dr. Nataraj. Finally, the committee pores through the material for each candidate and is faced with the very difficult task of selecting one of them to be the year’s award winner.

Gary A. Gabriele, PhD, Drosdick Endowed Dean, College of Engineering, applauded the committee’s selection: “This is a great honor for Dr. Nataraj and a well-deserved recognition of the innovative research he has been involved in at Villanova. The depth and breadth of his research, and the extensive involvement of undergraduate and graduate students in his work, are indicative of a very inquisitive and creative researcher who loves to share his passion for research with his students and colleagues.”

“Nat has been a great mentor to many young faculty and has been an excellent example of the teacher-scholar model that Villanova faculty strive to achieve.”

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

In March, Falvey Memorial Library and the College of Engineering sponsored the Scholarship@Villanova/Outstanding Faculty Research Award Lecture, featuring Dr. Nataraj. His presentation, “Dynamic Systems: The Science of Machinery, Robots, Medical Diagnostics and Autonomy,” described some of the research that led him to win this prestigious award.

## PUTTING STORMWATER IN ITS PROPER PLACE

Robert Traver, PhD, PE, D.WRE, F.EWRI, F.ASCE '82 MSCE, spent much of 2013 in the public eye. As the director of the Villanova Center for the Advancement of Sustainability in Engineering (VCASE), and a nationally recognized expert in stormwater management, Dr. Traver was interviewed by the media on the six month anniversary of Hurricane Sandy. In his position as chair of the Task Committee on Flood Safety Policies and Practices, he led the American Society of Civil Engineers' national summit on the topic. And, in mid-October, as director of the Villanova Urban Stormwater Partnership (VUSP), Dr. Traver, along with Civil and Environmental Engineering colleagues Professor Andrea Welker, PhD; Associate Professor Bridget Wadzuk, PhD, '00 CE; and Assistant Professor John Komlos, PhD, hosted the eighth Pennsylvania Stormwater Management Symposium.



On Villanova's annual St. Thomas Day of Service, faculty and students helped to design and install a rain garden at St. Martin of Tours School in Philadelphia.

### \$1M EPA Grant Funds Philadelphia Stormwater Study

Thus far, 2014 is shaping up to be a year of transformative research grants for Dr. Traver and fellow VCASE faculty. In late January, the Environmental Protection Agency (EPA) awarded a \$1 million grant to Villanova University to study the performance and effectiveness of green infrastructure stormwater practices in urban areas—using Philadelphia as the pilot area. The research is under the direction of Dr. Traver with Drs. Welker and Wadzuk. Also collaborating on the project is Assistant Professor of Mechanical Engineering, Garrett Clayton, PhD, a member

of the Center for Nonlinear Dynamics and Control (CENDAC), as well as the Philadelphia Water Department (PWD) and faculty members from Temple University and Morgan State University. "Although our understanding of how green infrastructure works has expanded tremendously during the past decade, the goal of our grant is to maximize the efficiency and robustness of that which is being used to implement the PWD's Office of Watersheds Green City Clean water initiative," says Dr. Traver. The EPA project will run through August 2017, and will support the participation of graduate and undergraduate students, who will work alongside the faculty.

**"We still have more to learn so we can improve our designs and create the next generation of stormwater control measures."**

—Robert Traver, PhD, director of the Villanova Center for the Advancement of Sustainability in Engineering

### "Growing Greener" Program Funds Additional Research

In addition to the EPA grant, Villanova has been awarded more than \$225,000 from the Department of Environmental Protection (DEP) as part of \$20.65 million in funding for watershed protection projects. For its part, VCASE faculty Drs. Wadzuk and Welker will focus on stormwater facility research, which responds to the research needs of VUSP partners.

The team will study and evaluate the technology (in this case, rain gardens) to improve its potential for water quantity and quality benefits. "To maximize performance in vegetated storm water control measures (SCMs), infiltration and evapotranspiration (ET) removal mechanisms need to work together," explains Dr. Wadzuk. "This combination leads to greater creativity in SCM design and flexibility in siting." Drs. Wadzuk and Welker believe that traditional infiltration SCM design (e.g., flow path and soil media) can be modified to encourage ET, and achieve the necessary volume reduction and pollutant reduction with soil media amendments, and re-use of existing soils and longer detention times. The results of their research will be transferrable to many different rain gardens, along with guidelines for their design and build. Dr. Wadzuk adds, "There is an emphasis on sustainable designs that use on-site materials rather than proprietary media or products."

In addition to these government-supported grants, the research that VCASE and VUSP are conducting also has been recognized and generously rewarded by private local foundations. Read "William Penn Foundation Awards \$565K to VUSP," below.

## WILLIAM PENN FOUNDATION AWARDS \$565K TO VUSP

In April, Andrea Welker, PhD's, proposal for the development of a watershed protection strategy for Philadelphia, received a \$565,000 grant from the William Penn Foundation (WPF). The award was part of a \$35 million multiyear investment the WPF has made to protect and restore the Delaware River watershed, a critical source of drinking water for 15 million people. The grants fund an unprecedented collaboration of leading conservation organizations, which will align their work to protect land, restore streams, test innovative approaches in ecologically significant places and monitor results throughout time.

"The Delaware River Watershed is a critical resource for communities in New Jersey, New York and the entire region. Every day, millions of people depend upon the watershed as a source of drinking water, for agricultural uses, and for recreation," says EPA Region 2 Regional Administrator Judith A. Enck. "Preventing pollution from entering the Delaware River and its watershed is the single most effective strategy to ensure that the watershed is protected."

