

Villanova

COLLEGE OF ENGINEERING

ANNUAL REVIEW 2012-2013



VILLANOVA
UNIVERSITY
College of Engineering





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Message From the Dean

2012–2013 was another outstanding academic year for Villanova University College of Engineering. We achieved progress toward the objectives outlined in our strategic plan—strengthening the undergraduate curriculum, enrolling increasing numbers of diverse and high-achieving students, and growing our graduate programs. The College of Engineering has succeeded in communicating its distinctive identity through interviews with dozens of local, regional and national publications, and media outlets. Just this past spring, our commitment to women in engineering was recognized by The Philadelphia Inquirer, Philadelphia Business Journal and KYW News Radio.

College of Engineering faculty are taking center stage at industry conferences, serving on the boards of engineering journals and associations, leading government committees, receiving prestigious teaching awards, earning highly competitive research grants and conducting cutting-edge research.

Our students never fail to impress—earning competitive national scholarships and fellowships, conducting exceptional research, publishing papers, winning design and entrepreneurial competitions, and serving others across town and around the world.

These accomplishments exemplify what makes Villanova Engineers unique and important contributors to society. In addition to the academic excellence and technical skills that every university expects of its students, Villanovans distinguish themselves as:

- Ethical leaders
- Rooted in Augustinian values
- Change-makers
- Problem-solvers
- Communicators
- Innovators
- Whole-brain thinkers
- Committed to the global community

In the article that follows, the College's new Assistant Dean of External Relations, Keith Argue, will invite you to engage in the life of the College, both on a personal and professional level. During the coming months, I encourage you to consider the ways in which you can ignite change at Nova by mentoring students, offering internships and employment, sponsoring research opportunities, and contributing to the College's physical needs and areas of growth. Each and every day, our students, faculty and staff demonstrate why Villanova University College of Engineering is worthy of your support. We hope you will accept the invitation to engage with us.

Sincerely,

A handwritten signature in black ink, reading "Gary A. Gabriele". The signature is fluid and cursive, with a prominent "G" and "A".

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



Hands-on experience in the Structural Engineering Teaching and Research Lab gives Villanova students like David Reichmann '12 CE, '16 MSCE a practical edge in the workplace.

ENGINEERING ALUMNI ANSWER THE INVITATION TO ENGAGE

Throughout the years, the College of Engineering's corporate partners have made invaluable contributions to the education and training of our engineering students. Villanova University alumni have been instrumental in establishing and sustaining the College's most effective and dynamic relationships with industry. While it's clear that the College has benefited from its myriad engagements with industry, what is the return on investment for our corporate partners? To answer that question, we recently interviewed Villanova engineers at four companies to learn how their respective employers have benefited from their relationships with the College. By participating in the relationship-building process, these alumni advocates have not only helped students at their alma mater to thrive, but brought real and demonstrable value to their companies, namely in the form of new engineering talent.



“There are innumerable ways to begin a mutually beneficial relationship with the College of Engineering.”

Keith Argue, Assistant Dean of External Relations, College of Engineering

After reading this article, our hope is that you, too, will answer the call to engage and encourage your company to actively participate in the life of Villanova University College of Engineering. From sponsoring internships, research and senior design projects, to mentoring student groups, serving as guest lecturers and competition judges to collaborating on community service and STEM outreach programs, there are innumerable ways to begin a mutually beneficial relationship with the College of Engineering.



Arthur Teeter '14 EE and Daniel Nieman '14 EE review experiment results.





Joe Lamack '87 ChE
Air Products

Participants:

Air Products supplies a unique portfolio of atmospheric gases, process and specialty gases, performance materials, equipment and technologies to customers across a wide range of industries. We spoke with Carbon Dioxide General Manager **Joe Lamack '87 ChE**, and Global Project Development Manager **Bob Gordon '80 ChE**. Air Products' relationship with the College of Engineering began in the late 1950s.

AECOM provides technical and management support services to a broad range of international markets, including transportation, facilities, environmental, energy, water and government to create, enhance and sustain the world's built, natural and social environments. We spoke with **David Didier '92 CE, '10 MBA**, vice president, Keystone District transportation manager. AECOM's relationship with the College began about 10 years ago, and solidified in 2010 with the execution of a comprehensive four-year agreement with the Department of Civil and Environmental Engineering.

Boeing is the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems. We spoke with **Coleen Burke-Finney '90 ME, '99 MBA**, director, Strategy and Business Capture, Phantom Works, and executive contact for the Boeing-Villanova relationship; and **Mark Muller '90 ME, '98 MSME**, manager, Operations Analysis, Boeing Vertical Lift Division. Boeing's relationship with Villanova is more than 20 years old.

RT Logic, a Kratos Company, is the leading supplier of innovative signal processing systems providing field-proven capabilities for communication with satellites, spacecraft, missiles, and airborne platforms in the defense and aerospace communities, including factory test, flight, ground data networking and RF links. We spoke with President **John Monahan '86 EE**. RT Logic's relationship with the College began in 2012.

Q: We all recognize that Villanova-trained engineers are unique, but what is it about their education and training that truly sets them apart?

Air Products: Villanova's emphasis on the practical aspects of an engineering education fits well with Air Products' results-oriented culture. Many Villanova alumni we hire find the transition to be a comfortable one.

Boeing: Based upon my own work experience, the curriculum is more strongly aligned with my expectations for career growth and is a better match for the demands of the workplace. The Dean and the department chairs are open to corporate



“The MDL experience is completely in line with what we know creates the most successful professionals: Those who've had project-based experiences through the whole product lifecycle.”

**RT Logic President
John Monahan '86 EE**

engagement in curriculum development. There's a real blending of the curriculum to meet the needs of industry, while at the same time ensuring the highest academic standards.

RT Logic: From our perspective, the most successful engineers coming out of college are those who've had team-based, real-world project experiences that help reinforce class-learned theory. These engineers (with project experience) start at a level two-to-five years beyond their peers without this experience. I'm delighted and impressed that the College is providing this real-world experience to students through the Multidisciplinary Design Lab (MDL). The Nova program is very mature.

Q: Tell us more about your experiences working with students through the Multidisciplinary Design Lab. Why is this activity so appealing to industry?

RT Logic: The MDL experience is completely in line with what we know creates the most successful professionals: Those who've had project-based experiences through the whole product lifecycle—from visioning to prototyping to testing and retesting, through producing a finished product and interacting with customers. They also have to manage a budget and meet timelines. It's beyond getting your hands dirty in the lab; it's having a solid grasp of the fundamentals and applying them to solve real-world problems. The MDL experience is key and sets Nova engineers apart. The MDL really hit home for us.



Mark Muller '90 ME
'98 MSME, Boeing

Boeing: We sponsor a recurring senior design project through the MDL on autonomous vehicles. Boeing has a strong systems engineering focus, and it is in our best interest to promote that kind of thinking in future engineers, so the content of the MDL projects is very much aligned with the talent pipeline.

Q: Why is it important to your company to bring in undergraduate engineers as summer interns?

Air Products: The internship program gives Air Products more insight into a candidate's technical and personal skills, enabling us to make better hiring decisions.

RT Logic: From a talent pipeline perspective, the MDL-internship combination is very important to us. The students get to know our company and our culture, and get hands-on experience. The two interns we had this summer were fantastic. Their technical competence was exceptional; they had a great attitude and possessed solid interpersonal skills to interact effectively with our team. These students were willing to do anything—from customer support to firmware modifications. They were incredible team players. The interns performed at the level of an employee who's been with our company for two or more years. During the course of three months, the interns made demonstrable, value-added contributions to our company.

Q: How would you describe the value added by your graduate research assistant?

AECOM: The graduate research assistant position is the largest component of our alliance agreement with the College.

The first student we had in this position spent his summer months at AECOM's Philadelphia office conducting research on unreinforced deck designs for his thesis.

After completing this project, he presented his report to our clients in the transportation sector, including the Pa. Department of Transportation. His presentation allowed us to showcase the partnership between Villanova and AECOM, and we later hired that student as a full-time employee.

The project and partnership was a win-win from our perspective. We shed light on some novel technology and showed that both organizations—AECOM and Villanova University—are working at the cutting-edge. Even if none of our clients chooses to pursue unreinforced decks in their bridge projects, they'll remember that AECOM is an innovative firm that is willing to pursue new ideas. By collaborating with university partners, we can tackle any unique engineering challenge.



“By collaborating with university partners, we can tackle any unique engineering challenge.”

**AECOM Vice President
David Didier '92 CE, '10 MBA**

Q: Your company contributes both time and resources to further enhance the education of our undergraduates. Can you describe the return on investment your company receives from its various engagements with the College?

Air Products: We sponsor senior projects and send guest lecturers, which increases Air Products' visibility among the students and helps with our recruiting efforts. The engineers and commercial employees from Air Products who participate in these activities also benefit from the interaction with the students. Our Villanova alumni employees are energized by the students' enthusiasm, intelligence and motivation, and enjoy staying connected with their alma mater.

AECOM: The partnership has benefited our recruiting activities locally. We work with Dr. Dave Dinehart (professor and assistant chair, Department of Civil and Environmental Engineering) to identify top job candidates at the undergraduate and graduate level. I regularly get calls from AECOM offices across the country asking how we've been so successful working with the College. I tell them it's a comprehensive relationship that goes beyond recruiting or a single research project. We have lots of touch points with Villanova and a shared agreement to work closely as partners toward common goals.

BOEING: We participate in the University's career fair and resume reviews, and provide support for student clubs and scholarships. We value the professional development speaking sessions that help students better understand our career path and the nature of our industry. We also give regular tours of our facilities to show students the practical applications of engineering, broken down by discipline, like manufacturing, aerospace and simulation labs. The relationship has been a win-win in more areas than just hiring talent. I'd recommend to other companies that you don't just swoop in at the end of their four years to hire them. You need to be involved in numerous areas to truly build a strong talent pipeline.

Q: Closing remarks—how would you summarize your company’s relationship with the College?

Air Products: The opportunities for engagement between Air Products and Villanova—such as internships, student mentoring, guest lecturers—are mutually beneficial on many levels. Villanova and Air Products share a similar culture and values. Villanova engineers are the whole package: technically sound, superior communicators, good team players, strong leaders and passionate about giving back to their communities.

AECOM: We are in the process of renewing our four-year agreement with the Civil and Environmental Engineering Department, which is a strong sign of the value we perceive. It’s really been a phenomenal relationship; nothing but a win-win.

RT Logic: I’ve appreciated reconnecting with the College after all these years, and I’m looking forward to continuing to grow this partnership. The two interns we had this past summer confirm that the College’s curriculum and programs, specifically the MDL, have matured.

Boeing: Villanova University College of Engineering consistently produces what Boeing looks for in an engineer: solid understanding of fundamentals that can be applied at the systems level, team-based learning experiences, and an eagerness to contribute and volunteer—this really speaks to their graduates’ great leadership potential.

From the Students’ Perspective

The students who have experienced what these companies label a “win-win” proposition agree with that assessment. **Christopher Rapone ’10 CE, ’12 MSCE**, the graduate student AECOM mentioned, believes he derived “numerous benefits” from working on a program to develop bridge decks that were built without steel reinforcement.

“I took classes that would help me in my career while conducting a large-scale research project that was directly related to the field I wished to enter after school,” Rapone explains. “The project allowed me to gain practical work experience, the same way an entry level engineer would and helped me cultivate working relationships with professionals in my field.” Rapone’s experience proved that his career choice was the right one for him, and led to a full-time position with AECOM.

Electrical Engineering seniors **Kelly Modrick** and **Daniel Nieman** completed summer internships at RT Logic in 2013 as part of their MDL project. They, along with team member **Gregory Mankes ’14 EE** will complete their company-sponsored MDL project—adding AM/AM and AM/PM enhancements to RT Logic’s channel simulator—in the spring of 2014.

“My experience working with RT Logic on my senior project and also as an intern in their Colorado Springs office definitely added to my educational experience,” says Kelly. “I have been able to make the connection between the communications theory I learned in class with its real-world applications. The opportunity has led me to consider working in the satellite communications sector upon graduation.”

Join Us

If your company is interested in learning more about the opportunities to engage with Villanova University College of Engineering, contact Assistant Dean of External Relations, Keith Argue at 610-519-5024 or Keith.Argue@Villanova.edu.



“I’d recommend to other companies that you don’t just swoop in at the end of the students’ four years to hire them. You need to be involved in numerous areas to truly build a strong talent pipeline.”

Coleen Burke-Finney ’90 ME, ’99 MBA, director, Strategy and Business Capture, Phantom Works, Boeing

Chemical Engineering

At a Glance

Department Chair:
Dr. Dorothy Skaf

Undergraduate enrollment: 211

Percentage female: 42 percent

Percent of graduates
earning a minor: 60.6 percent

Number of current graduate
students: MS: 35, PhD: 4



Associate Professor William Kelly, PhD, advises Lauren Woll '14 ChE on how to inoculate a 20-liter bioreactor with antibody-producing mammalian cells.

STUDENT AWARDS AND RECOGNITION

Brian Delancy '15, Joseph Reckamp '14 and Kevin Splaine '13 received Outstanding Student Awards from the American Institute of Chemical Engineers (AIChE) Delaware Valley section.

IN THE CLASSROOM

A Systems Biology graduate course was taught for the first time in fall 2012.

The Chemical Engineering Department is offering a new master's degree program in Biochemical Engineering, led by **Dr. William Kelly**, associate professor, and co-chaired by **Dr. Noelle Comolli**, assistant professor.

Faculty are incorporating engineering tools such as MATLAB, Aspen and Excel's statistical add-ins to prepare students for current engineering work environments.

CHANGING FACES

Dr. Randy Weinstein, professor and department chair, was promoted to the position of associate dean for academic affairs for the College of Engineering.

Dr. Dorothy Skaf, associate professor, completed the remainder of Dr. Weinstein's term as chair.



Assistant Professor
Jacob Elmer, PhD



Assistant Professor
Rees Rankin, PhD

Drs. Jacob Elmer and Rees Rankin have joined the Chemical Engineering Department. Dr. Elmer earned his PhD from Ohio State University. His main teaching and research area is bioengineering with a focus on protein engineering. Dr. Rankin received his PhD from Carnegie Mellon University. He will support the department's energy research through fundamental calculations regarding catalysis and surface species.

In spring 2013, the new position of research associate professor was formally approved for **Dr. Charles Coe**, whose primary focus is on energy-related research.

Professor **Dr. Donald Joye** retired in December 2012 after 32 years with the College of Engineering. He most recently taught graduate courses in polymer science, separations and heat transfer. He led the senior chemical engineering lab, directed freshman in the electric car project, and even taught an Honors course on the music and plays of Gilbert and Sullivan.

