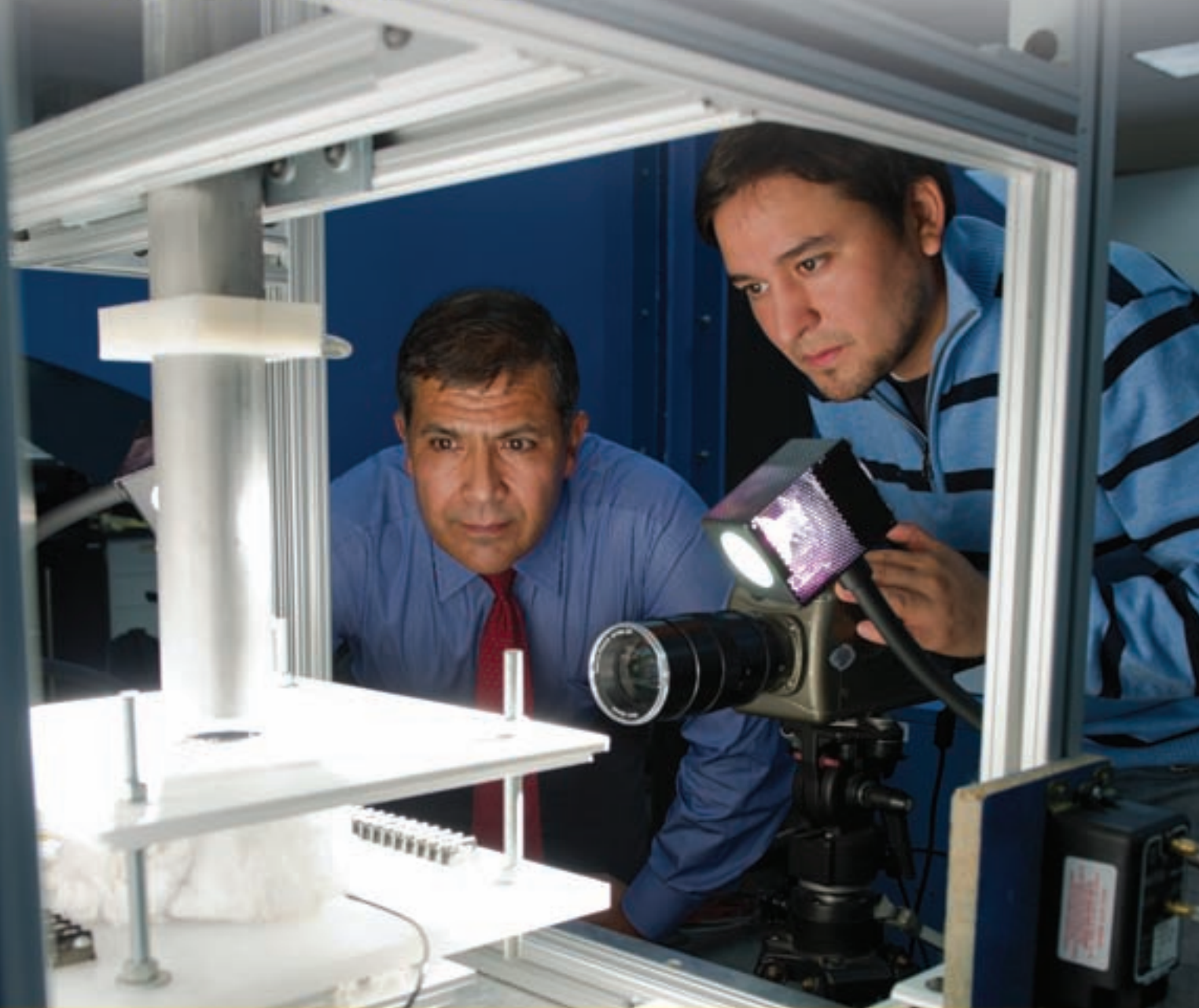


# VILLANOVA

ENGINEERING

*Spring 2011*



## **INSIDE:**

High-Tech Heaven

Energy Wise

Engineering the  
Future of Business

Bringing Light to  
Ifugao

**VILLANOVA**  
UNIVERSITY

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*On the Cover:*

Dr. Alfonso Ortega, Associate Dean for Graduate Studies and Research and The James R. Birlle Professor of Energy Technology, and Andres Diaz, a Mechanical Engineering Ph.D. student, conduct drop impingement experimentation in the Laboratory for Advanced Thermal and Fluid Systems.