For her part in this three-year project, Dr. Welker's research is focused on monitoring the effectiveness of individual stormwater control measures (SCM) in three targeted micro-watersheds. This monitoring will be used to inform mathematical modeling of the SCMs, which is critical to understanding the monitoring results. Dr. Welker's research will be complemented by watershed monitoring and modeling that will be performed by Temple University in the same targeted micro-watersheds, and regional monitoring being performed by the Academy of Natural Sciences of Drexel University. Temple and Villanova will be working with local watershed organizations to develop monitoring protocols and train volunteers to perform monitoring across the region.

Laura Sparks, chief philanthropy officer of the WPF, explained that monitoring data will enable them and other foundations to make more informed, evidence-based decisions going forward. Sparks continued, "We are eager to use the data collected to inform real-time adjustments, analyze the potential of



Civil and Environmental Engineering Professor Andrea Welker, PhD, and Ashley Neptune, a Water Resources Engineering graduate student, review the data logger at the Fedigan rain gardens.

these projects across the watershed and magnify those results to catalyze widespread action grounded in high-quality science." The WPF hopes to identify new evidence-based methods for avoiding or mitigating key stressors

threatening water quality, including urban storm water runoff, agricultural pollution, loss of forests in essential headwater areas, and aquifer depletion.

## NEW CYBERSECURITY GRADUATE PROGRAM RECEIVES CORPORATE GRANT



Through a new research grant, the College of Engineering will work with Hoyos Labs to further advance biometric security.

In order to further technological advancements in secure identity authentication, Hoyos Labs, a digital infrastructure company, has provided a \$78,000 research grant to Villanova University in the area of computer security, focusing on identity assertion, role gathering, adjudication and access control. “The world of secure identity authentication is evolving constantly,” says Hector Hoyos, CEO of Hoyos Labs. “To keep up with the newest information

and to ensure that Hoyos Labs has access to, and can leverage, the best technology available in its identity assertion platforms, we have teamed up with this top group of experts at Villanova University.”

Led by Scott Streit, Hoyos Labs’ chief computer scientist and an adjunct professor in the College’s Cybersecurity graduate program, the Villanova project is centered

on an intrusion detection system that will look at failed security attempts and the commonalities of the attacks. “The goal,” explains Streit, “is to replace passwords with biometric security, which recognizes your face or the patterns of the irises in your eyes.” Doctoral student Stephen Suffian ’13 MSSE also is involved in the study, and Streit expects that other students will be added to the research team at some point in the near future.

Gerard F. Jones, PhD, professor and Senior Associate Dean for Graduate Studies and Research, notes: “Villanova Engineering is excited to have this wonderful opportunity for collaboration with Hoyos Labs, one of the world’s foremost developers of multi-biometric recognition technology and software. We are especially pleased that this comes at a time when we are beginning to see very serious student interest in our new Master of Science in Cybersecurity program. We look forward to long-term, continued growth in our work with Hoyos as our Cybersecurity program achieves national recognition.”

“Hoyos Labs is the first to showcase a truly end-to-end solution that will address the challenges of secure identity authentication in a convenient and scalable way to both consumers and corporations,” says Streit. “This is a technology that I believe in, and I will work closely with the Villanova team to help develop the preeminent identity authentication technology on the market.”

## PROFESSOR’S GROUNDBREAKING RESEARCH GENERATES MEDIA INTEREST

When Villanova University’s Jens Karlsson, PhD, associate professor of Mechanical Engineering, and his Oregon State University collaborator Adam Z. Higgins, PhD, School of Chemical, Biological and Environmental Engineering, published the results of their research into the cryopreservation of biological living tissues, the scientific community took notice. In a study titled “Effects of Intercellular Junction Protein Expression on Intracellular Ice Formation in Mouse Insulinoma Cells,” Drs. Karlsson and Higgins discovered how ice crystals invade different types of tissue cells during the freezing process—a significant discovery that could pave the way for new cryopreservation techniques for organs.

In the medical community, attempts to cryopreserve tissues and organs to be used for transplantation have been stymied because cells within tissue are highly susceptible to damage from ice formation. For more than a decade,

Dr. Karlsson has pursued research on strategies for overcoming these obstacles, and in November 2013, his groundbreaking findings were designated as “New and Notable” and featured on the front cover of *Biophysical Journal*, a leading publication in the area of biophysics.

Since that time, Dr. Karlsson’s research has piqued the interest of both his peers and the public media. In addition to prominent placement in *Biophysical Journal*, related articles have been published by *The Scientist Magazine* and *Fox News Health*. KTRH in Houston aired an interview with Dr. Karlsson, and the story was featured on respected scientific news sites including *Phys.org* and *ScienceDaily.com*. Most recently, Dr. Karlsson was interviewed by the BBC, as well as on the popular public radio program “The Pulse” on Philadelphia’s WHYY. His research is also referenced in the March 2014 issue of *Microscopy Today*.



Jens Karlsson, PhD, associate professor of Mechanical Engineering, discusses current research with graduate students in his Biothermal Sciences Laboratory.



Visit “COE in the Media” in the News Room at [engineering.villanova.edu](http://engineering.villanova.edu) for related articles and interviews.

When asked what comes next in his research, Dr. Karlsson explains that his team is “working on better understanding these processes, so that we ultimately can develop computer

models that will aid with the design of effective cryopreservation techniques, as well best practices for transporting and storing tissue-engineered medical products.”

## MAKING HEADLINES



The College of Engineering has more than doubled its media mentions in the past year (radio, newspaper, industry publications and websites): a reflection of our student accomplishments, and faculty research and expertise. The increase also can be attributed to the efforts of the College’s Communications Department, as well as Villanova University Media Relations.

In addition to stories about individual achievements like Dr. Jens Karlsson’s groundbreaking research, our faculty has written editorials for national publications on topics such as women in engineering, the engineer of tomorrow, the future of engineering education and STEM.