PUBLICATIONS AND PRESENTATIONS

For more, see Books, Boards and Awards at www.villanova.edu/media.

Dr. Justinus Satrio, assistant professor, gave two invited lectures in Nicaragua.

Drs. William Kelly, Assistant Professor **Zuyi 'Jacky' Huang** and **Gerard F. 'Jerry' Jones**, senior associate dean for Graduate Studies and Research contributed to a June 2013 article in *Biotechnology and Bioprocess*.



Assistant Professor Noelle Comolli, PhD, and Joseph Brady '14 ChE analyze results from a glucose assay.



Frank Insera '14 ChE and Assistant Professor Michael A. Smith, PhD, discuss appropriate laboratory technique for nitrogen adsorption analysis.

RESEARCH INITIATIVES

New Treatment for Severe Asthma

With a focus on biomaterials for drug delivery applications, **Dr. Noelle Comolli's** goal is to design polymer systems that target drugs to a certain area of the body (i.e., lungs, tumor site) or to control their release time so that one dosage can have a prolonged effect. She currently is working to develop multifunctional nanoparticles that can target inflamed cells in the lungs of severe asthmatics. The primary objective is to formulate combinations of vitamin D3 and albuterol in nanoparticles that will provide a targeted, controlled release of these drugs to inflamed lung cells. The proposed nanoparticle will be made from a biodegradable polymeric micelle with vitamin D3 as the encapsulated drug. Attached to the outside of the nanoparticles, the albuterol will serve as the targeting mechanism. Once inside the cell, the polymer nanoparticle will degrade over time allowing the controlled release of vitamin D3. Dr. Comolli believes that the nanoparticles, if aerosolized within a regular nebulizer or metered-dose inhaler, could provide a targeted treatment for severe asthmatics in a patient friendly device.

Developing and Improving Catalysts for Alternative Energy Applications

Assistant Professor **Dr. Michael A. Smith** and his research team are working to develop novel and improved catalysts for alternative energy applications such as solar energy collection, the reduction of carbon dioxide to methanol and the synthesis of catalysts to create fuels from biomass. An important method for developing these materials involves synthesis using molecularly self-assembled colloids as templates for the nanostructure. The team synthesizes nanostructured materials under precisely controlled conditions; characterizes them using nitrogen adsorption, X-ray diffraction and electron microscopy; functionalizes them to conduct useful chemistry; and tests materials in catalytic applications such as the partial oxidation of methanol to formaldehyde. They also are working on characterizing surface chemistry with Dr. Rob Rioux at Penn State University, and are conducting related research with faculty in the Department of Inorganic Chemistry at the Fritz-Haber Institute of the Max Planck Society in Berlin, Germany. Dr. Smith's team collaborates extensively with colleagues **Drs. Satrio** and **Coe** in developing catalysts for biomass conversion.

Civil and Environmental Engineering



At a Glance

Department Chair:
Dr. Ronald Chadderton

Undergraduate enrollment: 211

Percentage female: 35 percent

Percent of graduates earning a minor: 21.4 percent

Number of current graduate students: MSCE: 75,
MSWRE: 25, PhD: 8



Italian Engineering and Architecture course students with Professor and Assistant Department Chair Dave Dinehart, PhD, (bottom left) and The Rev. Joseph L. Farrell, OSA, Associate Vice President for Mission and Ministry (top right).

STUDENT AWARDS AND RECOGNITION

Aaron Williams '15 CE earned a three-year, full tuition scholarship from the Army ROTC Freedom Battalion.

Villanova football player **Josh Bucci '14 CE** was named an Academic All-Star by The Philadelphia Inquirer.

Kevin Britt '15 CE helped found Villanova's student chapter of the United States Green Building Council. This organization trains students and provides accreditation under the LEED (Leadership in Energy and Environmental Design) program. Kevin is one of the youngest people in the country to have achieved LEED Accredited Professional status.

IN THE CLASSROOM

In collaboration with **The Rev. Joseph L. Farrell, OSA**, Associate Vice President for Mission and Ministry, **Dr. David Dinehart**, professor and assistant department chair, offered a new study abroad course titled "Italian Engineering and Architecture," which combined engineering and Augustine studies.



Seniors Evan Campbell, James Matzke and Robert Flynn measure sign retroreflectivity.

PUBLICATIONS AND PRESENTATIONS

For more, see Books, Boards and Awards at www.villanova.edu/media.

Assistant Professors **Drs. Leslie Myers McCarthy, PE**, and **Seri Park, PTP**, co-authored the feature article in the March–April 2013 issue of *Public Roads* magazine published by the Federal Highway Administration. The cover story “Innovative Partnerships Help Inventory Traffic Signs” featured several Villanova CEE undergraduates.

Professor **Dr. Andrea L. Welker, PE**, contributed to two articles in the April 2013 issue of the *Journal of Irrigation and Drainage Engineering*. Both articles reflect the extensive research Dr. Welker has performed on Villanova University’s green infrastructure for the past five years.

DISTINCTION

Dr. Andrea Welker was promoted to professor.



Patrick McAlpine '13 CE and Assistant Professor Eric Musselman, PhD, PE, prepare a prestressing strand for testing.

RESEARCH INITIATIVES

Innovative Rocking Wall for Earthquake Resistant Buildings

With a grant from the National Science Foundation, **Dr. Eric Musselman, PE**, assistant professor, is advising **Patrick McAlpine '13 CE** in evaluating the performance of an innovative rocking wall system for improving the earthquake resistance of buildings. McAlpine’s focus is on the performance of the post-tensioning system within the rocking wall, which helps restore the wall to its original position after an earthquake. The research includes both experimental testing and finite element analysis. Researchers from Iowa State University and the University of Minnesota also are collaborating on this project.

Energy-Conscious Materials Offer Alternative for Airfield Pavements

The introduction of larger aircrafts on flexible airfield pavements has led to a need for asphalt mixtures capable of sustaining such heavy loads. **Dr. Leslie Myers McCarthy** (co-PI), Dr. Yusuf Mehta at Rowan University (PI) and research assistant **Maria Chiara Guercio '13 MSCE**, have investigated the mechanical responses of a number of modified asphalt mixtures to identify their potentials for use in airfield aprons and taxiways. Laboratory-compacted specimens of each modified asphalt mixture were tested using federal standards to determine volumetric properties and mechanical responses. The effects of static and dynamic aircraft loading were evaluated in ABAQUS™ using the material properties of the mixtures determined by lab results. Based on the team’s findings, modified mixtures, green technologies such as warm mix asphalt and reclaimed asphalt pavement, and mixtures using alternative gradations such as stone matrix asphalt, perform similarly to or even outperform the Federal Aviation Administration’s standard asphalt mixture. The results of this initial study support the idea that an opportunity exists for airports to implement energy-conscious paving materials without compromising pavement design life.

Electrical and Computer Engineering



At a Glance

Department Chair: Dr. Pritpal Singh

Undergraduate enrollment: 218

Percentage female: 16 percent

Percent of graduates earning a minor:
33 percent

Current graduate students: MSCpE: 15,
MSEE: 78, PhD: 17

STUDENT AWARDS AND RECOGNITION

Kailash Choudhary '13 MSEE received the Outstanding Graduate Student Award from both the College and the Electrical and Computer Engineering Department.

Freshman Presidential Scholar, **Christine Fossaceca '16 CpE** was awarded a 2013 David L. Boren Scholarship. Boren Scholarships are funded by the National Security Education Program, which focuses on geographic areas, languages and fields of study deemed critical to U.S. national security. Christine will study in Seoul, South Korea in the spring 2014 semester.

Patrick Loughnane '14 EE received the Society of American Military Engineers' Philadelphia Post Scholarship Level II award for distinctive academic achievement, leadership and citizenship.

Shawn Plesnick '14 BSEE, '15 MSEE received an award from the Science, Mathematics and Research for Transformation (SMART) Scholarship for Service Program. As a SMART scholarship recipient, he receives a full scholarship and employment placement after graduation.

IN THE CLASSROOM

Assistant Professor **Dr. Lunal Khuon**, together with alumnus and supporter **Dr. Karl Zurn '66 EE, '69 MSEE** delivered a new senior elective course in Biomedical System Design.

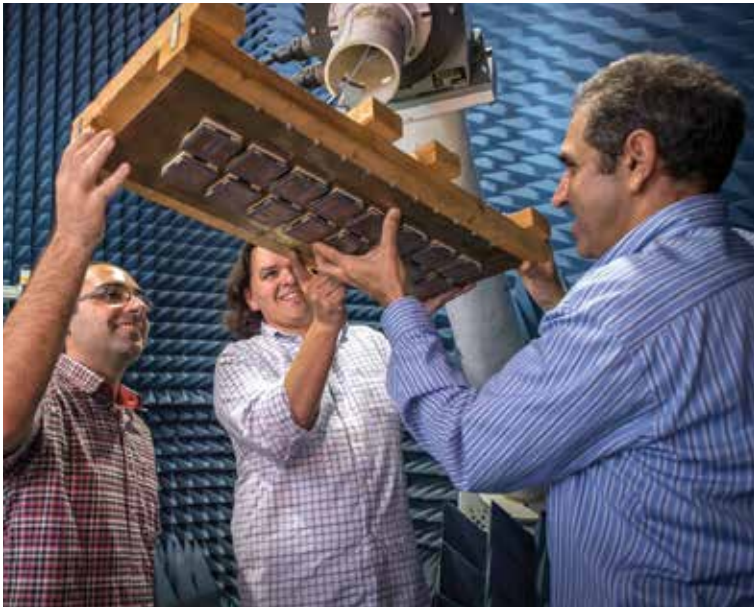
The Department is offering a new master's degree program in Cybersecurity, led by **Dr. Richard Perry**, associate professor of Computer Engineering.

The ECE Department represented the College at an initial meeting of Pennsylvania universities interested in collaborating to promote entrepreneurship and innovation in the education of engineering students.

The Nova Mobile Health project in Waslala, Nicaragua received additional funding from Halloran Philanthropies, enabling the project to expand its reach to more than half of the region's 92 communities. The Schools of Nursing and Business are collaborating with the College of Engineering on this interdisciplinary project.

With support from the National Collegiate Inventors and Innovators Alliance, Villanova and Universidad Nacional de Ingeniería (UNI) in Managua are establishing a joint course for developing sustainable technologies for rural Nicaraguans.

Mr. Samuel Brattini '63 EE, an engineer from KEMA consulting, a company serving the electric utility industry, coordinated visits for **Drs. Pritpal Singh** and **Nisha Kondrath**, assistant professor, to three electric energy companies. Industry input was received on the ECE Department's present graduate level offerings in the power and energy track, and suggestions were made for the addition of new courses. The graduate level program in this area will be reviewed as a result of this industry feedback.



PhD candidate Elie Bou Daher; Christopher Thajudeen, '13 PhD, '07 MSEE; and Professor and ARL Director Ahmad Hoorfar, PhD, mount a dual polarized array of stacked E-patches in the antenna compact range to measure its farfield radiation characteristics.

CHANGING FACES

Assistant Professor **Charles McKeough** has retired. A College of Engineering faculty member since 1961, he taught courses in Electrical Engineering Fundamentals, Electrical Energy Systems and Electric Machines.

PUBLICATIONS AND PRESENTATIONS

For more, see Books, Boards and Awards at www.villanova.edu/media.

PhD student **Joshua Fabian**, along with **Drs. James Peyton Jones**, professor, and **Garrett Clayton**, assistant professor of Mechanical Engineering, presented during a session of the American Society for Engineering Education Annual Conference and Exposition. Their presentation was titled "Low-Cost, High-Capability, Embedded Systems for Education and Research: A Toolbox for Microsoft Kinect."

With **Dr. Pritpal Singh** and Assistant Professor **Edmond Dougherty '69 EE, '86 MSCS; Emily Battinelli '12 EE; Kayla Holmquest '12 EE; and Julia Musso '11 MSSE**, contributed a paper to the 2012 IEEE (Institute of Electrical and Electronics Engineers) Global Humanitarian Technology Conference, titled "Low-Cost, Low-Power-12V DC Surgical Suction Device for Use in Developing Countries."

DISTINCTION

Dr. Robert Caverly, professor, was named an IEEE Fellow.

Dr. Xiaofang ('Maggie') Wang was promoted to associate professor with tenure.

RESEARCH INITIATIVES

Former Student's Traumatic Injury Leads to Faculty Research

In a July 2009 skateboarding accident, Kevin Kret, a freshman ECE major at Villanova, suffered a traumatic brain injury, which left him in either a persistent vegetative state or minimally conscious state. In 2012, Kevin's father, Michael, reached out to Villanova with a special request. He asked the University to conduct research on brain computer interface in the hopes that he could someday communicate again with his son. The request came to **Dr. Lunal Khuon**, an expert in electronic circuits and systems, and **Dr. Kevin Buckley '76 BSEE, '80 MSEE**, an expert in biomedical signal processing. Together with the International Brain Research Foundation, Drs. Khuon and Buckley are exploring the possibility of directly processing electroencephalogram signals (i.e., brain waves) of individuals in a range of states of consciousness and creating a pathway from them to an external device. Their team includes a graduate student researcher and three undergraduates, one of whom is **Dylan Kret '15 ECE**, Kevin's brother.

Novel Antenna Miniaturization Techniques

Dr. Ahmad Hoorfar, professor and director of the Antenna Research Lab (ARL), is investigating various antenna miniaturization techniques in the development of wideband, multiband and reconfigurable electrically small antennas. These antennas are for use in both communication and radar systems when the available space limits the use of conventional printed antennas. In one of the techniques under investigation, Dr. Hoorfar is applying the mathematical concept of space-filling curves for the miniaturization of novel antenna structures whose radiation characteristics can be reconfigured in real time for various multiband/wideband operations. In addition, he is analyzing the performance of these antennas when they are embedded within composite materials for integration with vehicular and UAV platforms. Selected proposed antennas are then prototyped, fabricated and measured. **Dr. Christopher Thajudeen, '13 PhD, '07 MSEE** assists Dr. Hoorfar in this investigation.

Mechanical Engineering



At a Glance

Department Chair: Dr. C. Nataraj

Undergraduate enrollment: 303

Percentage female: 23 percent

Percent of graduates earning a minor: 42.7 percent

Current graduate students: MS: 56, PhD: 22

STUDENT AWARDS AND RECOGNITION

Evan Gonshor '14 ME received an American Society of Naval Engineers Scholarship based on his academic performance, work history, professional promise, extracurricular activities and recommendations.