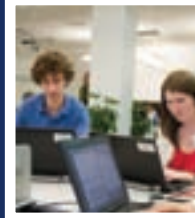
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## Message from the Dean

**Father Peter Donohue has been traveling the country and abroad as part of his "What's Next?" tour to engage the Villanova community in the University's 10-year strategic plan, which is designed to navigate the challenges of a global higher education landscape while remaining committed to core values within the Catholic, Augustinian tradition.**

I have had the opportunity to join him on nearly a dozen of these trips. It has been a pleasure to meet many of you for the first time and to reconnect with so many friends of the College of Engineering. At these events, Father Peter celebrates the Villanova community's thirst for knowledge, improving the world, and being a positive force for change. Within the College of Engineering, our students and faculty live these commitments on a daily basis.

**Thirst for Knowledge.** Our undergraduate program enjoys a strong national reputation, and we constantly build on our already robust graduate studies program. A commitment to developing innovative curricula has always been a key to our success. But in addition to adapting *what* we teach, we've also adapted *how* we teach.

For example, the first group of students to complete the Engineering Entrepreneurship Minor will graduate this May, having spent three years learning the science of engineering through the art of business (see page 9). We also recently opened the new Villanova Multidisciplinary Design Lab, which provides a state-of-the-art collaborative space for students to work across disciplines on real-world, industry-sponsored projects (see page 2).

**Improving the World.** Service-learning continues to grow in both popularity and opportunity. Some of our newest projects allow our students to collaborate with their counterparts from the Villanova School of Business and the College of Nursing. See page 12 for an update about the work our students are doing in the Philippines.

There have also never been more ways for students and faculty to participate in STEM outreach initiatives to turn younger students on to engineering. Check out page 15 to see how NovaCANE, one of our newest programs, is making an impact in Philadelphia.

**A Positive Force for Change.** The work of our faculty researchers and their students has the potential to change the way people live and work, with groundbreaking initiatives underway in our three centers of research and eight specialized research groups. See page 5 to find out how the Thermal and Fluid Sciences Research Group is changing the way we think about and use our precious energy resources.

As always, alumni play an important role in shaping our future. On page 17, you can see how some of your fellow alumni are helping us improve the education we provide.

Father Peter's tour is continuing, and I hope you will be able to hear his presentation. I think you'll find it inspiring and take pride in being an alumnus/a of this great University. For ongoing updates, become a "fan" of the College on Facebook ([www.facebook.com/VillanovaEngineering](http://www.facebook.com/VillanovaEngineering)) or join the Villanova College of Engineering group on [LinkedIn.com](https://www.linkedin.com/company/villanova-college-of-engineering).

Sincerely,



Gary A. Gabriele, Ph.D.  
*Drosdick Endowed Dean of Engineering*





# HIGH-TECH HEAVEN:

## Villanova's New Multidisciplinary Design Lab

by Debbie Clayton

**The chance to participate in a real-world project as a junior engineering student initially attracted Scott Deady to apply for one of the first undergraduate industry-sponsored research projects offered through the new Villanova Multidisciplinary Design Lab (MDL). But the lab itself convinced him he'd made the right decision.**

"It's amazing! I think it's the most high-tech room I've ever been in," says Deady, a Mechanical Engineering major from Fairport, N.Y. "The lab is an awesome place for group design meetings. The tables are sectioned off for six or seven people, and we can each plug in our laptops and push a button for our screens to appear on the table's 3-D monitor. There's a whole wall of interactive whiteboard space to work on design problems, too."

The brainchild of Dr. Gary Gabriele, Drosdick Endowed Dean of Engineering, the MDL is the result of a sizeable endowment from alumnus John Paul Jones III ChE '72, former CEO of Air Products and Chemicals. Located in the Center for Engineering Education and Research, the state-of-the-art



*In the Villanova Multidisciplinary Design Lab, undergraduate student teams work on real-world, industry-sponsored research projects. Pictured left to right: Thomas James ME '12, Frank Pezzolla ME '12, Lindsey Kreischer ME '12, and Frank Diaz ME '12.*

lab occupies a former project room transformed into a workspace for challenging design projects that cross the disciplines of Electrical, Computer, and Mechanical Engineering (with plans to add additional disciplines).