Along with University news coverage and media mentions in everything from the *Philadelphia Inquirer* to the BBC, the College also continues to produce its own articles, which appear on the News Archives link in the News Room on the home page of the College’s website. More than 40 stories about College of Engineering faculty, students, competitions, events, academic programs, extracurricular organizations and alumni were written from September 2013 through May 2014.

**Visit the College News Room at [engineering.villanova.edu](http://engineering.villanova.edu) to read articles like these:**

### From COE in the Media

Experts Peer into Pa. Potholes (*Philadelphia Inquirer*)  
Who Will Watch You Fall? A Radar Detection Program for the Elderly (*The Atlantic*)  
Resolving the Critical Infrastructure Cybersecurity Puzzle (*Signal Magazine*)  
Fatigue Evaluation of a GFRP Reinforced Bridge Deck Outlet (*STRUCTURE*)  
20 Skills That All Successful Entrepreneurs Have (*BusinessInsider.com*)

### From the News Archives

Seniors Present Their Best  
Undergraduate Engineering Students Win ISPE DVC Student Poster Competition  
Engineering Student Named University Innovation Fellow by NSF-Funded Epicenter  
Academia and Industry Form Partnership to Improve the Energy Efficiency of Data Centers  
Villanova Engineering Professors’ Work to Be Featured in National Compendium

## STUDENTS DRIVEN TO PERFORM

BY JIN CHOI '14 CLAS

Organized by SAE (Society of Automotive Engineers) International, Formula SAE is a collegiate design competition in which students manage and finance a racing team. Teams develop a formula-style race car with the notion that they are engineering firms hired by a manufacturing company to produce 1,000 units. Throughout the course of one production year, each team designs, manufactures and races an open-wheeled prototype based on rules that foster both creativity and technical skill. A true-real world experience: Each team must manage vehicle research, design and manufacturing, as well as the finances behind its project.

The main Formula SAE event is held each May at Michigan International Speedway. In addition to the car's "on-track" performance, students must deliver a simulated business presentation—including the design presentation and cost analysis report—to venture capitalists considering an investment in the team's engineering firm. On-track evaluations include the car's acceleration, skid-pad, autocross,

endurance and fuel efficiency. A 22 km endurance race assesses the overall performance of each team's car.

**"I love the people I have met, the creativity that is fostered and the experience each year of building something out of nothing."**

—Albert Montemuro '15 ME  
team captain

Each year since its founding in 2008, the NovaRacing team has started at square one with the design of a new car (the previous model cannot be reused), which is completed in early fall. Manufacturing of the prototype begins in October, and the goal is to have the car completed by January in order to test and prepare for the race. Throughout the process, students experience design obstacles, tight deadlines, and the challenge of balancing the Formula SAE project with schoolwork and other student activities. Though faced with



Countless hours are spent working on the Formula SAE car in the CEER garage.

numerous difficulties, students agree that one of the biggest rewards lies in tackling these challenges.

The team, currently around 25 members, meets every Friday in the garage located in the basement of CEER where they discuss the schedule and progress of the car's frame, suspension,

wheel assembly, powertrain, composites and electrical systems. At least one member of the team can be found working on the car at any given time, even during weekends. They all share a passion for motor racing and for some, the Formula SAE team is the reason they chose to pursue their education at Villanova.

**f Visit the team's website, novafsa.com, or the Villanova FSAE Facebook page.**

### Formula SAE Sponsorship

While it is not judged as part of the competition, sponsorships also play a large role in the Formula SAE team's work. The car would not be possible without the individuals and companies who provide both funding and materials. In addition to the College of Engineering, some of the team's largest sponsors include Ford, McCarthy Tire and Automotive Center, Royal Purple and Bally-Ribbon Mills. For more information on sponsorships, please contact co-captain Kendrick van Doorn at kvando01@villanova.edu.

## NOVACANE TEACHES YOUNG LEARNERS THE IMPORTANCE OF SUSTAINABILITY

Villanova Community Action by New Engineers (NovaCANE), a student organization started more than five years ago, aims to increase middle school students' interest and abilities in the STEM subjects: Science, Technology, Engineering and Math. In keeping with this goal, as well as supporting the University's efforts toward sustainability, NovaCANE students and Dorothy Skaf, PhD, associate professor and chair of the Department of Chemical Engineering, have been "going green" with local students.

Each month, Dr. Skaf and volunteer engineering students visit Ss. Colman-John Neumann School in Bryn Mawr, Pa., to cover a wide range of topics, from recycling, green energy and water purification, to the chemistry of cooking, acids/bases reactions and creating polymers. The group assists about 25 seventh and eighth grade students with hands-on learning projects, and is there to answer questions and make the learning worthwhile and fun.

One activity NovaCANE presents involves sorting different kinds of plastics by their recycling code and discussing the composition of each type of plastic, as well

as the benefits of recycling them. This allows students to immediately apply what they have learned and make a difference. Dr. Skaf says: "The program is meant to encourage student curiosity regarding science and engineering, and to demonstrate the societal benefits that arise from these disciplines. An added benefit is for the seventh and eighth graders to interact with Villanova students as role models."

Another group of volunteer students, led by Samantha Cardenas '14 CEE, is teaching the same lessons to middle school students at St. Martin of Tours School in Philadelphia.



Middle school students in the NovaCANE program visit the College for hands-on engineering

## NOVANSBE INTRODUCES ENGINEERING TO LOCAL HIGH SCHOOL MINORITY STUDENTS



NovaNSBE students lead local high school youth in engineering projects.

With grants from Dow Chemical Company's Dow Promise program and the Harris Corporation Foundation, the Villanova University chapter of the National Society of Black Engineers (NovaNSBE) has developed and presented programming for its newly formed NSBE Jr. chapters at Harrington and Lower Merion high schools. At least twice a month—once at Villanova; once at the high schools—NovaNSBE members work with minority teens in the schools' extracurricular engineering clubs to introduce and encourage STEM fields as careers. At the same time, NovaNSBE members benefit from learning how to plan, organize and present engineering projects to high school students.