Wesley Blummer '14 ME was accepted into the RISE (Research Internships in Science and Engineering) program in Germany for summer 2013.

Russell Rioux '13 ME received the 2013 Falvey Scholar award, which recognizes outstanding undergraduate research. His work focused on nanoscale surface modifications for increased heat transfer in pool boiling, which has a range of applications from consumer electronics to nuclear power plants. Russell's research mentor was Assistant Professor Dr. Calvin Li, director of the Nanoscale Interface and Phase-Change Transport Laboratory.

Stephen Schraer '13 ME won the Meyer Innovation and Creative Excellence (ICE) Award for the College of Engineering. He earned recognition for his work with the engineering service learning program and for leading the humanitarian unexploded ordnance robotics initiative. The ICE Award was presented to one student in each of the University's undergraduate colleges/schools.

IN THE CLASSROOM

Drs. Sridhar Santhanam, professor, **Gang Feng**, assistant professor, and **Ani Ural**, associate professor, received a grant to explore the "flipped" or inverted classroom approach in the Mechanics of Solids course required of all sophomore MEs. In the inverted classroom, students learn new content online (on their own time) by watching video lectures, and what used to be homework (assigned problems) is now done in class. This approach allows the teacher to offer more personalized guidance and hands-on interaction with students.

CHANGING FACES

Professor **Howard Fulmer**, who had been with the Mechanical Engineering Department since 1990, will teach in the Department of Mathematics in Villanova University College of Liberal Arts and Sciences.

Joining the department as a full-time visiting assistant professor is **Dr. David Jamison**. Dr. Jamison specializes in the biomechanics of spinal injury and earned his PhD from the Biomedical Engineering program at Drexel University.



Bahareh Jalali '16 MS, a Biology graduate student working in Dr. Karlsson's laboratory, is using a micro-osmometer to measure the strength of a buffer solution.



Visiting Assistant Professor
David Jamison, PhD

PUBLICATIONS AND PRESENTATIONS

For more, see Books, Boards and Awards at www.villanova.edu/media.

Dr. Gerard Jones, professor and senior associate dean for graduate studies and research, was guest associate editor of the January 2013 ASME (American Society of Mechanical Engineers) Journal of Heat Transfer, a special edition on computational fluid dynamics. The papers solicited and reviewed for this edition came from a symposium on this topic that Dr. Jones hosted at Villanova University.

Dr. Calvin Li served as a guest editor and contributor to the January 2013 issue of the Journal of Nanofluids.

Professor **Dr. Amy Fleischer** was the keynote speaker for the Naval Surface Warfare Center Carderock Division's (NSWCDD) Women's History Month Observance.

Dr. Fleischer was interviewed by ASME on the topic of sustainable energy storage. The interview can be found on the ASME website.

DISTINCTION

Dr. Amy Fleischer was named an ASME Fellow. She also graduated as a Fellow of the Executive Leadership in Academic Technology and Engineering program (ELATE) at Drexel University where she was a member of the inaugural class of leaders in academic engineering and the sciences.

Dr. Ani Ural was promoted to associate professor with tenure.

RESEARCH INITIATIVES

Synthesis and Characterization of Nanoparticle Film

Nanoparticle films exhibit synergistic properties, making them useful for numerous advanced applications including energy conversion and storage, visual display devices, water purification and biomedical usage. Their poor resistance to mechanical loading and abrasion, however, present a major obstacle to their widespread use and commercialization. Villanova PhD student **Di Zhang** and postdoctoral research fellow **Dr. Lei Zhang** are working with **Dr. Gang Feng** on techniques to greatly increase the mechanical durability of nanoparticle films. The Villanova team is working collaboratively with Dr. Daeyeon Lee at the University of Pennsylvania.

To date, the group's research has demonstrated that atomic layer deposition can drastically improve the mechanical durability of nanoparticle films on organic and inorganic substrates, which will ultimately enable practical application and commercialization of nanoparticle-based products. Supported by an award from the Nanotechnology Institute and a Pennsylvania Keystone Innovation Starter Kit grant in nanotechnology, this project has produced three scientific articles published in ACS Nano and Nanoscale.

Multiscale Modeling of Graphite Nanofibers for Enhanced Energy Storage

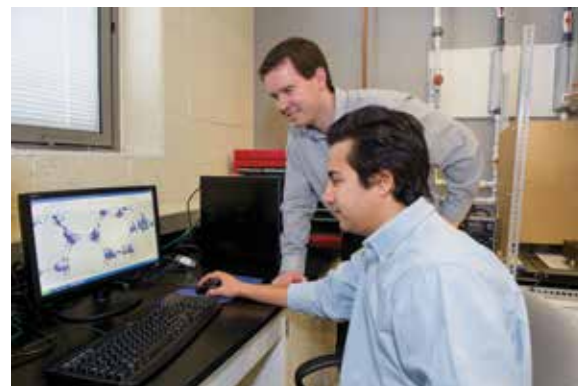
Phase change materials (PCMs) are used to improve the energy efficiency of equipment or processes undergoing cyclical loading, such as concentrated solar power plants and handheld electronics. By improving PCM thermal conductivity, energy storage capability increases. Assistant Professor **Dr. Aaron Wemhoff** and his team, with funding from the National Science Foundation, applied multiscale modeling to determine the influence of embedding graphite nanofibers (GNFs) on the overall thermal conductivity of latent PCMs, with specific emphasis on GNF internal structure and volume fraction. Research results indicate that the internal structure of GNFs and the formation of percolation networks both play a major role in improving the PCM thermal diffusivity.



Gary A. Gabriele, PhD, Drosdick Endowed Dean of the College of Engineering and Professor Amy Fleischer, PhD, celebrate her graduation as an ELATE Fellow.



Associate Professor Young Chun, PhD; Bryan Kong '14 ME; Brian Shields '15 ME; Assistant Professor Calvin Li, PhD; and Evan Cox '14 ME discuss a group project in the MDL.



Assistant Professor Aaron Wemhoff, PhD, and Masoud Khadem '13 PhD review the results of molecular dynamics simulations.

Student Accomplishments



Members of team "Fun Run" celebrate their victory on Pitch Day 2013 (Tom Belatti '13 ME, far right).



A guest visits team "Du Riz" during Pitch Day 2013.



Ian Dardani '13 ME is presented with the Robert D. Lynch Award during the College's Recognition Ceremony.

Engineering Students Win Women of Color Scholarships

Aleshia Ayers '15 CE and **Brittany Davis '15 ChE** were presented with 2013 Villanova Women of Color Scholarships. Recipients of the scholarship are nominated based on involvement in the Villanova community, good academic and disciplinary standing, financial need and commitment to service.

Villanova Students Stand Out as New Faces in Engineering

Alex Clark '14 ChE was named among the New Faces in Engineering-College Edition, a program of the National Engineers Week Foundation. He was nominated and selected by the National Society of Professional Engineers. **Michelle Parziale '14 ME** also was nominated for the award.

Boeing Awards Scholarships

Juniors Kelly Modrick EE and **Steven Tavoletti ME** were each awarded a \$3,250 Boeing Engineering Scholarship for the 2012-2013 academic year. Sophomore **Kristen Shannon ME** received a \$2,500 scholarship from the company.

Entrepreneurial Engineering Students Repeat VSEC Success

Of the seven finalist teams in the Villanova Student Entrepreneurship Competition (VSEC), five included at least one engineering major. This year's top award went to "Fun Run," a team which included **Tom Belatti '13 ME**. This is the third straight year that the College of Engineering has been represented on the first place team.

"Du Riz," a team of three junior engineering students, placed third in VSEC. **Frederick Hesse-Tetteh CpE**, **Warren Chan CE** and **Joseph Reckamp ChE** developed an inexpensive, portable rice huller to improve crop yields for impoverished rice farmers. Du Riz also took home an award for the most promising social entrepreneurship idea.

Dean's Annual Awards Dinner Recognizes Exceptional Students

In mid-April, the College hosted its 38th annual Dean's Awards Dinner. This year, the Dean's Award for Excellence was presented to 73 students who each had a cumulative grade point average of at least 3.50 at the end of the fall term. Ten graduating seniors received the 2013 Meritorious Service Award, which recognizes academic achievement and meaningful contributions and service provided to the College of Engineering:

Christine M. Alizzi CE
Tyler A. Casteel ChE
Ian P. Dardani ME
Francis J. Dougherty ChE
Timothy J. Henderson ChE

Ellen M. Knapp ChE
Benjamin W. Lawrence ChE
Christine K. McQuade ChE
Alexander J. Metz ME
Michelle A. Parziale ME

Medallions Awarded to Graduating Seniors

During the College's Recognition Ceremony, medallions were awarded in each department to a graduating senior and graduating master's or PhD student who demonstrated academic excellence and leadership. The 2013 recipients were:

Graduating Seniors

Michael A. Ciavarella CpE
Ian P. Dardani ME
Jelena Renic ChE
Erica J. Sokoloski CE
Dang Wang EE

Graduate Students

Benaiah Anabaronye MSChE
Kailash Choudhary MSEE
Adrienne G. Donaghue MSWRE
Eric C. Nolan MSME
Lauren A. Pugh MSSE

Ian Dardani was also this year's Robert D. Lynch Award recipient which recognizes a graduating senior's outstanding academic achievements and exemplary dedication to serving the community.

Undergraduate Student Snapshots



Joseph K. Denny '13, '14 MS

Major: Mechanical Engineering, Mechatronics Minor

Hometown: Springfield, Pennsylvania

Activities

- Autonomous Surface Vehicle team
- Supernovas and Singers choral groups
- Twirlers
- Pastoral Musicians

Next Step

Joseph is completing the five-year BS/MS program. After graduation he hopes to find employment in the robotics and defense field, building the next generation of autonomous robots.

Navigating Invaluable Design and Prototyping Experiences

One of my most defining experiences at Villanova—one which pointed me toward a career in robotics—has been participating on the Autonomous Surface Vehicle (ASV) Team. Each year, in preparation for the International Roboat Competition, a group of students builds and programs a 6-foot boat to navigate and complete tasks autonomously. When I joined the team as a sophomore, we began working with a 5-year-old boat that we soon realized was not up to the standards needed to compete. Having considered our options for improving the vessel, we determined that the best course of action was a complete redesign.

After some negotiation and many serious design meetings, the ASV team started work on a new vehicle, which we named SeaCat. I generated its initial design, which was then tweaked by fellow team members and our advisers, Drs. Nataraj and Clayton. Once the design and build were approved, SeaCat became the team's responsibility, with our advisers providing technical assistance only when we were stuck. First the hulls and frame were completed; then the electronics were installed; and finally the computer was plugged in and programmed. With each step we gained invaluable design and prototyping experience, and we became more confident in our abilities. The team felt that SeaCat had a realistic shot at winning the 2012 International Roboat Competition.

Our months of hard work paid off and SeaCat did not disappoint, bringing home a second place victory, and the pride and confidence that go with it. Our seven member team had been entrusted with a large amount of time and money to make our designs a reality, and the experience was priceless. We were given a chance to build something awesome and had the time of our lives doing it.



Chenyao Zhang '14

Major: Chemical Engineering, Chemistry Minor

Hometown: West Chester, Pennsylvania

Activities

- Phi Kappa Phi
- Tau Beta Pi
- Research on modeling the generation of haptoglobin and albumin under heat shock conditions
- Research on the synthesis of a glycosyl donor for the lipid A disaccharide
- Rays of Sunshine Community Service Club
- Executive board member of the Chinese Students and Scholars Association

Next Step

Chenyao will pursue a Master's degree in Chemical Engineering at Villanova University. She also hopes to pursue an MBA after several years of work experience.

Villanova: A Great Foundation for a Career

When I made the decision to study chemical engineering, I was excited, yet nervous and overwhelmed. How do engineers apply principles to practical operations? What subfields of chemical engineering should I consider? I had many questions, and the answers have become clearer thanks to my Villanova education. Completing design projects and safety assignments helped me connect abstract principles to real-life practices. Meeting guest speakers from different industries opened my eyes to numerous career options for engineers. Talking to professors with different areas of expertise and rich work experiences encouraged me to look into different subfields and find my passion in chemical engineering.

The thinking behind the engineering curriculum also impressed me. Statistics and safety knowledge were carefully integrated into different courses. The department also emphasized strong engineering ethics and communication skills. For example, a series of projects required making ethical engineering judgments, and a communication course helped us develop a professional lab report, give an effective presentation and write a solid resume. My educational experience in the Department of Chemical Engineering has not only given me great confidence in my engineering knowledge, but also a clear vision of my future as a responsible and professional engineer.

Undergraduate Student Snapshots



Kayla Spitzer '14

Major: Civil and Environmental Engineering

Hometown: Ascot, England

Activities

- President of Chi Epsilon
- Secretary of LEVEL
- Engineering service break trip to Panama
- POWER peer educator

Next Step

Kayla intends to continue her studies in graduate school with a focus on structures.



Daniel Nieman '14

Major: Electrical Engineering

Hometown: Sterling, Illinois

Activities

- Solar cell research
- Engineering break trips to Nicaragua and Panama
- Engineers Without Borders
- Co-leader for Back on My Feet
- President's Environmental Sustainability Committee member

Next Step

Obtain a job in the field of electrical communications while working toward a Master's degree in Electrical Engineering.

Travel Experiences Prove Unforgettable

There are so many things that make Villanova University special. Simply mentioning the sense of community, the engaged student population, or the numerous on-campus groups barely begins to describe Villanova's unique atmosphere. In my three years here, I have been fortunate enough to have had the opportunity to study abroad in Italy and go to Panama on a service break trip.

Studying abroad in Italy was possibly the most unique experience I have ever had. Two Villanova professors developed a five-week curriculum specifically for our group of eight students. As we traveled across the country, we learned about the Order of St. Augustine, architecture and engineering. I had a chance to learn about the art in Sienna, Brunelleschi's dome of Florence's Cathedral, and why the Tower of Pisa leans.

Less than a year later, I had an equally amazing opportunity to go on an engineering service break trip to Panama. This trip sent 15 students and two faculty members into the country with the goal of providing thousands of rural Panamanians with clean drinking water. In just a week, we were able to design and begin construction on a spring-fed water source that would give 6,000 people drinking water. One of the most rewarding moments of my life was when I heard that the system we—undergraduate engineering students—had designed was built and working. These experiences have been invaluable, and I feel blessed to have had these opportunities.