"Design is a core activity of engineering," explains Dr. Gabriele, who worked on a similar student-design curriculum while Associate Dean of Engineering at Rensselaer Polytechnic Institute. "But it is rare for an engineering college to actually provide specific space for student design work. Here, we have done that."

Most engineering colleges require a Capstone project for all seniors. Designed to demonstrate everything students have learned throughout their college careers, the projects incorporate leadership and management, allowing stu-

dents to build confidence and apply analysis skills. The MDL industry-sponsored projects run parallel with the Capstone program. Now, students can either complete a Capstone project or elect to do an industry-sponsored project through the MDL.

"Today's world is flat. With this type of competition, you can have the right technical solution but fail due to cultural, political, economic, or ethical misunderstandings. Working across disciplines, whether within engineering or alongside partners from business or liberal arts backgrounds, allows you to take on problems differently that may lead to success," says Jones. "By bringing real-world projects into the College and interacting with sponsor-company teams on multidisciplinary projects,



*Undergraduate student research teams are investigating design improvements to the automated systems used by SPS Technologies, based in Jenkintown, Pa., to manufacture aircraft parts.*

students will see the benefits of reaching out across boundaries when they run into a problem.”

### Off to a Running Start

“We’re cutting our teeth this semester,” says George Simmons MSCS ’87, Director of the MDL. “We have two official projects so far, with the promise of six more in the fall. Projects are announced through professors, and students apply to participate. After we survey the students on skills, interests, and personality traits, we match them with the projects on hand. This semester, we have nine students divided between the two projects.”

SPS Technologies, located in nearby Jenkintown, Pa., signed on as the inaugural MDL industry partner. A manufacturer of high-quality aircraft parts, the company sponsored both initial projects for the lab. SPS forges parts out of special alloys, and every piece of material has to be certified before distribution. Inevitably, there are reject parts, and the company has tasked Villanova engineering students to design automated systems to ensure consistently higher quality.

“Involving industry in the process is just a natural outgrowth of providing our students with the best possible learning experience,” says Dr. Gabriele. “Through industry problems and mentorship, our students can best understand the types of design problems faced by professional engineers. On the flipside, industry benefits from working with young minds. More importantly, they get to see potential employees at work.”

Jones agrees: “This lab allows students to bring a multi-disciplined approach to solving

technical challenges. Sponsors not only benefit from Villanova’s various engineering disciplines, but also from the other capabilities that can be brought to the table from the University’s other schools. It’s all in how a company chooses to define a project.”

In his role as project manager, Simmons is a liaison between the students and the industry partner. “I hold the students’ feet to the fire and help them adhere to a schedule that satisfies the industry partner,” notes Simmons. “Each team also has a faculty advisor, but we’ve been very careful not to put ideas into their heads. We hope they come up with novel ways to approach each project.”

This year, the MDL students started as juniors since most seniors had already selected their Capstone projects. The initial projects

will extend into the fall semester, with a completion goal of spring 2012.

### Creative Space

What makes the MDL so special? “We have state-of-the-art equipment and five collaboration work stations, each with high definition, three-dimensional flat screens and video conferencing. The electronic system is built into each table, so that six people sitting around the station can plug in their laptops and connect their monitors to the big screen,” says Simmons, whose office is in the lab. Teams meet at the MDL on a regular basis to brainstorm, research, design, and collaborate.

“I hope the lab strengthens the active involvement between the College and the companies that work with the students,” says Jones.

*Engineering faculty, including Dr. LeRoy Alaways, Visiting Assistant Professor of Mechanical Engineering, serve as advisors to the student teams.*





## High-Tech Heaven

continued

“I also hope it builds the College’s reputation as a place where companies can bring their real-world problems.”

Frank Irons, Director of Industrial Engineering and Automation at SPS, worked closely with Simmons to develop the projects, engage SPS mentors, and manage key deliverables throughout the process. “We expect the program will be a great learning ground to solve problems in our factory, develop a pipeline of new engineers, and allow students some hands-on experience,” explains Irons. “The two projects represent our current top two quality challenges. We will definitely implement solutions the students develop. In fact, both projects may have working prototypes we’ll use in actual production.”