Working with its grant funding, NovaNSBE chose two specific engineering projects: an electric car and concrete-making, which will provide students with true engineering experiences that will last throughout the school year. In late April, at the Engineering Olympics, the high school students had the opportunity to race their cars and showcase their cement to an audience of fellow NSBE Jr. members, NovaNSBE students and NSBE professionals.

NovaNSBE currently has about 30 active members and is advised by Stephen Jones, PhD, Associate Dean of Students and Strategic Programs.

## INTERNATIONAL COLLABORATIVE LEARNING OFFERS BEST OF BOTH WORLDS

This past spring's issue of the VEU featured "Service Learning that Saves Lives," a look at the University's Nova Mobile Health system in Waslala, Nicaragua. In the process of establishing that program, project leader Pritpal Singh, PhD, professor and chair of Villanova's Department of Electrical and Computer Engineering (ECE), developed a partnership with faculty at UNI, the Universidad Nacional de Ingeniería (National Engineering University). While the initial goal was to engage UNI faculty and students in providing technological assistance to local Nicaraguan communities, Dr. Singh explains its evolution, "UNI Professor Maria Virginia Moncada and I recognized the possibility of developing a joint educational program to bring together students from both universities for a unique learning and entrepreneurial experience." With a grant awarded by the National Collegiate Inventors and Innovators Alliance (NCIIA), a two-course sequence was developed to teach Villanova and UNI students not only how to create new technologies, but also how to commercialize them.

In January 2014, as a prelude to the first course, Dr. Singh; Edmond J. Dougerty '69 EE, '86 MSCS, director of the Engineering Entrepreneurship program; and James Klinger, PhD, faculty director of Villanova's Center for Innovation, Creativity and Entrepreneurship, traveled to Nicaragua to deliver an Introduction to Entrepreneurship course to UNI

students in the joint program. "Entrepreneurship is a new concept for them," says Dr. Singh. "Their education is focused primarily on technical skills."

**"Face-to-face time is critical to project collaboration."**

—Pritpal Singh, PhD, professor, department chair and project leader

The first course—ECE 5900: Developing Technologies for Rural Nicaraguans—launched in spring 2014 with nine students from Villanova and 11 students from UNI. The stated goal of the course was to provide students with an in-depth ECE design experience by addressing real-life problems and proposing low-cost solutions for rural Nicaraguans. In the process, Villanova students learned about Nicaragua's culture, history and geography; and all students were taught entrepreneurship, case studies of rural technologies, the design process and project proposal development.

During spring break, four Villanova ECE students accompanied Dr. Singh to Nicaragua where they met their UNI classmates. The purpose of their visit was two-fold: 1) Identify potential opportunities to contribute to local development, and 2) Experience working on multidisciplinary and intercultural teams. While there, faculty and students from both



Villanova and UNI students gather for a group photo during their travels in Totogalpa, Nicaragua.

schools divided into three groups and traveled considerable distances to different destinations and project sites, including Waslala; Jinotega; and Villa el Carmen, site of the Nova Mobile Health expansion. After spending four days at their individual sites, the groups came together again for debriefing and a presentation of project ideas based on the needs of each location. "I was pleasantly surprised to learn the students had come up with about 30 different projects in the three broad categories of health, energy and water," says Dr. Singh.

Back at Villanova, the class narrowed those choices to the top four or five projects with which they will move forward in teams with the UNI

students. Dr. Singh explained the goals for the spring semester: "By the end of the school year, each team will have developed a proposal with a detailed project description, including functional specifications, timeline, budget and individual member assignments." For juniors in the course, the work will carry through into the following year, becoming their senior design project.

The fall 2014 course, now in development, is titled "Building Sustainable Business Models for Base-of-the-Pyramid Customers."

## CAMBODIA PROJECT TAKES VILLANOVA ENGINEERS TO FINALS OF NATIONAL DESIGN COMPETITION

BY JIN CHOI '14 CLAS

Former structural engineering capstone team members and 2013 graduates Fernando Rabell and Sean Muirhead, along with their then-teammates, current Civil Engineering graduate students Joaquin Iglesias '13, Patrick McAlpine '13 and James Matzke '13, were selected as one of three finalist teams in the 2014 SEI (Structural Engineering Institute) Student Structural Design Competition. Their winning design was the basis of a newly constructed preschool in Cambodia that integrates the need for early education, and health and hygiene into the building design.

The project developed during summer 2012 when Rabell traveled to Cambodia



The design of this under construction preschool in Cambodia took Villanova's Engineering team to the SEI Student Structural Design Competition finals.



A winning team: Faculty Advisor Zeyn Uzman with Civil Engineering students Sean Muirhead, James Matzke, Fernando Rabell, Joaquin Iglesias and Patrick McAlpine.

with fellow engineering students and Director of Engineering Service Learning Jordan Ermilio '98 ME, '06 MSWRE. Much of their time on that trip was spent at the Caramanico School in Trapeang Chres, Ratanakiri, Cambodia, which was built by Anne and Thomas Caramanico PE, '71 CE, '83 MSCE. Inspired by his experience, Rabell adopted the community's proposal for a preschool building as the focus of his senior capstone and invited Iglesias, Matzke, McAlpine and Muirhead to join him on the project.

Working closely with the Caramanico Foundation, the team researched local design requirements in order to create

an approved design for the school. In December 2013, Iglesias, McAlpine and Ermilio returned to Cambodia to meet with the in-country contractor, zone the site and break ground. The new building will provide a safe and healthy learning environment for more than 80 children.

The Structural Engineering team was recognized at the SEI/American Society of Civil Engineers Awards Lunch at Structures Congress in Boston, Mass., in April, where they competed for first place by presenting their project before a panel of judges. The Villanova team finished in second place, earning them a \$500 award.