International Service Trips Offer Life Lessons as well as Learning Experiences

I have been fortunate to participate in two international engineering service trips, both of which taught me important lessons about the impact I can have on people's lives. My first trip, to Nicaragua, gave me the opportunity to work on multiple projects, but one in particular remains vivid in my mind. Our job was to install light switches on a small solar system at a health worker's house in a remote village. Shortly after installation, the lines stopped functioning, and we discovered the switches we used had created a short and burned out essential components. It was a valuable technical learning opportunity and taught us the importance of paying careful attention to our work. We had to leave the community the next day, before we were able to fix the problem, and it was hard to leave knowing that we had made this individual's life more difficult for a few months rather than improving the system as intended.

In the autumn of my junior year I was able to travel to an indigenous community in Panama to install a photovoltaic system for a local school. After installing the system itself, we wired the two classrooms to provide outlets, ceiling fans and lights. Once all the proper connections were made and the system was in place we showed our work to the community. After the sun went down, our group gathered with the villagers in a classroom where, for the first time, they experienced a significant source of light after dark.

Faculty Accomplishments

Awards and Recognition

Dr. Moeness Amin, director of the Center for Advanced Communications (CAC) and **Dr. Fauzia Ahmad**, CAC research associate professor and director of the Radar Imaging Lab, received the Best Paper/Oral Presentation Award at the 2012 International Conference on Information Science, Signal Processing and their Applications.

Dr. Robert Caverly, professor of Electrical and Computer Engineering, received the 2013 Farrell Award, which recognizes an engineering faculty member who has demonstrated personal concern for students and exceptional dedication to the College.

Edmond Dougherty, assistant professor of Electrical and Computer Engineering, and director of the Engineering Entrepreneurship program, received the Meyer ICE Award for Excellence in promoting Creativity, Innovation and Entrepreneurship at Villanova University.

During University Commencement,

Dr. C. Nataraj, professor and chair of Mechanical Engineering, received the 2013 Villanova University Outstanding Faculty Research Award for his sustained scholarly contributions. Dr. Nataraj was recognized for the worldwide impact of his life's work in the area of dynamic systems and nonlinear dynamics.

Dr. Robert Traver PE, WRE, MSCE '82; director of the Villanova Center for the Advancement of Sustainability in Engineering and the Villanova Urban Stormwater Partnership, was elected a Fellow of the Environmental and Water Resources Institute, a specialty institute of the American Society of Civil Engineers.

For the second consecutive year,

Dr. Yimin Zhang, director of the Wireless Communications and Positioning Lab, was selected for the Air Force Summer Faculty Fellowship Program.



Director of the Center for Advanced Communications Moeness Amin, PhD, and Fauzia Ahmad, PhD, research associate professor and director of the Radar Imaging Lab.



Ed Dougherty '69 EE, '86 MSCE, director of the Engineering Entrepreneurship program.



Mechanical Engineering Professor and Department Chair Dr. C. Nataraj is presented with the Outstanding Faculty Research Award by University President, The Rev. Peter M. Donohue, OSA, PhD, '75 LAS.

Faculty Accomplishments



Dr. Ahmad



Dr. Caverly



Dr. Demirli



Dr. Huang



Dr. Kelly



Dr. McCarthy



Dr. Singh



Dr. Traver



Dr. Wadzuk



Dr. Welker



Dr. Yost



Dr. Zhang

COMMITTEE AND BOARD APPOINTMENTS

Dr. Fauzia Ahmad is an editorial board member of IET Radar, Sonar & Navigation.

Dr. Robert Caverly, professor of Electrical and Computer Engineering, chaired the Institute of Electrical and Electronics Engineers (IEEE) MTT-17 Technical Committee on HF-VHF-UHF Technology. He also served as general co-chair of both the 2012 and 2013 IEEE Topical Conferences on Power Amplifiers for Wireless Technology, and was co-organizer of the IEEE International Microwave Symposium's 2012 workshop "MRI RF Receive Coil Control in the High Field Environment."

Dr. Ramazan Demirli, research assistant professor and director of the Acoustics and Ultrasound Lab, served as session chair at the 2012 IEEE Ultrasonics Symposium.

Dr. Zuyi 'Jacky' Huang, assistant professor of Chemical Engineering, was selected to serve a three-year term on the Policy Committee of the International Federation of Automatic Control. There are only eight faculty members worldwide serving on this committee and Dr. Huang is one of three U.S. representatives.

Dr. William Kelly, associate professor of Chemical Engineering, was co-organizer of the 9th European Symposium on Biochemical Engineering Science.

Dr. Leslie Myers McCarthy, assistant professor of Civil and Environmental Engineering, was elected to the board of directors of RAIL Solution.

Dr. Pritpal Singh, professor and chair of Electrical and Computer Engineering, was appointed chair-elect of the Mid-Atlantic section of the American Society of Engineering Education (ASEE).

Dr. Robert Traver chaired the Pennsylvania Department of Environmental Protection's Water Resources Advisory Committee.

Dr. Bridget Wadzuk '00 CE, associate professor of Civil and Environmental Engineering, chaired the American Society of Civil Engineers' Stormwater Infrastructure Committee.

Dr. Andrea Welker, professor of Civil and Environmental Engineering, is secretary/treasurer of the civil engineering division of the ASEE. She also chairs the Continuing Education Committee of the Geo-Institute, and is academic liaison for the Institute's Delaware Valley chapter.

Dr. Joseph Yost, associate professor of Civil and Environmental Engineering, co-chairs the Structural Engineering Institute's Student Initiatives Committee.

Dr. Yimin Zhang, director of the Wireless Communications and Positioning Lab, served on the International Advisory Committee of the 2013 IET Radar Conference. He also served an additional term as an associate editor for IEEE Transactions on Signal Processing.

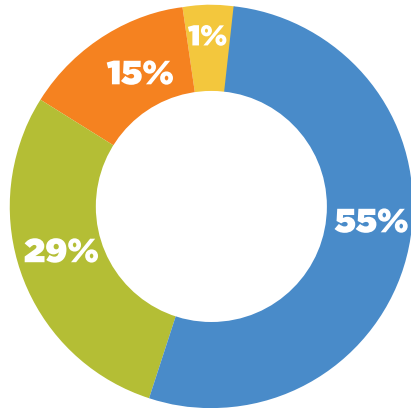
College of Engineering Faculty and Graduate Student Scholarship*

	Total
Books	4
Edited Books	1
Refereed Journal Articles	114
Chapters	6
Book Reviews	1
Conference Papers Published	107
Other Publications	44
Grant Applications	137
Papers Presented	117
Editorial/Leadership	123

*In the field of engineering, graduate students typically co-publish with their faculty advisors; therefore, graduate student scholarship is not tracked since it closely aligns with faculty scholarship.

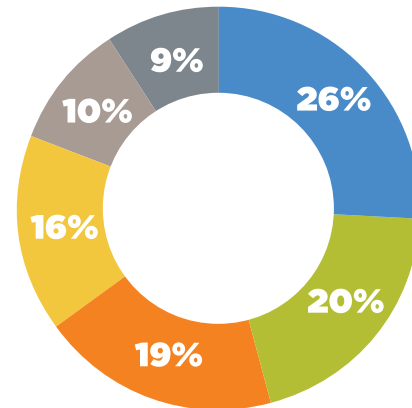
Engineering Research by the Numbers

RESEARCH EXPENDITURES FOR FISCAL YEAR 2013 | \$2,735,991 | 99 Active Grants



SOURCE of SUPPORT

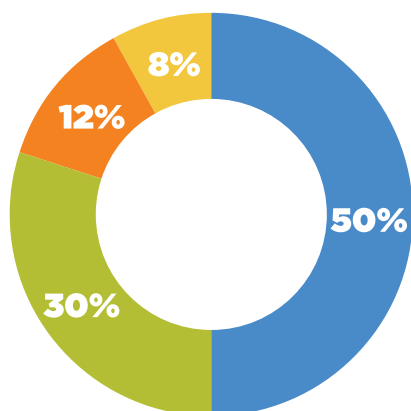
- 55%** Federal
- 29%** Corporate
- 15%** State
- 1%** Private (Foundations and Other)



AREA SUPPORTED

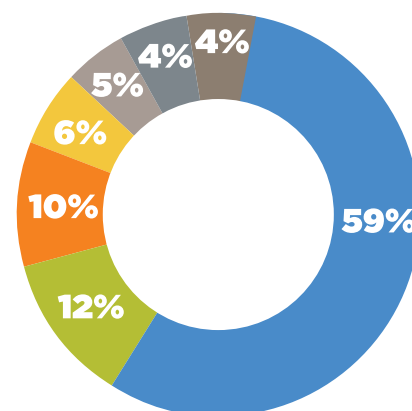
- 26%** Center for Advanced Communications (CAC)
- 20%** Villanova Center for the Advancement of Sustainability in Engineering (VCASE)
- 19%** Mechanical
- 16%** Civil and Environmental
- 10%** Center for Nonlinear Dynamics and Control (CENDAC)
- 9%** Electrical and Computer, Chemical and Multidisciplinary Design Lab (MDL)

RESEARCH AWARDS RECEIVED DURING FISCAL YEAR 2013 | \$2,102,532 | 30 New Grants Awarded



SOURCE of SUPPORT

- 50%** Federal
- 30%** Corporate
- 12%** State
- 8%** Private (Foundations and Other)



AREA SUPPORTED

- 59%** VCASE
- 12%** CAC
- 10%** CENDAC
- 6%** Mechanical
- 5%** Chemical
- 4%** Civil and Environmental
- 4%** Electrical and Computer

Engineering Research Awards



STUDENT RESEARCH AWARDS

Engineering Students Win Sigma Xi Awards

Sigma Xi is the international honor society for research scientists and engineers. Both graduate and undergraduate Engineering students participate in—and regularly win—the annual Sigma Xi Student Research Competition.

Mechanical Engineering PhD students **Mohsen Samadani** and **Parham Ghorbanian** were 2013 graduate poster winners. Advised by Dr. C. Nataraj, professor and department chair, Samadani took first place for “Diagnostics of a Nonlinear Pendulum Using Computational Intelligence.” Ghorbanian placed second for “Discrete Wavelet Transform EEG Features of Alzheimer’s Disease in Activated States.” Dr. Hashem Ashrafiuon, professor and director of the Center for Nonlinear Dynamics and Control, served as his adviser.

Chemical Engineering students **Shawn Welch '13** and **Joseph Reckamp '14** were Sigma Xi undergraduate poster winners. Shawn earned first place for “Development and Analysis of Acidified Silica-Based Catalysts for Cracking of Pinewood Biomass,” advised by Drs. Charles Coe, research associate professor; and Justinus Satrio, assistant professor. Dr. Satrio also served as adviser for Joseph whose “Evaluation of the Potentials of Paper Mill Sludge (PMS) as a Feedstock for Thermochemical Biofuels Production” took second place in the competition.

Fellowships Support Undergraduate Student Research

The Villanova Undergraduate Research Fellows Program (VURF) provides financial support for student research. The following engineering students received VURF awards for the coming year:

Mechanical Engineering:

Alexandra Abel '14 “Computational Modeling Linking Long Term Use of Bisphosphonates,” mentored by Associate Professor Dr. Ani Ural

Alpha Mansaray '14 “Nanospectrometer,” mentored by Dr. Rosalind Wynne, associate professor of Electrical and Computer Engineering

Christopher Pietrocarlo '14 “Experimental Comparison Study of the Mechanisms of Zero-, One-, and Two-Dimensional Nanoadditives on Effective Thermal Conductivities of Composite Materials,” mentored by Assistant Professor Dr. Calvin Li

Brendan Steinbock '16 ME “Outlier Rejection Strategies in Visual Odometry,” mentored by Assistant Professor Dr. Garrett Clayton

Chemical Engineering:

Samuel Chung '14 “Hydrothermally Stable Catalysts to Upgrade Pyrolysis Oils,” mentored by Dr. Coe

Andrea DiPaola '15 “Exploring the Potentials of Ultrasound and Microwave for Pretreating Biomass Prior to Hydrolysis and Fast Pyrolysis Conversion Processes,” mentored by Dr. Satrio

Gregory Wisniewski '15 “Hydrothermal Pyrolysis of Algae,” mentored by Dr. Satrio



Anthony Webb '16 MSME; PhD student Ronald Warzoha '08 ME; and Mechanical Engineering Professor and NovaTherm Director Amy Fleischer, PhD, examine a data center server.



VUSP colleagues Robert Traver, PhD, PE, WRE, MSCE '82; Bridget Wadzuck, PhD, '00 CE; and Andrea Welker, PhD, PE.

RESEARCH CENTER AWARDS

Dr. Amin to Serve as PI on Qatar Research

Dr. Moeness Amin, director of the Center for Advanced Communication, has received a three-year grant from Qatar National Research Fund for research into the use of radar technology to assist the elderly who live alone. “Advanced Signal Processing and Emerging Sensing Technologies for Assisted Living” is the CAC’s first research track for civilian applications. The Center will partner on this project with Qatar University. Villanova will receive 35 percent of the \$1,050,000 funding and Dr. Amin will serve as the Principal Investigator for the entire project, including the Qatari part.

VCASE and VUSP Receive Public and Private Sector Grants

Civil and Environmental Engineering Professors **Drs. Andrea Welker** and **Robert Traver**, director of the Villanova Center for the Advancement of Sustainability in Engineering (VCASE) and the Villanova Urban Stormwater Partnership (VUSP), received a grant from the William Penn Foundation to conduct research on supporting green infrastructure in Southeastern Pennsylvania. Through its Growing Greener program, the Pennsylvania Department of Environmental Protection is providing three-year funding for a related VCASE study titled “Prediction of Evapotranspiration from Vegetated Stormwater Control Measure.” Associate Professor **Dr. Bridget Wadzuck** is the lead on this project with Drs. Welker and Traver.

The Growing Greener program awarded a \$126,745 grant to VUSP for its research on “Rain Garden Configuration to Maximize Hydrologic Performance,” led by Drs. Traver and Welker. A \$178,000 EPA grant will support VUSP’s campus Stormwater Research and Demonstration Park. Assistant Professor **Dr. John Komlos**, an environmental engineer, is a key component of this project. Overall, these projects fund seven graduate students.

FACULTY RESEARCH AWARDS

Chemical Engineering Professors Awarded Grants for Biomass Research

Assistant Professors **Drs. Justinus Satrio**, **Michael Smith** and **Charles Coe**, were awarded a two-year, \$300,000 USDA Biomass Research and Development Initiative grant. The work involves developing catalytic materials to be used for catalytic pyrolysis processes and for upgrading biocrude oil.