## A PARENT'S PERSPECTIVE

"I am thoroughly impressed with the engineering students' deep technical knowledge and the compassion they have for others. Villanova is clearly on the right track in educating brilliant students who understand that they are part of a global community. They have the right attitude not only to have successful careers, but also to be key contributors to society."

—Paul Power '82 VSB, father of Hannah Power '16 CE



## BRINGING YEAR-ROUND WATER TO CENTRAL PANAMA

### Father Wally and the College of Engineering

In the 1980s, Father Wally Kasuboski accepted a position as priest in the tiny village of Wacuco, Alto Bayano in central Panama. In a dense jungle region with little infrastructure, he organized a construction company with a spiritual mission that has created jobs, built churches, maintained roads and designed water systems. In 1991, when new Villanova engineering graduate Chris McCartin decided he “wanted to help people,” he was encouraged to join Father Wally and his Bayano Mission for a year. That was the start of a relationship with the College’s Department of Civil and Environmental Engineering that has lasted more than two decades.

### Water Problems

Home to roughly 8,000 people and growing rapidly, the Chepo/Bayano region of Panama, about two hours from Panama City, faces numerous geographic and environmental challenges. None is more critical, however, than the need for access to clean water. High salinity levels in the region’s soil have left most ground water unfit to drink, and during the dry season, life nearly comes to a halt.

Despite a rainy season that lasts from August until early December and generates 71 inches of water each year (as compared with rainfall of about 41 inches in the Philadelphia region), the village of Wacuco and nearby town of Torti have no reliable source of continuous clean water. The dry season

impacts crops and livestock, affecting the villagers’ livelihoods, and many children often are too sick to come to school as the result of drinking unsanitary water.

“Villagers’ faces register complete disbelief when I tell them that it’s possible to have freshwater all year round,” says Assistant Professor Frank Falcone, AP, PE, ’70 CE, ’73 MSCE, a regular service-trip leader to the region. “They assume I must be crazy to suggest such a thing.” But that’s exactly what he, his fellow faculty and Villanova engineering students are prepared to provide.

Though the region has one rudimentary dam, a water resources master plan (WRMP) developed this past year by William Angiolillo ’12 CE, ’13 MSCE, with input from Ian Dardani ’13 ME, called for a second dam to meet the region’s demand. A potential location was identified on a map, but during the 2014 spring break trip, the Villanova team sent to evaluate it found the proposed site to be unsuitable from a geotechnical and accessibility standpoint. Civil and Environmental Engineering Professor Andrea Welker, PhD, and her colleague, Associate Professor Bridget Wadzuk, PhD, ’00 CE, led a group of juniors and seniors involved in the project. “The students now are tasked with enhancing the existing dam, but we expect that one improved structure will provide enough clean water for the region for the next decade, even with accounting for population growth,” says Dr. Welker.

### Truly Experiential Learning Courses

Drs. Welker and Wadzuk are advising a capstone design course in Geotechnical and Water Resources Engineering, a class devoted to implementing the WRMP (See the related article, “Innovative Partnerships Enhance the Learning Experience,” on Page 10). In addition to working on the existing dam, the students are designing foundations and providing flood information to those students in the Structural Design Capstone course who are designing a bridge downstream of the dam to enable access during the wet season.

Along with the Civil Engineering courses dedicated to these projects, students in the interdisciplinary course GEV 3000: International Technology and Sustainability also are working with Father Wally in Panama. In addition to the work being done by engineering students, College of Nursing students are focused on the health-related aspects of water resources, Villanova School of Business students are helping Father Wally with the management side of a water distribution network, and Liberal Arts and Sciences majors are addressing the geographical and GIS elements of the WRMP.

Altogether, the 2014 spring break trip included six faculty members and 28 students representing each of Villanova’s undergraduate colleges, making it the largest service trip to Panama in the University’s history.



Samples and measurements are being taken at the combination box at the upstream end of the Cañazas water supply system.

## EYEWITNESS TO A MIRACLE

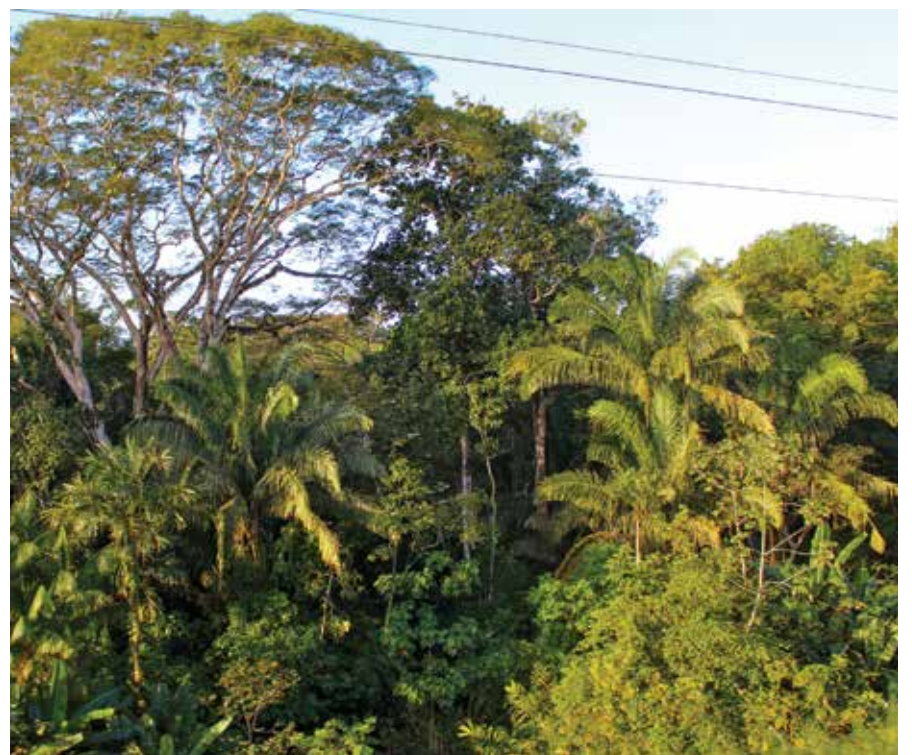
If you ask Frank Falcone, assistant professor of Civil and Environmental Engineering, he’ll tell you that God’s miracles have been at work in Panama. “For many years, the only freshwater well in central Panama existed on Father Wally Kasuboski’s property, a miraculous response to prayer,” says Falcone. In March 2013, during a particularly extreme dry season in Torti, Panama, Falcone saw for himself a second miracle:

“The residents of the town were suffering from a desperate shortage of clean water, to which they responded with strong and continuous prayer. When our team arrived for Villanova’s annual spring break trip, Father Wally expressed his concern as he told me about their immediate need.

On the first Sunday of that week, a woman from town told Father Wally that she saw a trickle of water emerging from the side of a stream bank along a river in Torti. Personally, I had my doubts as to the likelihood of this trickle amounting to much, given the river’s very low flow rate. And, even if the flow rate had been higher, there was the issue of contamination that left the water unsafe for drinking. Still, Father Wally and I, along with one of his workers, visited the site and with a pick and shovel began to unearth an unexpected and incredible water source.

Throughout that week, students from Villanova worked alongside Father Wally and his crew to develop that water source, and design a pumping and piping system to transport the water to an empty tank in Torti. The water was pure, fresh and clean, and flowing at the continuous rate of approximately 110 gallons per minute—enough water for the entire population of Torti—a miracle indeed, and a testimony to answered prayer.

Father Wally quoted Matthew 25: “Lord, when did we see you thirsty and give you something to drink?” And the King replied, “Truly I tell you, whatever you did for one of the least of these brothers and sisters of mine, you did for me.” Father Wally reminded us that we were ‘doing God’s work’ there in the jungle—truly changing lives.”



The dense jungle environment makes developing infrastructure, including water supply systems, difficult in central Panama.

## INNOVATIVE PARTNERSHIPS ENHANCE THE LEARNING EXPERIENCE

For the spring semester, Associate Professor Bridget Wadzuk, PhD, '00 CE and Professor Andrea Welker, PhD, teamed up with professional engineers from Schnabel Engineering, David B. Campbell CE '76, MSCE '81, PE, D.WRE, and Brian Crookston, PhD, PE, to deliver an innovative capstone design course in Geotechnical and Water Resources Engineering. The goal of the course was to design a second dam and foundations for a bridge in Panama,

working with Father Wally Kasuboski (see “Bringing Year-Round Water to Central Panama” on Page 9).

Schnabel Engineering, a firm recognized for its expertise in geotechnical, tunnel and dam engineering, first became involved with a Civil and Environmental Engineering capstone project two years ago, and just as they did then, the engineers came to every class (three hours each week). Dr. Crookston

and Campbell even made themselves accessible to students via email. Given the challenges of the projects at hand, students both enjoyed and benefitted from working with these experienced professionals.

Dr. Welker notes that, in addition to their insight and guidance, having a professional partner for a capstone project provides invaluable access to real-world figures and data that would otherwise take years to complete (including boring logs, conceptual drawings, environmental assessments, etc.). She points out, “The class is only 14-weeks long, which doesn’t allow us the time to gather all the necessary data, but it’s important for the students to work with real drawings and figures, to face the constraints of the real world.”

Drs. Welker and Wadzuk, and Civil Engineering graduate student Amanda Hess, along with a group of nine undergraduates, visited Panama during spring break to locate the proposed site of the second dam. After seeing the site firsthand, the Villanova team determined that, from a geotechnical

standpoint, a second dam could not be built in that location. The students now are tasked with enhancing the existing dam, and their partners from Schnabel Engineering will be right alongside them, providing much needed guidance and expertise.



“Villanova gave me the tools for building a successful career, and I have long

believed in giving back: both to the school and to the students. Villanova engineers are well-educated in engineering theory and its applications, but just as importantly, Villanova builds their character.”

—Dave Campbell '76 CE, '81 MSCE, P.E. D.WRE, director of Dam Engineering and winner of the inaugural American Academy of Water Resource Engineers, Practitioner of the Year Award (2014)



Students take measurements of the region’s existing dam area, which they are proposing to enhance as part of their capstone project.



## VILLANOVA BUILDS STRATEGIC PARTNERSHIPS IN PANAMA

In January 2014, a delegation of Villanova University faculty, staff and alumni traveled to Panama City with the Villanova School of Business Center for Global Leadership’s “Professional Development in International Business” program.

Among them were Frank Falcone, assistant professor of Civil and Environmental Engineering, and Dr. Robert Traver, professor and director of the Villanova Center for the Advancement of Sustainability in Engineering (VCASE). VCASE was one of the program sponsors.

During their visit, Falcone and Dr. Traver spent time with leaders from the City of Knowledge (COK), an enterprise and innovation zone for those interested in establishing schools or businesses in central Panama. The COK is in need of a stormwater management plan, a project Dr. Traver will undertake with students as part of the spring 2015 Water Resources capstone project.

Falcone and Dr. Traver also spent time with the Panama Canal Authority (ACP), which is undertaking an enormous expansion project that will effectively double the canal’s throughput capacity. The rapid changes occurring in Panama City make it an

ideal time for Villanova students to pursue internships with ACP through a program Falcone and ACP’s then-CEO Alberto Aleman established in 2013.

The Universidad Católica Santa María La Antigua (USMA) in Panama City represents the most recent opportunity for collaboration. In addition to working with Villanova engineers on Panamanian projects, USMA particularly is interested in establishing a nursing school, and therefore, hopes to establish a relationship with Villanova’s College of Nursing.