Dr. Satrio also is engaged in two VCASE projects. He is working with **Dr. Ronald Balsamo**, associate professor of Biology, on the use of biochar as a soil amendment, and with **Dr. Wadzuck** on energy derived from algae.

NSF Grant Supports Energy Research

A team of Mechanical Engineering faculty received a \$325,843 three-year grant from the National Science Foundation to explore a more efficient means of energy storage and release in large and small electronic systems. The thermal research team consists of Professor **Dr. Amy Fleischer**, director of NovaTherm—the Villanova Thermal Management Laboratory, and Assistant Professors **Drs. Gang Feng** and **Aaron Wemhoff**.



PhD student Maria Nydia Ruiz-Felix works with Andria DiPaola '15 ChE in the Biomass Resources and Conversion Technologies Lab.

Center for Advanced Communications (CAC)

At a Glance

Director: Dr. Moeness Amin, Professor of Electrical and Computer Engineering

Faculty researchers: 10

PhD students: 2

MS students: 7

Undergraduates: 7

Total active grant funding: \$4,542,600

Number of current research projects: 19

Key Research Areas and Lead Faculty

From the Department of Electrical and Computer Engineering

Acoustics: Dr. Ramazan Demirli

Antennas: Dr. Ahmad Hoorfar

Lightwave Devices: Dr. Rosalind Wynne

Microwave: Dr. Robert Caverly

Radar Signal Processing: Dr. Fauzia Ahmad

Satellite Navigation: Dr. Moeness Amin

Security: Dr. Bijan Mobasseri

Wireless Technologies: Dr. Yimin Zhang

RECOGNITION AND DISTINCTION

A 2012 report prepared for the Industry/University Cooperative Research Center Program (I/UCRC) of the NSF, named the Center for Advanced Communications (CAC) "an excellent and rare example of how to sustain and grow a research operation in a smaller university."

CAC was identified by the NSF as a model for small universities.

CAC celebrated a record breaking year for competitive research grants from Department of Defense (DOD) agencies. Together with CAC research professors

Drs. Zhang and **Ahmad, Dr. Amin** was awarded a total of \$1.65 million from the DOD. In all three cases, Villanova was the sole award recipient.





Qisong Wu, PhD, post-doctoral research fellow; and PhD student Saurav Subedi discuss wireless sensing research experiments with Yimin Zhang, PhD, research professor and director of the Wireless Communications and Positioning Lab.



PhD students Elie Bou Daher '13 EE and Khodour Al Kadry conduct a radar imaging experiment with Fauzia Ahmad, PhD, director of the Radar Imaging Lab.

PUBLICATIONS AND PRESENTATIONS

For more, see Books, Boards and Awards at www.villanova.edu/media.

Drs. Amin and Ahmad contributed “Through-the-Wall Radar Imaging: Theory and Applications” for the Radar Signal Processing section of E-Reference Signal Processing (Elsevier, 2013).

Dr. Ahmad, director of the Radar Imaging Lab, served as lead guest editor of the special section on “Compressive Sensing for Imaging” in the Journal of Electronic Imaging, April 2013.

CAC members presented at 10 invited talks, which included five plenaries and tutorials at international conferences in Canada, China and Germany.

PARTNERSHIPS AND COLLABORATION

Memorandums of Understanding (MOU) were renewed with the University of Montenegro, Podgorica, Montenegro; and the University of Wollongong, New South Wales, Australia for an additional three years. The CAC currently has 10 signed MOUs with international academic institutions.

CAC welcomed 12 international visitors in 2012–2013. They worked with CAC faculty and students in the areas of signal processing, radar, acoustics and ultrasound.

RESEARCH INITIATIVES

CAC Contributes to International Research on Through-the-Wall Imaging

Because of its groundbreaking and seminal contributions in the area of urban sensing and its related Through-the-Wall Radar Imaging (TWRI) technologies, the CAC, since 2005, has participated—as the only academic institution—on two related international NATO task groups. The NATO panel’s objective is to produce a state-of-the-art technology assessment of this emerging research and development area, which could be of particular benefit to the military and criminal justice system. New technology would allow law enforcement officers to locate and apprehend criminals hiding in buildings and assist soldiers in identifying and tracking adversaries within enclosed structures. The result would be fewer combat and civilian casualties. The use of this technology also extends to locating people trapped in mines, inside burning buildings or under collapsed structures.

TWRI efforts at the CAC have been supported by various U.S. federal agencies, including Defense Advanced Research Projects Agency, Office of Naval Research, Army Research Lab and Army Research Office, as well as international agencies in Australia and Canada. The total TWRI funding awarded to the CAC during the past 10 years exceeds \$9.5 million.

Center for Nonlinear Dynamics and Control (CENDAC)



At a Glance

Director: Dr. Hashem Ashrafiun, Professor of Mechanical Engineering

Faculty researchers: 8

PhD students: 11

MS students: 4

Undergraduates: 8

Total active grant funding: \$350,000

Number of current research projects: 5

Key Research Areas and Lead Faculty

Advanced Control Theory and Applications: Dr. Sergey Nersesov, ME

Advanced Dynamics: Dr. Verica Radisavljevic-Gajic, ME

Automotive Research: Dr. James Peyton Jones, ECE

Biomedical Engineering: Dr. Zuyi 'Jacky' Huang, ChE

Biomedical Systems Modeling and Diagnostics: Dr. Ani Ural, ME

Dynamic Systems: Dr. C. Nataraj, ME

Image-Based Controls and Mechatronic Systems: Dr. Garrett M. Clayton, ME

Innovations in Robotics and Unmanned Surface and Underwater Vehicles:
Dr. Hashem Ashrafiun, ME

Networks for Control Systems: Dr. Sarvesh Kulkarni, ECE

Nonlinear Stochastic Dynamical Systems: Dr. Subramanian Ramakrishnan, ME



PhD student Josh Fabian reviews a wheeled mobile robot configuration with Assistant Professor of Mechanical Engineering Garrett Clayton, PhD.



Michael Benson '14 ME and PhD student Farshad Mahini discuss how to implement new control hardware for autonomous boats in the Unmanned Surface and Underwater Vehicles Laboratory.

PUBLICATIONS AND PRESENTATIONS

For more, see Books, Boards and Awards at www.villanova.edu/media.

Professor George Chiu, NSF Control Systems Program Director, was guest speaker for CENDAC's Outstanding Seminar Series. The title of his presentation was "Updates and New Initiatives in Dynamics Systems and Control at the National Science Foundation."

CENDAC faculty organized four symposia at the 2012 ASME Dynamic Systems and Control Conference.

PARTNERSHIPS AND COLLABORATION

CENDAC faculty and students continue to add new material to the VU LEGO Real Time Target open source software. Developed by Electrical and Computer Engineering Professor **Dr. Peyton Jones** in 2010, LEGO Real Time Target serves as a low-cost option for research and education.

Center members provided modules for the Leadership Education and Development (LEAD) program, hosted the regional Marine Advanced Technology Education (MATE) competition, and participated in the Philadelphia School District's "STEM Secrets" outreach program.

RESEARCH INITIATIVES

Comcast Applied Research for [IPv6] Modeling, Migration and Adoption (CARMMA)

Drs. Kulkarni, associate professor of Computer Engineering, and **Vijay Gehlot**, associate professor of Computer Science in the College of Liberal Arts and Sciences, are conducting research aimed at augmenting

and refining the capabilities of the algorithms and software delivered in an earlier phase of the University's project with the Comcast Corporation. A complementary goal is to begin the process of modeling Comcast's access network for the purpose of simulation and predictive performance analysis.

The current prototype of the company's back-end service model aggregates and analyzes IPv6 equipment deployment data on a daily basis and the network performance-related data at more frequent intervals. These services currently are deployed on a single virtual machine. In the next phase, the architecture of this model will be refined such that the data is no longer centralized. Rather, it will be distributed over easily replicated and dynamically deployable virtual machines in multiple geographic locations in order to enhance scalability. In addition, network performance-related data will be stored using parallelizable database tables and searched with customized algorithms. Such an approach will enable Comcast to make an early determination as to whether a network fault condition is limited to a customer's premises, or is symptomatic of a more general Cable Modem Termination System (CMTS) level failure. If it is indeed a CMTS-level failure (or impending failure), the parallelizing reverse-IP search algorithm proposed by Drs. Kulkarni and Gehlot can localize in real time the exact CMTS that are affected. This early warning can potentially save Comcast significant expense and improve goodwill by providing an opportunity to identify fault conditions and remedy them before customers even realize that there is a problem with their network connections.



Villanova Center for the Advancement of Sustainability in Engineering (VCASE)

At a Glance

Director: Dr. Robert Traver, Professor of Civil and Environmental Engineering, and Director of the Villanova Urban Stormwater Partnership

Engineering Operations Manager: Sonali Joshi, MS, MA, EIT

Faculty researchers: 24

PhD students: 13

MS students: 9

Undergraduates: 16

Total active grant funding: \$2,761,782

Number of current research projects: 25

Key Research Areas and Lead Faculty

Alternative and Renewable Energy: Drs. Pritpal Singh, ECE, and Amy Fleischer, ME

Biomass Resources and Conversion Technologies: Drs. Justinus Satrio and Michael Smith, ChE

Environmental: Dr. Metin Duran, CEE

Global Learning Community: Bill Lorenz, Sustainable Engineering; and Dr. Pritpal Singh, ECE

Sustainable Infrastructure and Materials: Drs. Leslie Myers McCarthy and Seri Park, CEE

Villanova Urban Stormwater Partnership (VUSP): Drs. Andrea Welker and Bridget Wadzuk, CEE





Leslie Myers McCarthy, PhD, and Seri Park, PhD, observe the aggregate gradation of an asphalt mixture after compaction.



Graduate student Amanda Hess '16 MSCE and Kyle Johnson '13 CE perform monthly maintenance and calibration on field equipment near Fedigan Hall.

PUBLICATIONS AND PRESENTATIONS

For more, see Books, Boards and Awards at www.villanova.edu/media.

As chair of the Task Committee on Flood Safety Policies and Practices, **Dr. Robert Traver** led a national American Society of Civil Engineers (ASCE) summit on this topic in April.

Around the six month anniversary of Hurricane Sandy, Wall Street Journal radio and CBS Philadelphia/KYW 1060 interviewed **Dr. Traver** on the topic of storm recovery.

The VCASE Visiting Lecture Series brought in 10 speakers to address both undergraduate and graduate classes. All lectures were broadcast live and are archived on the VCASE website.

Drs. Leslie Myers McCarthy, assistant professor, and **Seri Park**, Clare Boothe Luce Assistant Professor, co-authored a Transportation Research Board National Cooperative Highway Research Program Synthesis.

PARTNERSHIPS AND COLLABORATIONS

Michael Baker Corporation established the Michael Baker Sustainability Fund, a three-year partnership providing combined support for VCASE and VUSP. In addition to supporting the overall mission of the College, the Fund will provide Baker with access to faculty research, as well as access to students for recruitment as potential interns and full-time employees.

For the second year, VCASE awarded seed grants to its faculty. The grants encourage collaborative and interdisciplinary research between faculty members from different disciplines, and are instrumental in helping faculty conduct research that is still in the nascent stages. The scholarly work developed as a result of this support helps faculty leverage and gain external funding. Five seed grants were awarded during this academic year.

RESEARCH INITIATIVES

Developing Sustainable Methods for Treating Stormwater

Stormwater runoff is a primary pollutant in many of the nation's waterways. Green infrastructure is a preferred and sustainable method for treating the volume and quality of stormwater runoff as it uses naturally occurring physical, biological and chemical processes. For the past decade, the emphasis on stormwater treatment has been on infiltrating runoff; however, this is not always practical or possible due to site conditions, such as poor or contaminated soil and limited space in the urban environment.

With the support of two "Growing Greener" grants from the Pennsylvania Department of Environmental Protection, **Dr. Wadzuk**, associate professor, has been working with several of the Civil and Environmental Engineering Department's graduate students—**Meghan Feller CE '12**, **Amanda Hess '16 MSCE**, **Dominik Schneider CE '11** and **Gerald Zaremba**—to find an alternative stormwater runoff volume reduction strategy within the natural hydrologic cycle. Her team, assisted by **Drs. Traver** and **Andrea Welker**, has found that evapotranspiration (the process of water being evaporated and transpired through soil and plant surfaces) can provide substantial volume reduction in green roofs, bioretention rain gardens and constructed stormwater wetlands. The next step is to develop a simple and effective method that engineers can use when designing and regulating green infrastructure to take advantage of the volume reduction potential of these systems to minimize costs and encourage widespread implementation.



Center for Energy-Smart Electronic Systems (ES2)



At a Glance

Director: Dr. Alfonso Ortega, Associate Vice President for Research and Graduate Programs, and James R. Birlle Professor of Energy Technology

Faculty Researchers: 5

Post-Doctoral Researchers: 2

PhD students: 3

MS students: 2

Undergraduates: 3

Total active grant funding: \$223,000

Number of current research projects: 4

Core Faculty

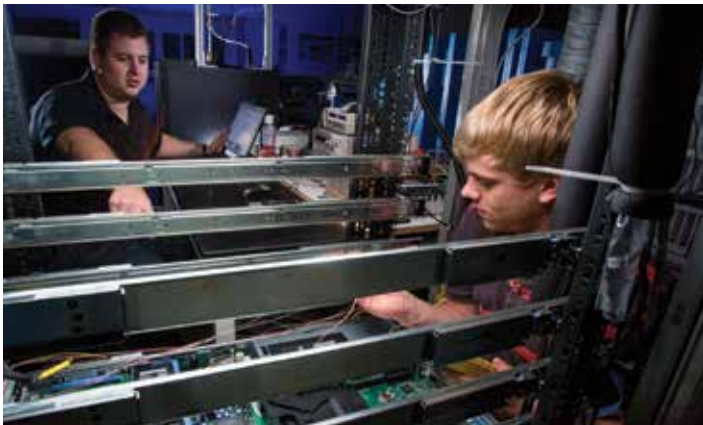
From the Department of Mechanical Engineering

Dr. Gerard F. Jones, professor and senior associate dean for Graduate Studies and Research

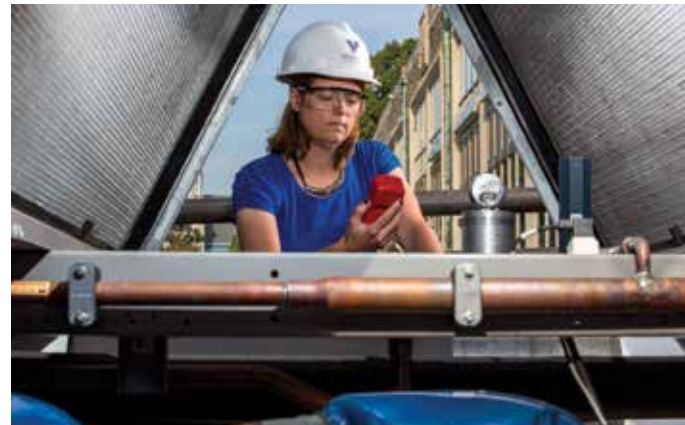
Dr. Amy Fleischer, professor and director of NovaTherm—Villanova Thermal Management Laboratory

Dr. Aaron P. Wemhoff, assistant professor and director of the Multiscale System Analysis Laboratory

Dr. Kamran Fouladi, adjunct professor



ME graduate research assistants Ben Zuk and Daniel Fritch assemble an advanced liquid cooling system for rack based servers used in data centers.



Mechanical Engineering Professor Amy Fleischer, PhD, collects data from Villanova's campus cooling towers.

OVERVIEW

In 2011, the NSF established the Industry/University Cooperative Research Center (I/UCRC) for Energy-Smart Electronic Systems (ES2). A partnership among Villanova University, Binghamton University, The University of Texas at Arlington and the Georgia Institute of Technology, ES2 is committed to developing innovations that will make data centers—the lifeline of today's businesses—more energy efficient, sustainable and cost-effective to operate.

ES2 brings together computer scientists and mechanical and electrical engineers, and links the fields of information technology, dynamic systems control, electronic systems and electronic cooling, to develop methodologies for efficiently operating electronic systems by controlling resources and managing workloads to achieve optimal energy consumption. This holistic approach to the development and design of energy-smart electronic systems could translate into millions of dollars in savings and a much “greener” industry.

RECOGNITION AND DISTINCTION

Ian Dardani '13 ME earned the award for Best Poster at the October 2012 I/UCRC ES2 meeting. Titled “Analysis of Air Cooling Effectiveness for 1U Servers,” the poster features the work Ian performed under the advisement of Dr. Aaron Wemhoff.

At the April 2013 I/UCRC ES2 meeting, the Villanova team earned the Best Poster award for “Thermodynamic Modeling of Data Center Cooling Systems, Part 2: VTAS Component Models.” The poster team included engineering PhD student **Marcelo del Valle**, **Kayvan Abbasi '15 MSME**, **Drs. Wemhoff** and **Alfonso Ortega**.

PARTNERSHIPS AND COLLABORATION

In fall 2012, Villanova University hosted the regional meeting of 7x24 Exchange, one of the most important interest groups in the data center industry. Alumnus **Tom Reusche '83 EE** is president of the local chapter. A number of Villanova alumni attended the regional meeting, including **Dennis Cronin '74 VSB**, a 7x24 Exchange founder and one of the best known data center professionals in the country.

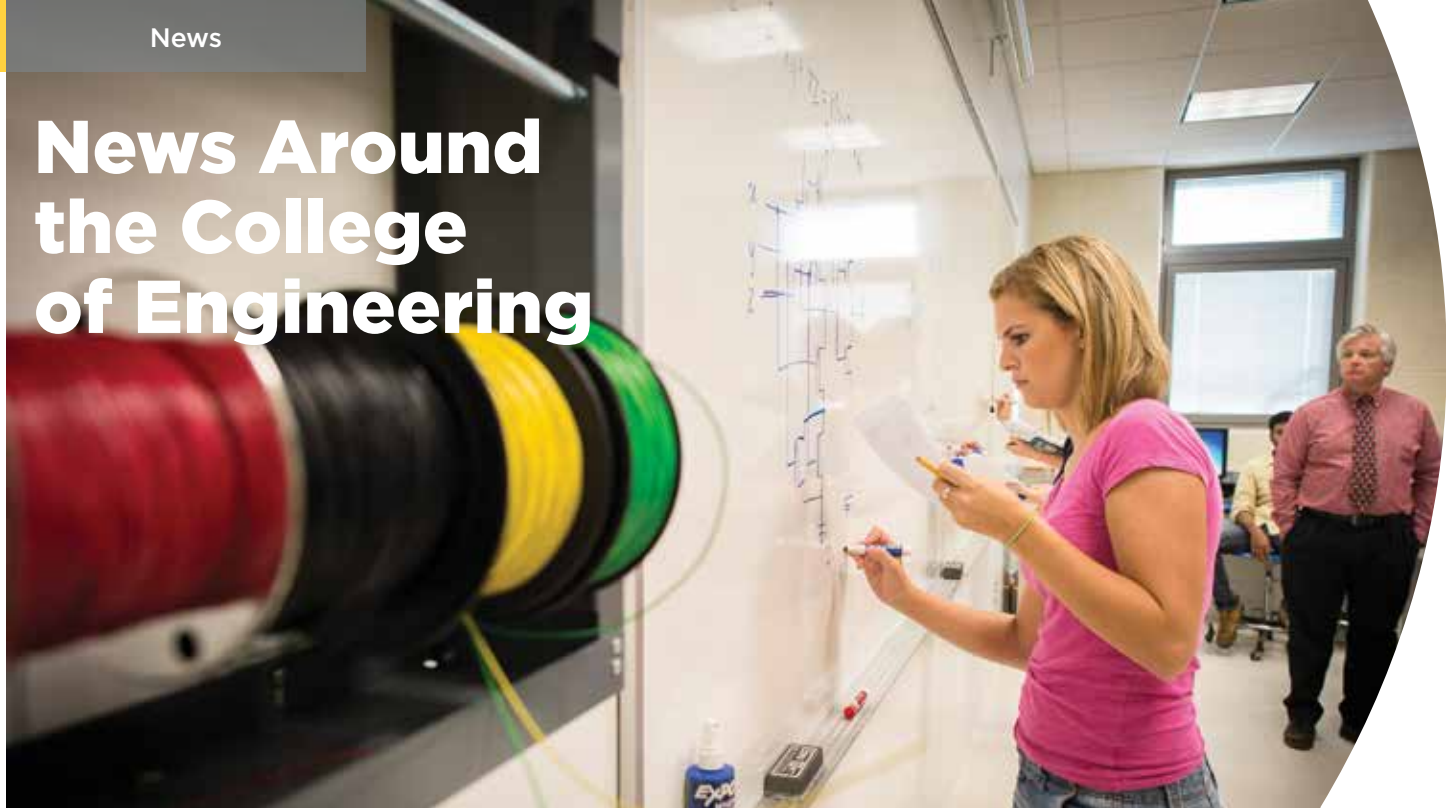
In spring 2013, Dr. Ortega was one of four keynote speakers for the 7x24 Exchange national meeting.

RESEARCH INITIATIVES

Chip to Cooling Tower Thermodynamic System Simulator (VTAS)

Drs. Wemhoff, Kamran Fouladi and **Ortega** are developing computational models of cooling system equipment used to remove heat from data centers. These models, constructed from individual components (servers, racks, CRAC, chiller, cooling tower and air side economizer), have been implemented into a computational framework called the Villanova Thermodynamic Analysis of Systems (VTAS). VTAS is a GUI driven tool that enables users to analyze the thermodynamic efficiency of data center cooling systems using a flow network modeling approach. It can predict flow distribution, and key air temperatures and pressures in dynamically operated, air cooled data centers. More importantly, it can predict the level of inefficiencies in data center components by tracking the thermodynamic exergy, a measure of energy quality. By identifying regions of high exergy destruction, VTAS can be used to isolate inefficiencies within cooling systems. The latest version of VTAS enables the modeling of hybrid air-liquid or liquid only cooled data centers, which potentially represent the next generation of data center cooling approaches.

News Around the College of Engineering



Recognizing the College's Commitment to Women in Engineering

The Henry Luce Foundation awarded a \$500,000 Clare Boothe Luce (CBL) Program Grant to the College of Engineering in support of three CBL female professorships. This grant—which marks the first time the program has awarded three CBL professorships to the same university in one year—recognizes the College's ongoing commitment to encouraging and supporting women in engineering.

Three Clare Boothe Luce Assistant Professors joined the faculty in 2012–2013: **Dr. Seri Park**, Civil and Environmental Engineering, **Dr. Nisha Kondrath**, Electrical Engineering and **Dr. Verica Radisavljevic-Gajic**, Mechanical Engineering.

In May, The Philadelphia Inquirer and local radio station KYW 1060 AM both featured stories about Villanova University's female engineering graduates. Thirty percent of the College's undergraduates are female compared to the national average of 18.2 percent.

Engineering Entrepreneurship Program Grows in Popularity

In 2008, the College of Engineering launched its unique minor in Entrepreneurship for Engineers, a program that has grown each year. Led by **Edmond J. Dougherty**, more than 40 students signed up for the Engineering Entrepreneurship minor this year, almost double the year before. Nearly 20 percent of the students in the rising sophomore engineering class are enrolled in the program, making it the largest minor in the College.

In fall 2012, Villanova School of Business students participated for the first time in the Engineering Entrepreneurship course Creativity and Innovation. Campus-wide interest has prompted the College to offer three sections of the course in fall 2013, opening it to students in any major.

Encouraging Interdisciplinary Learning

In May, Drosdick Endowed Dean of Engineering **Gary A. Gabriele, PhD**, brought together the Engineering Advisory Board (EAB) with **Patrick G. Maggitti, PhD**, the Helen and William O'Toole Dean at the Villanova School of Business, as well as members of his advisory council. The purpose for the meeting was to give each board a broader view of what is going on across the campus in teaching and research, as well as to communicate the increasing emphasis on collaboration and opportunities for cross-college learning.

To demonstrate his commitment to interdisciplinary learning, University President, **The Rev. Peter M. Donohue, OSA, PhD, '75 LAS**, invited teams of faculty from different disciplines to develop proposals that promote cross-college collaboration and enhance the University's academic environment. The Inaugural Award for the President's Grant Proposal Program for the Development and Implementation of Interdisciplinary Courses was presented to a team of four faculty members, one from each college/school. Frank Falcone, associate professor of Civil and Environmental Engineering, represented the College of Engineering on the project: "Improving Student Learning Through Interdisciplinary Project-Based Learning Experiences." Their work led to the interdisciplinary course International Technology

and Sustainability. Engineering Service Coordinator and Adjunct Professor **Jordan Ermilio '98 ME, '06 MSWRE** was instrumental in developing and teaching the course, which was first offered in spring 2013.

Air Products Donates \$74,000 to College

While many companies have left an impact on the College of Engineering, few have left the indelible mark of Air Products. For more than 50 years, this world-renowned manufacturer has demonstrated its commitment to our students, faculty, research and facilities, and in November 2012, Air Products made yet another generous donation. On behalf of the company, Villanova alumnus and Air Products manager **Joe Lamack '87 ChE** presented a check for \$74,000 to Dean Gabriele. During the past six years, Air Products has donated approximately \$400,000 to the College. Read more about Air Products' commitment to the College in "An Invitation to Engage," the feature story on Page 2.

Ward Lecturer Offers Students a Broader View of Design

The College of Engineering capped off National Engineer's Week 2013 with a presentation by world-renowned designer and entrepreneur Mike Nuttall. Nuttall spoke on "Design, Innovation and Entrepreneurialism" as part of The Patrick J. Cunningham Jr. and Susan Ward '80 Endowed Lecture Series. Addressing more than 300 students, faculty and visitors, Nuttall reflected on his decades in the design industry where he is known for strengthening the visual appeal of technology products to create a strategic marketing advantage for his clients.

Dean Gabriele was pleased with the perspective offered by Nuttall's presentation. "When engineers think of design, they ask, 'Will it function?;' whereas an industrial or product designer like Mike considers how the design will present itself to the user. The intersection of these two concepts of design is something that students rarely get to see," he says.



Verica Radisavljevic-Gajic, PhD, Clare Boothe Luce Assistant Professor of Mechanical Engineering, explains a concept to Patrick Rose '13 ME.



Demonstrating creativity and entrepreneurship, as well as the importance of interdisciplinary learning, Philosophy major Paola Gadala-Maria '15 teamed up with Electrical Engineering student Thomas Vohlberg '15 to create Mobile Rays for Pitch Day 2013.



More than 300 College of Engineering and Villanova Business students attend the 2013 Ward Lecture Series with guest speaker Mike Nuttall.

Graduate Studies Update

“Pharmaceutical, biotech and medical device companies were very positive and supportive of this new program.”

Biochemical Engineering program
Associate Director **Dr. Noelle Comolli**



Designed with the input of industry experts, Villanova's Biochemical Engineering degree will ease the transition from classroom to career.



Those with a graduate degree in cybersecurity will possess the skills necessary to work in areas of vital importance to corporations, governments and society.

“Our graduates will be equipped to participate in the evolution of future cyber technology.”

Cybersecurity program
Director **Dr. Richard Perry**

COLLEGE ADDS NEW GRADUATE PROGRAMS IN RAPIDLY GROWING FIELDS

The College of Engineering has introduced two new graduate programs. Led by **Drs. William J. Kelly**, and **Richard Perry** respectively, Master of Science programs in Biochemical Engineering and Cybersecurity are available to full-time and part-time students with in-class and E-Learning options.

Biochemical Engineering

The Master of Science in Biochemical Engineering program was created to meet the needs of pharmaceutical and biotechnology companies. A niche within the field of biomedical engineering—which is expected to grow at a rate of 62 percent during the next 10 years—Villanova's biochemical degree will focus on the design and optimization of biopharmaceutical facilities, processes and products. Dr. Kelly, associate professor of Chemical Engineering, says, “This new degree allows young engineers and scientists interested in pursuing a career in the pharmaceutical industry to develop skills that will benefit them in positions ranging from drug discovery scientist at a small biotechnology company to process or facility design engineer at a large pharmaceutical company.”

Associate Director **Dr. Noelle Comolli**, assistant professor of Chemical Engineering, notes that focus group panel discussions were held with local companies to gauge their interest and receive feedback on the course plan. “They were pleased that our program would offer courses like Global Pharmaceutical Industry, Biopharm Facility Design and Drug Delivery Design,” she says.

Cybersecurity

The Master of Science in Cybersecurity program was developed to provide companies with cybersecurity experts in a time where information security is paramount. According to a 2013 CIO Journal article, jobs in cybersecurity are growing at a pace 12 times the national average. Dr. Perry, associate professor of Computer Engineering, explains, “There is a clear need for engineering professionals trained in cybersecurity to design and build secure systems and software, and to monitor and respond to unknown and sophisticated attacks.”