Villanova University engineers are involved in multiple efforts in Panama, including service, academic partnerships, internships and capstone design projects.

While on sabbatical during the spring 2014 semester, Dr. Traver made several visits to Panama to meet with USMA, COK and local engineering firms. The College, and the University as a whole, are looking forward a long-term relationship with this rapidly growing Central American country.



## LESSONS LEARNED AT VILLANOVA TAKE ALUMNI TO EAST AFRICA

Before coming to Villanova University in 1989, Dan Kane '93 CE had no inclination to travel outside the United States. “I told friends I would visit another country only after seeing all 50 states,” he says. Despite not yet having traveled west of the Mississippi, in his junior year, a service break trip took Kane to Wacuco, Panama, and his worldview changed. The experience opened his eyes to the needs of others, an awakening that would inspire a lifelong journey of faith and service, which he shares with his wife and Civil Engineering classmate, Kim Binder Kane '93.

After spending most of the past 20 years in the Washington, D.C. area with Dan

working as a civil engineer, the Kanes made the life-changing decision to move to Uganda with their three children. In August 2014, Dan will begin work with Engineering Ministries International (eMi) to provide organizations helping the poor in East Africa with technical expertise in the water, sanitation and hygiene sectors.

“The University’s commitment to service and social justice has been a huge influence on our lives,” say the Kanes. Dan summarizes his feelings with the Albert Schweitzer quote, “I don’t know what your destiny will be, but one thing I know: The only ones among you who will be really happy are those who will have sought and found how to serve.”



Dan Kane '93 CE and Kim Binder Kane '93 CE are moving with their children to Uganda, where Dan will work with Engineering Ministries International.

## APPLYING THEORY TO REAL LIFE—GARRARD ESPOSITO '06 ME

BY BRENDA LANGE

Learning theory in his engineering courses was fine for Garrard Esposito '06 ME, as far as it went. However, it was the on-the-job experience he gained through two internships that gave him the insights he needed to decide the course of his career.

Getting his start with a small, general contractor in Delaware after his sophomore year served to whet his appetite for construction work, specifically, working as an on-site engineer. So when Professor Jerry Jones suggested he apply for an internship/scholarship with Conti Enterprises, a large contractor specializing in large-scale civil engineering projects, Esposito jumped at the chance. “I was assigned to do work on the Weehawken ferry terminal for the New York waterway,” Esposito remembers. “The project manager was a Villanova alum. It was a great project and got me hooked on the world of construction and applied engineering.”

**“The internship showed me what I would do on a professional level and how I could apply the theories I was learning to real life—something Villanova does well.”**

—Garrard Esposito '06 ME



Garrard Esposito '06 ME with his parents Curt Esposito and Mary Lyde Foster Esposito on graduation day.

As he planned out his final two years at the College of Engineering, Esposito scheduled electives that tied in with structures and other aspects of structural engineering. He also used his senior project—Water for Waslala—as additional on-site experience. There, his assignment was to collect data to configure a proper design for a solar-powered water pump to help those in outlying villages get potable water. “This was a life-defining experience,” he says. “We drafted the design when we returned to campus. It was fun to build it and also to help people.”

Interning for Conti Enterprises ultimately helped Esposito get his first job after



Garrard Esposito '06 and his wife, Christine, in Sun Valley, Idaho, where they traveled to attend the wedding of two Villanova classmates, Rich '06 VSB and Jessica DeFelice '06 CLAS.

graduation. Although he was offered a job with Conti, he went instead with Turner Construction, the largest general contractor in the United States. With Turner, he moved around the country, eventually marrying a hometown girl and settling in Austin, Texas. Today, he works as a systems account manager at Trane Commercial Systems. His future plans continue along the applied engineering lines, specifically, designing more energy-efficient buildings—making them more intelligent through systems technology.

Esposito says he tells everyone and anyone about Villanova, and how it shaped and launched his career. “The personal nature of the engineering program is why I am where I am in life today,” he says. “I credit Villanova completely—the multi-faceted curriculum, the religion program and the collective opportunity you find there. It’s a wonderful chance to be together with creative people that you may never quite find again.”

*Garrard Esposito was featured in “Conti Enterprises Rewards Three Engineering Students,” in the Spring 2005 issue of Villanova Magazine.*

## LIVING AN EXTRAORDINARY LIFE—SHERRIE-ANN MARTIN '09 ChE

BY BRENDA LANGE

The transition from student to career woman was nearly seamless for Sherrie-Ann Martin '09 ChE. Although it took her about five months to find a position that was right for her, she landed somewhere many fellow engineers might covet. Beginning at Merck's Lansdale facility the October after graduation, her original role as biological sterile validation engineer has expanded. Today, as a technical operations engineer, she supports the formulation and filling of lyophilized vaccines manufactured on-site, monitoring process control, and facilitating changes to improve process robustness and efficiency. Martin's job requires a lot of technical writing, as well as substantial time doing fieldwork. “This mix allows me to work in various environments, so my days are never mundane. I live out my two passions—writing and learning more about the process through field experience,” Martin says.



Today, Sherrie-Ann Martin is a technical operations engineer for Merck in Lansdale, Pa.

Just about five years after Martin gave the student speech at University Commencement, she can clearly see how her Villanova experience, and specifically, her time spent in the College of Engineering, fine-tuned her sensibilities, clarified her values and goals, and directed her to where she is now. Martin laughs when reminded of some of the phrases in her speech. One especially relates to her position at Merck and the way she approaches her career and her life. “How will we differentiate ourselves to our communities, countries and our world?” she asked her classmates in 2009. “Are we willing to just blend in? Are we comfortable settling with being ordinary? I dare you all today to be on the offensive as you determine in every core of your being to allow this first step to help facilitate living dangerously extraordinary lives.”