The only Cybersecurity program in the region that can be earned entirely online, the new master's degree is an extension of the existing cybersecurity graduate certificate in the computer engineering program. The curriculum is composed of core cybersecurity courses plus electives from computer engineering, computer science and mathematics.

To learn more about any of the College's nine master's degree programs, visit www.gradengineering.villanova.edu or send an email request to grad.engineering@Villanova.edu.

Graduate Student Snapshots



Michael Cunningham '14 MSSE

Master of Science in Sustainable Engineering, part-time

Education: Bachelor of Science in Mechanical Engineering, Temple University, 1985

Work Experience: With decades of industry experience, Cunningham currently works for Devine Brothers Inc., a mechanical contracting company in King of Prussia, Pa. As project manager/

estimator/green energy specialist, his job entails performing energy analyses, monitoring and benchmarking for commercial businesses in order to help them reduce energy costs.

Why Sustainable Engineering? In Cunningham's line of work, sustainability is increasingly important. He says, "Sustainable engineering gives me a broad look at how to save energy and operate in a sustainable manner. I have the 30,000 foot view, as well as the 30 foot view, which is important since I have to operate at all levels."

Why Villanova? Before beginning his graduate studies, Cunningham did his research. And what he found is that Villanova has a program unlike any other. He reflects, "Other schools seemed to be more policy-oriented. Villanova's program trains you on how to get the job done; it doesn't just present the idea of sustainability. Through this program I have had the opportunity to learn about and perform lifecycle assessments on products and processes, and have become knowledgeable about sustainable materials."

Cunningham is very happy with his Villanova education, and feels like he learns something new in every class he takes. "I equate attending class in this program to a TED talk, because the faculty are truly subject matter experts working in the industry. The difference is that I get to be a part of the conversation, not just a listener."

How has It Impacted His Career? "In a word, exponentially." Even for a well-established and successful professional like Cunningham, the knowledge he's acquired through this program has positively and significantly affected his career trajectory. He explains, "It has given me a definable skill set, and that's something everyone needs to advance their career. Perhaps most importantly, it lends to my credibility. When I meet with clients at a high level, I can discuss sustainability in minutiae, and the client is confident that I know what I'm talking about."

Learn more at www.vusustainableengineering.com.



Marcelo Del Valle

PhD Candidate

Adviser: Dr. Alfonso Ortega, Associate Vice President of Research and Graduate Programs

Education: Master of Science in Mechanical Engineering, University of Nevada-Reno, 2008

Research: Del Valle is involved in data center and energy efficiency research, specifically the transient behaviors of hybrid air liquid cooling systems.

Companies like Facebook, Comcast, Google and Microsoft are particularly interested in this research given that the inefficient energy use of their massive data centers costs them a significant amount of money over time.

Del Valle's research projects are sponsored by companies that provide him with a company mentor. Del Valle sees the value in these partnerships: "This collaboration provides companies with research capabilities and helps them to identify qualified potential employees. At the same time, Villanova students have the chance to network with industry contacts while working on real-world projects."

Service: In addition to Del Valle's research projects, he also has embraced the opportunity to travel to Panama on a Villanova service trip. While there, his team fixed a water network problem in the village of Wacuco, ultimately improving the quality of life for the local residents.

Why Villanova? Del Valle's decision to pursue his PhD at Villanova University was in large part due to research opportunities with Dr. Ortega, as well as the College's reputation for excellence in education. Del Valle found that while some universities were known for outstanding research, and some for outstanding education, none combined these two as well as Villanova. "Academic excellence coupled with stimulating research on current issues is what makes Villanova stand apart from other schools in the region and across the country," says Del Valle.

Future Goals: Del Valle hopes to defend his thesis in 2014 and plans to continue work in the data center industry. He has made industry contacts through his research projects, and believes this will provide him with career opportunities. As Del Valle succinctly puts it, "Villanova is a fantastic place to work and learn, and acts as a springboard for your career."

Learn more about the PhD program at www.gradengineering.villanova.edu.

STEM Outreach



LEAD students build structures in civil engineering class.



Future engineers enjoy a firsthand look at structural engineering through the NovaCANE program.

A Commitment to Outreach

The acronym STEM (Science, Technology, Engineering and Math) used to be familiar only to educators and those working in high-tech disciplines. Now, STEM-related stories have become commonplace as the federal government responds to U.S. industry leaders' concerns about the lack of qualified American employees in these areas.

Villanova University's College of Engineering has been involved with STEM education outreach for more than a decade. Its nine distinct STEM programs reach more than 650 students from sixth through twelfth grades annually.

VESTED (Villanova Engineering, Science, and Technology Enrichment and Development)

brings 60 Philadelphia-area high school students to campus for engineering experiences, college preparation classes, team-building opportunities and discussions with industry leaders. Reports have shown that VESTED improves performance in all school subjects and increases college attendance.

The national Leadership Education and Development (LEAD)

Summer Engineering Institute program invites 30 academically gifted minority students from across the country to live on Villanova's campus for three weeks. They engage in hands-on engineering projects, learn about the University and visit industry sites.

NovaCANE (Villanova Community Action by New Engineers)

takes 30 Villanova students to area middle schools where they conduct experiments and provide teacher education. Participating classes later visit campus for a day of hands-on engineering activities. The program reaches about 200 local school students.

FIRST (For Inspiration and Recognition of Science and Technology)

Tech Challenge is an annual robotics partnership between Villanova and the School District of Philadelphia. The School District hosts the regional fall kick-off, and College of Engineering students serve as mentors prior to the competition, which

takes place five months later. The event draws more than 300 competitors.

MATE (Marine Advanced Technology Education), a national, NSF-supported organization, partners with Villanova's Mechanical Engineering faculty and students to host its regional Underwater Remotely Operated Vehicles contest. Held in collaboration with the School District of Philadelphia, this event attracts about 300 students from 35 schools and involves 100 Villanova volunteers and industry partners.

In addition to its work around the world, **Villanova Engineers Without Borders** sends teams of undergraduate and graduate students to area schools and clubs.

The purpose of **HE2ARTS (Health Education and Enrichment in Arithmetic, Technology and Science)** is to assist Catholic schools in Brooklyn, NY enrich existing science and math curricula. Villanova faculty and students provide demonstrations to middle school students and offer teacher training. They also host a visit to Villanova for a day of hands-on engineering projects and activities.

Each spring, about 80 girls in grades 5-8 come to campus for **Girl Scouts Day of Engineering**.

Villanova Engineering faculty partner with local high school teachers on engineering research projects and assist them in developing **STEM teaching modules for the classroom**.

For more information about the College's STEM program, contact Dr. Stephen Jones, Associate Dean for Student and Strategic Programs at 610-519-5439 or S.Jones@Villanova.edu.

International Service Learning: A Global Commitment

The Why, What, Where and How

Why is engineering service learning important?

In its mission statement, Villanova University College of Engineering states that it is committed to providing educational opportunities that reinforce technical excellence, Augustinian values and the pursuit of knowledge with a focus on ethical leadership and community engagement. In what he sees as a natural extension of the College's mission, Director Jordan Ermilio '98 ME, '06 MSWRE describes the purpose of the service learning program: "Engineering service projects provide unique learning opportunities that change how we see and understand the world around us. Complex challenges like providing access to water and health care become real. Poverty is no longer something that happens somewhere else, it has a name and a face. Students involved with these projects become more excited about learning because they have seen how their engineering expertise can be applied to solve complex global problems."

In addition to offering students the opportunity to use their engineering skills by providing technical assistance to international partners, the College's service learning program also encourages innovation and full immersion in the host community's problems. Ermilio explains, "If you want to learn how to swim, you have to get in the pool." An important aspect of this work also entails building the capacity of international partners by providing training workshops that focus on long-term sustainability.

What is engineering service learning?

Participation in service learning may include volunteering with one of the international project partners during semester break, working on an in-class project or being part of a student club that focuses on community engagement through an engineering service activity. During the spring 2013 semester, 125 Villanova students were involved on a volunteer and/or curricular level, and in the fall 2013 semester, nearly 200 students are slated to participate. Combined with involved faculty, staff and graduate students, more than 350 people within the College of Engineering have decided to "get in the pool" and directly engage in these complex challenges.

Where is the College involved in service learning projects?

The College of Engineering currently is working with 11 organizations in six different countries (not including the United States). The following are among the most recent projects:

In **Nicaragua**, teams work on water supply projects with Water for Waslala, renewable energy systems with the Association for Integrated Development and the Nova Mobile Health initiative in collaboration with the country's Ministry of Health and Universidad Nacional de Ingeniería (National Engineering University).



Villanova students and faculty in Cambodia discuss the day's work.



The Water for Waslala project continues to address the region's water system supply issues.



In Panama, community residents discuss a water resources plan with Villanova Engineers.



The vastness of the region makes the provision of engineering services challenging in the Philippines.

“More than 350 people within the College of Engineering have decided to “get in the pool” and engage in these complex challenges.”

Jordan Ermilio, Director of Service Learning

Villanova Engineering groups in **Panama** continue to work with Father Wally and his Cheypo-Bayano Mission in Wacucu to advance development projects related to sustaining water supply infrastructure by creating a water resources master plan for the region.

With the generous support of the Caramanico Foundation, teams in Cambodia are introducing early education programs to the remote region of Ratanakiri. They are providing technical assistance and engineering analysis for the design of a preschool building. Villanova Engineering teams also are working with the Golden West Humanitarian Foundation to prototype remote control vehicles that can detect and remove unexploded ordinances, a problem, which has plagued the country for more than 40 years.

In the **Philippines**, teams are working with a small municipality to assist with solid waste management issues and to provide engineering services related to a sanitary landfill design.

How is this being done?

“Integrated engineering service learning is one key to the success of this program,” says Ermilio who is always looking for ways to relate service work to the classroom. Each department in the College has its own unique way of connecting students to these learning opportunities. Some like Mechanical Engineering have created courses specifically to address a particular issue. Dr. Gerard Jones, associate dean for Graduate Studies and Research, voluntarily teaches a Gravity Driven Water Networks course in the evening that introduces the fundamentals of providing water supply to remote communities in Nicaragua. Dr. David Dinehart, assistant chair of Civil and Environmental Engineering, offers special sections of the Department’s Capstone Design course where students work on the structural design of the Caramanico School in Cambodia. Professor Frank Falcone has incorporated the Panama project into his Water Resources Engineering course.

This integrated approach has taken hold across campus. This past year, Ermilio and Falcone taught an interdisciplinary course where business, engineering and environmental science students worked on teams in a hybrid class that combined lectures and seminar projects. The spring 2014 course will also include nursing students, making it the first time that all four of the University’s undergraduate schools/colleges have collaborated in the classroom. You can read more about the increasing emphasis on cross-college collaboration in “Encouraging Interdisciplinary Learning” on page 26.

How can I support this work?

From supporting integrated service learning at the classroom level to providing pay-it-forward funds for students to engage in short-term assignments, there are a variety of ways to participate in the program and support these initiatives.

To learn more, visit www.villanova.edu/engineering/service/learning or contact Jordan.Ermilio@Villanova.edu.

External Partnerships

Relationships Benefit Partners, Engineering Students and Society

Each year the College of Engineering partners with corporations, foundations, government agencies and NGOs and engages in activities from simple recruitment to advanced research.

With a commitment to mutually-beneficial relationships, specific areas of partner involvement include:

- Support for the College's STEM outreach and other service programs
- Student scholarships and faculty fellowships
- Student Internships
- Funded senior design projects (in-house co-ops) in the Multidisciplinary Design Lab (MDL)
- Sponsored faculty-led research projects
- Guest lectures or serving as judges at student competitions
- Gifts that support laboratory facilities and capability expansions, or gifts-in-kind of equipment
- Service on departmental or College advisory committees

Here are a few examples of the College's "win-win" engagements with partners in the public and private sectors:

Air Products

- Supports departmental initiatives and STEM outreach, presents guest lectures, and participates on leadership boards and committees. Air Products hires more Villanova engineering students as interns and full-time employees than any other corporate partner.

Boeing and Lockheed Martin

- Provide funding for scholarships, departmental initiatives and STEM outreach. Support senior design projects on autonomous vehicles and cybersecurity. Participate in guest lectures, mentoring and service on College boards and committees.

Caramanico Foundation and Golden West Humanitarian Foundation

- Support service learning opportunities in Cambodia, including early childhood education, unexploded ordinance removal and remediation and senior capstones in structural and mechanical engineering.

Dow Chemical Company

- Sponsors 30 high-achieving 11th and 12th graders in the LEAD (Leadership Education And Development) Summer Engineering Institute at Villanova University.

Office of Naval Research

- Provides ongoing support for fundamental research on the integration of physics and computational intelligence to develop novel diagnostic techniques to prevent catastrophic failure in nonlinear dynamic systems.

PA Department of Environmental Protection

- Awards grants for Villanova Urban Stormwater Partnership research on evapotranspiration and stormwater control measures, involving faculty, undergraduate and graduate students.

RT Logic

- Through the MDL, supports an ECE senior capstone project on an advanced channel simulator and provides summer internships.

For more information about these or related engagement opportunities, please contact Keith Argue, Assistant Dean, External Relations, College of Engineering, at 610-519-5024 or Keith.Argue@Villanova.edu.



Villanova Engineering students at the Caramanico school in Cambodia.



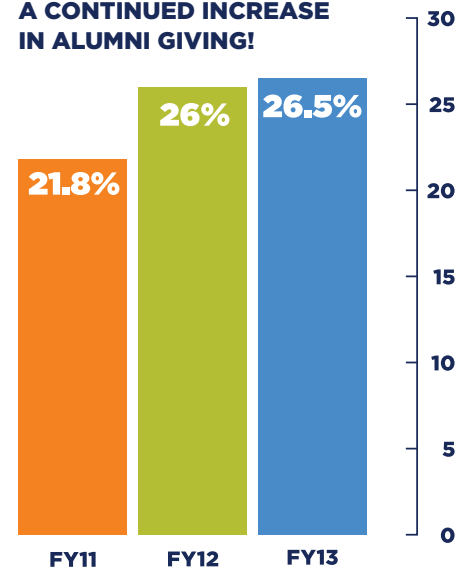
Air Products hires Villanova graduates like Bridget Nyland '11 ChE and Thomas Dorney '11 ChE —a win-win for both students and the company.

A Foundation of Support

THANK YOU!

The College of Engineering gratefully acknowledges our donors for their generous contributions during the 2013 fiscal year.

A CONTINUED INCREASE IN ALUMNI GIVING!



Percentage of College of Engineering alumni donating to the University

Endowment Gifts

Endowment gifts create a lasting legacy of support for the College of Engineering and may be named for the donors, or in honor or memory of someone, such as parents or a cherished professor. These gifts are fundamental to the health of the University and the College of Engineering as they reduce dependence on tuition revenues, provide a predictable source of income, enable the development of innovative programs, and attract exceptional students and faculty.

We would like to thank the following individuals for their exceptional generosity in creating the endowed funds highlighted below during the 2013 fiscal year. For a complete list of endowment gifts designated to the College of Engineering, visit our website at www.villanova.edu/engineering/gift.html. The minimum threshold to endow a fund at Villanova University is \$100,000.

William C. and Susan W. Allen

Susan W. and William C. Allen '69 Endowed Fund for Chemical Engineering

Robert J. and Karen Z. Bettacchi

Karen Z. and Robert J. Bettacchi '64 Endowed Engineering Scholarship

Coleen M. Burke-Finney and Michael J. Finney

Coleen M. Burke-Finney '90, '99 and Michael J. Finney Endowed Scholarship in Support of the Luckow Scholarship Challenge Program

Joseph B. Callaghan

Joseph B. Callaghan '59 Endowed Scholarship Fund

Thomas A. and Anne M. Caramanico

Anne M. and Thomas A. Caramanico '71 Endowed Service Learning Fund

Franklin J. Cona '61

Christopher J. and Frances D. Cona Tau Beta Pi Endowed Scholarship in Support of the Luckow Scholarship Challenge Program

William N. and Maureen E. Dooley

William N. and Maureen E. Dooley Endowed Service Learning Fund

Richard '69, '70 and Marilyn Faris

Faris Family Endowed Fund for Engineering Outreach

William J. Galm

William J. Galm '60 Endowed Engineering Scholarship

John '85 and Patricia '84 Hartner

Hartner Family Endowed Integrated Service Learning Fund

John F. Igoe

John F. Igoe '63 Endowed Scholarship in Support of the Luckow Scholarship Challenge Program

David E. and Karie Lewicki

David E. '98, '00 and Karen Lewicki Endowed Scholarship for Young Alumni in Support of the Luckow Scholarship Challenge Program

Paul J. Stroud '89

Edward A. Stroud '59 Endowed Scholarship in Support of the Luckow Scholarship Challenge Program

To learn more about creating an endowed fund, contact Cynthia Rutenbar, Director of Development for the College of Engineering, at 610-519-6973. For other ways to give, see Page 39.



Michael J. Finney and Coleen M. Burke-Finney '90, '99

Annual Gifts

Annual gifts to Villanova University and the College of Engineering provide critical resources that directly impact our students and faculty. Make a gift now through the secure online gift form at www.villanova.edu/advance/development/makeagift. Or, call 1-800-486-5244.

An ongoing list of donors can be found on the College website at www.supportvillanova.com.

Bequests and Planned Gifts

The 1842 Heritage Society recognizes and honors individuals who have made a bequest or planned gift. These donations may be testamentary gifts, life-income gifts or the transfer of assets. We invite you to visit www.villanova.edu/plannedgiving to learn more about the benefits of joining the 1842 Heritage Society.

We welcome the following alumni to the 1842 Heritage Society:

Anonymous (2)

H. Gerard '51 COE+ and Patricia Donohie

Stephen R. '72 COE and Louise A. Fitzgerald

Robert J. '50 COE and Marie A. Fitzmyer

Theodore R. '58 COE and Deborah Flint

Andrea Bawduniak '83 COE and Kevin '82 LAS Gosselin

Joseph L. '63 COE and Kathleen D. '64 CON Hagan

John F. '63 COE and Peggy Igoe

David E. '98, '00 COE and Karie Lewicki

William G. '62 COE and Suzanne Meinhardt Jr.

†Deceased



DONOR SPOTLIGHT:

**Richard K. Faris '69 CE,
'70 MSCE**

Sharing the power of education

Richard Faris is a man of strong beliefs. And he is someone who demonstrates those beliefs with his time, talents and financial contributions.

Faris was a non-traditional student—married with a child—who carved

out time to attend class and do homework because he knew getting his undergraduate degree, and then his master's, in civil engineering was crucial to his future success.

"I think it's important that everyone has an opportunity to get an education," Faris says. "It's important to reach people early on and impart the importance of having an education and gaining skills."

It's that deep-seated belief in the power of education to transform lives, and his understanding of the field of engineering and its importance in today's world that compelled Faris to endow a fund in Villanova University College of Engineering this past March. The \$200,000 commitment supports initiatives to introduce engineering to at-risk youth in the Philadelphia region and to emphasize the importance of education.

The Faris Family Endowed Fund for Engineering Outreach will identify, encourage and support local students, in a way that may be lacking in their lives.

"We want to encourage smart kids to go to school ... in places where that might not always be encouraged. Educating them is important for the future of our society," Faris says. "It's important for more people—including more women—to go into engineering."

As an undergraduate Civil Engineering major at Villanova, Faris developed an interest in transportation that led him to work with PennDOT as a graduate assistant. There, he learned about computers.

After 13 years working in the transportation industry, planning, designing, managing and controlling capital projects, and developing transportation network simulation systems, Faris started Primavera, a software company that he later sold to Oracle. Today, he is Senior Vice President-Customers for Oracle's Primavera Global Business Unit. When he has some free time, he speaks at a class on entrepreneurship at the University.

"I still work and don't plan to retire," he says. "It's important for those who are successful to give something back, to encourage something better for others. As I had mentors and opportunities, we need to make sure others have them too."

To learn how you can make a financial contribution to the College of Engineering, contact: Cynthia Rutenbar, Director of Development for the College of Engineering, Cynthia.Rutenbar@Villanova.edu or **Sean Grieve,** Major Gifts Officer, Sean.Grieve@Villanova.edu, or **Bryce Gorman,** Major Gifts Officer, Bryce.Gorman@Villanova.edu

Alumni Spotlight

Since 1909, when the College awarded its first engineering bachelor's degrees, our alumni have distinguished themselves and helped change the world. In this issue, the College shines an alumni spotlight on:



Elizabeth (Liz) Porter '93 EE

She found balance at VU

A sense of balance is important for Liz Porter, in both her professional and personal lives.

As a high school senior, she resisted the idea of attending college, preferring to sing with an all-girl rock band. Her mother had other ideas, however, and citing Porter's affinity for science, math and physics, encouraged her daughter

to apply to Villanova University College of Engineering.

After an agreed-upon gap year, Porter began her college education as an electrical engineering major, offsetting the rigorous coursework with participation in the glee club, and opting for musical theatre and a diverse selection of liberal arts electives.

"Everything at Villanova seemed approachable," remembers Porter. "I felt a balance, and fell in love with the mix I was able to have."

She also fell in love with a fellow student whom she met in a religion class and married shortly after his graduation. Adam Porter '94 is currently in Afghanistan on a military deployment. "Adam was a history major, and we would never have met if I hadn't had the opportunity to take that elective."

Porter has performed various functions in her long career with Lockheed Martin, and currently is the Program Director, Headquarter IT Programs for Information Systems & Global Solutions-Defense in Alexandria, Va. She earned her MBA from the University of Colorado in Colorado Springs, Colo.

"The College of Engineering shaped me and brought me where I am today," Porter says. "I especially remember my classes with Dr. Pritpal Singh, who taught me photovoltaics." She credits her experience in his classroom with landing her first job, working on designs for satellites and their renewable energy systems.

"My experiences at Villanova have opened so many doors for me ... I even won an award at work for empowering women in the study of energy and engineering," she says. "The diversity of my education, and the broad exposure I had to so many subjects and people truly shaped who I am today."



John J. Stranix '78 CE

Learning the team approach at VU

As a child of Philadelphia, John J. Stranix always had Villanova University on his radar screen but he was unsure about his degree—engineering seemed like a reach.

"It was my Navy scholarship, requiring me to be an engineer, that matched up with what was offered at Villanova," he remembers. "The NROTC classes helped me understand my engineering classes

and gave me confidence in my ability to manage the curriculum."

Stranix credits his engineering professors with knowing how to ensure their students gained the overall understanding they needed. "Villanova professors are actually concerned about their students and help them realize their full potential."

After earning his bachelor's degree in civil engineering, Stranix served as a Naval Company Commander during deployments to Spain and Puerto Rico, as well as in the contracting office at the New London Naval Submarine Base in Groton, Conn. Stranix and his wife, Regina, also a VU 1978 graduate, have four children and live in Virginia.

In 2000, Stranix established Stranix Associates, LLC, which provides project management and owner representation services on unique, large-scale projects. His philosophy is to use a team approach in all his projects, something he learned while at Villanova.

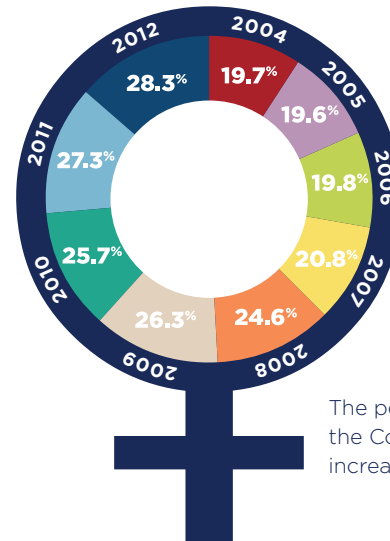
"Villanova taught me engineering, but also so much more. The NROTC along with my liberal arts electives made me a well-rounded individual," he explains. "You have to be adept at your specialty, but also need to know how to relate to all kinds of people." Stranix credits the success of his business to effective relationship-building, which promotes communication and understanding throughout the life of the client's project.

In February, Stranix will be keynote speaker for the Patrick J. Cunningham Jr. and Susan Ward '80 Endowed Lecture Series in Engineering. He will encourage today's engineering students to learn that they are part of a larger system. "Even though they may be working on a small part of a larger system or project, they should always try to get a better understanding of how their part fits within the whole. Once they see how it fits and how other parts are related, they will start to understand what it takes to advance and manage larger portions of a project."

College of Engineering by the Numbers



Villanova Women in Engineering



The percentage of female students in the College of Engineering has steadily increased during the past eight years.

DID YOU KNOW?

For the 2012–2013 academic year, the College of Engineering received 2,190 undergraduate applications, 51.3 percent of which were accepted. Ninety-five percent of those students who enrolled were in the top 25 percent of their high school graduating class.

Retention

Incoming class of 2012 returning to the College in fall 2013: **90 percent**

Degrees Conferred at May 2013 Commencement

Total Bachelor of Science Degrees: 232

BS Chemical Engineering: **73**

BS Civil Engineering: **43**

BS Computer Engineering: **17**

BS Electrical Engineering: **15**

BS Mechanical Engineering: **84**

Total Master of Science Degrees: 126

MS Chemical Engineering: **13**

MS Civil Engineering: **39**

MS Computer Engineering: **3**

MS Electrical Engineering: **10**

MS Mechanical Engineering: **29**

MS Sustainable Engineering: **19**

MS Transportation Engineering: **1**

MS Water Resources: **12**

Total Doctoral Degrees: 6

Career Choice, College of Engineering*

Employed full-time: **77 percent**

Full-time graduate school: **20 percent**

Part-time graduate school or part-time employment: **1 percent**

Total: **98 percent**

Average Starting Salary by Major*

Chemical Engineers: **\$60,780**

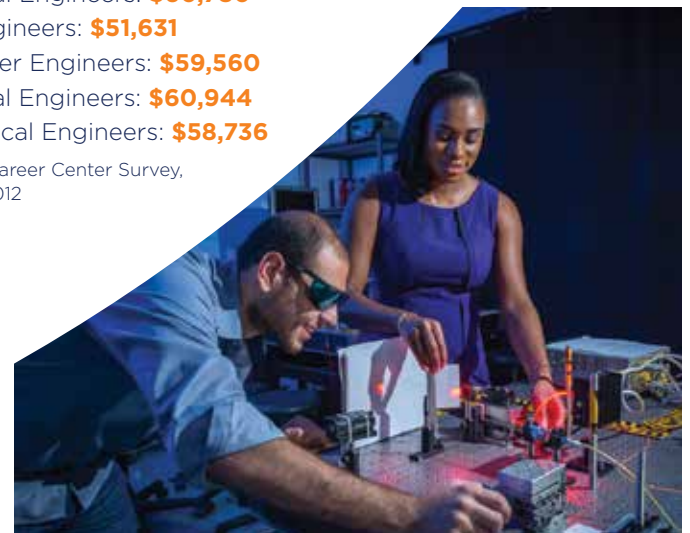
Civil Engineers: **\$51,631**

Computer Engineers: **\$59,560**

Electrical Engineers: **\$60,944**

Mechanical Engineers: **\$58,736**

*Source: Career Center Survey, Class of 2012





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Our Mission

Villanova University College of Engineering is committed to an educational program that emphasizes technical excellence and a liberal arts education within the framework of the University's Augustinian and Catholic traditions. As a community of scholars, we seek to educate students to pursue both knowledge and wisdom, and to aspire to ethical and moral leadership within their chosen careers, their community and the world. We value a spirit of community among all members of the College that respects academic freedom and inquiry, the discovery and cultivation of new knowledge, and continued innovation in all that we do.

About Villanova University

Since 1842, Villanova University's Augustinian Catholic intellectual tradition has been the cornerstone of an academic community in which students learn to think critically, act compassionately and succeed while serving others. There are more than 10,000 undergraduate, graduate and law students in the University's five colleges—Villanova University College of Liberal Arts and Sciences, Villanova School of Business, Villanova University College of Engineering, Villanova University College of Nursing and Villanova University School of Law. As students grow intellectually, Villanova prepares them to become ethical leaders who create positive change everywhere life takes them.

Accreditation

The undergraduate programs in chemical engineering, civil engineering, computer engineering, electrical engineering and mechanical engineering are accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

Ranking

In 2013, U.S. News & World Report once again ranked Villanova University College of Engineering in the top 10 in the nation in the Best Undergraduate Engineering Programs category among schools that award primarily bachelor's and master's degrees.

College of Engineering Degrees

BS in Chemical Engineering

BS in Civil Engineering

BS in Computer Engineering

BS in Electrical Engineering

BS in Mechanical Engineering

Five-year combined bachelor's–master's degree program

MS in Biochemical Engineering ***NEW!**

MS in Chemical Engineering

MS in Civil Engineering

MS in Computer Engineering

MS in Cybersecurity ***NEW!**

MS in Electrical Engineering

MS in Mechanical Engineering

MS in Sustainable Engineering

MS in Water Resources and Environmental Engineering

PhD Program (part-time or full-time)

15 Certificate Programs

Visit www.engineering.villanova.edu to learn more.