Martin, who is currently a graduate student in Chemical Engineering at Villanova, differentiates herself on a daily basis. She is active in her church and Bible study group; volunteers with Safe Harbor and the Salvation Army; and treasures what she calls the “closest thing to my heart,” a 13-year old Jamaican girl named Timeca whom she met on a mission trip to that country three years ago. She has visited the orphan twice since that first visit, and cherishes their friendship. Martin models positivity and individuality to Timeca through monthly letters. And she would give the same advice to



Sherrie-Ann Martin '09 ChE spent valuable time in the lab as an undergraduate.

today's undergraduates. “Don't conform. You don't need to be who everyone else is. Step back; know who you are; and then you can be yourself and share those qualities, which make you unique. Live out your purpose and passions. Be sensitive to that, all the time, in everything you do.” She also would tell today's students to enjoy the process; absorb everything they can from all Villanova has to offer. “The liberal arts will make you a more diverse engineer. Explore other interests and don't get overwhelmed.”

Martin also remembers learning to respect and value other perspectives at Villanova. The “thought diversity” she discussed in her commencement speech

was immediately apparent in her first days at Merck. “They were launching a new ‘inclusive behaviors’ program,” she says. “They recognized that there needs to be a diverse group behind key decision-making in order to develop the most robust plan of action. This aligned with what I had learned at Villanova, where there was such an emphasis on ensuring diverse perspectives, which allows for more educated decisions. It was exciting to see that play out on the job.”

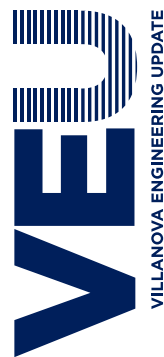
*“Let Us Be Fearless: Student Commencement Speaker Sherrie-Ann Martin” appeared in the Summer 2009 issue of Villanova Magazine.*

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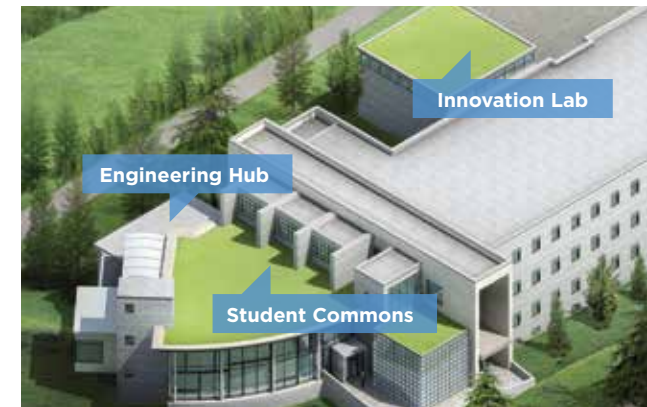
VILLANOVA ENGINEERING UPDATE

SPRING 2014

VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING

## EXPANDING THE COLLEGE OF ENGINEERING A \$2.5 million commitment from John G. Drosdick '65 COE will support an Engineering Innovation Lab

Villanova University has received a \$2.5 million commitment from alumnus John “Jack” G. Drosdick '65 COE—retired chief executive officer and president of Sunoco, Inc.—as part of the University’s \$600 million capital campaign, For the Greater Great®: The Villanova Campaign to Ignite Change. Designated for the College of Engineering, Drosdick’s gift will fund a new Engineering Innovation Lab in the Center for Engineering Education and Research (CEER).



Villanova launched the public phase of its Campaign in October 2013, and to date has raised \$317 million towards its \$600 million goal. The most ambitious in the University’s 170-year history, Villanova’s Campaign is aimed at cultivating academic innovation across its schools and colleges, investing in recruiting and retaining the finest teacher-scholars, dramatically enhancing financial aid and student opportunities, and continuing to build a premier living-learning environment on the University’s 260-acre campus.

The Engineering Innovation Lab, part of a planned CEER expansion, will enhance the College’s ability to provide increased student opportunities for hands-on, experiential and collaborative learning in a space that supports scalable real-world engineering projects. Gary A. Gabriele, PhD, Drosdick Endowed Dean, College of Engineering, explains one of the goals of this expansion: “This space is an important cornerstone to our strategic plan for providing one of the most innovative engineering education experiences in the country.”

### Other elements of the CEER expansion include:

- Student Learning Commons—To support and encourage collaboration, teamwork and community, the Commons will provide space for multidisciplinary team projects, as well as a place for seminars, lectures and events.
- Engineering Hub—This centralized location will provide a “home” for the College, including a Dean’s suite to accommodate the administration and staff; multimedia conference room for meetings; and a reception area to welcome prospective students, corporate visitors and more. Most importantly, the Hub will allow reclamation of critically-needed laboratory space by creating new office space for administrative staff currently occupying laboratories in CEER.



**John “Jack” G. Drosdick** spent 12 years with Sunoco, Inc. before retiring as chief executive officer and president in 2008. He began his 15-year career with Exxon in 1968, and later served as president of Tosco and Ultramar corporations. A member of the Steering Committee for Villanova’s

last campaign, Transforming Minds and Hearts, Drosdick served as chair of Villanova University’s Board of Trustees from 2001–08. In 2008, his \$2.5 million gift endowed the position of dean of the College of Engineering.

Mr. Drosdick is a native of West Hazelton, Pa., and currently resides in Bryn Mawr, Pa. After earning his BS in Chemical Engineering from Villanova, he received a master’s degree in chemical engineering from the University of Massachusetts in 1968.

To learn more about the CEER Expansion and the University Campaign, contact Cynthia Rutenbar, Director of Development, College of Engineering at [cynthia.rutenbar@villanova.edu](mailto:cynthia.rutenbar@villanova.edu) or 610-519-6973.