Four or five mentors interact with the nine students on a regular basis – either through phone calls, e-mail, or occasional face-to-face visits. They too, come from multiple disciplines – operations, engineering, and supervision. “We hope to drive to a working solution for each project and leverage them across the plant and division,” adds Irons. “We plan to involve the students in internships and possible full-time employment, as they will come to understand the inner working of our product line.”

Lindsey Kreisher ME ’12 is a team leader of one of the SPS projects. With experience as a project engineer for a manufacturing company during two summer internships, she was a natural to manage her group. “Everyone brainstormed different ideas and we divvied up research tasks,” notes Kreisher, who hails from Connecticut. “But my job is to keep them on track. I’m really hoping to find a solution that will help SPS, and then it will turn into my senior design project.”

Her fellow project leader, Scott Deady, also hopes for a successful outcome to his team’s challenge. “I like the idea of putting my knowledge to work and getting the experience of it all,” he adds. “I might as well get accustomed to the lifestyle now, since that’s what I’ll be doing after I graduate – probably for the rest of my life!”

To discuss opportunities to sponsor a project within the MDL, please contact George Simmons at [George.Simmons@Villanova.edu](mailto:George.Simmons@Villanova.edu)



*Scott Deady ME ’12 (left) discusses project progress with George Simmons, Director of the MDL.*

### The Right Guy for the Job

When George Simmons first heard a job description for the Director of the Multidisciplinary Design Lab (MDL), he thought the position fit him to a T. “I knew right away that I was the guy for the job,” he enthuses.

Though Simmons joined the College last August as a professor in the Engineering Entrepreneurship Minor program, he was no stranger to Villanova. Simmons earned his master’s degree in computer science in 1987, and his company hired Villanova engineering students and graduates on a regular basis.

“When I took classes here, I really fell in love with the place,” says Simmons, who received an undergraduate degree in Electrical Engineering from the New Jersey Institute of Technology in 1976. “Villanova has a very high caliber of students. I always stayed involved after finishing my master’s degree.”

Simmons worked at the Franklin Institute Research Center in Philadelphia in the late 1970s. It was an innovative environment, filled with entrepreneurs, he says. One of his fellow entrepreneurs, Ed Dougherty, Visiting Assistant

Professor of Electrical and Computer Engineering and Interim Director of the College’s Engineering Entrepreneurship Minor, started his own engineering company called August Design and Development and took Simmons with him. Together, they wrote proposals for projects including video systems, lasers, games, and sports broadcast equipment. They developed a version of the SkyCam used on ESPN Sunday Night Football games. After they sold the company, Simmons started a second business with his wife Rita Marie — GRS Solutions LLC.

“We did independent contracting work, including work for SkyCam,” adds Simmons, a New Jersey native. “I traveled the country for ABC Monday Night Football – and I’m not even a big football fan! When Ed started teaching at Villanova as an adjunct professor, he asked me to join him. I had already been a volunteer advisor for several years and it seemed like a natural fit.”

As director of the new lab and professor in the entrepreneurship minor program, Simmons hopes his students will leave Villanova “full of knowledge and full of confidence – absolute leaders.”

# ENERGY WISE

by Carly Keeny

**The national discourse around America's need for innovative energy policy has once again taken center stage. This time, it comes with a challenge: that 80 percent of the country's energy will come from solar, wind, nuclear, and cleaner coal technologies within the next 25 years.**

But innovation may require more than the consumption of different kinds of energy. The global consulting firm McKinsey & Company suggests that enhancing the energy productivity of existing technologies could result in significant energy demand reduction. In a 2007 report, they assert that “a concerted global effort to boost...the level of output we achieve from the energy we consume...could cut global energy demand growth by half over the next 15 years.”

At Villanova, engineering faculty and students tackle energy challenges in every major discipline. Within the Thermal and Fluid Sci-

ences Research Group, a team of seven Mechanical Engineering faculty researchers and their students examine energy use and efficiency problems through the lenses of heat transfer, thermodynamics, and fluid flow through experimentation, numerical theory, and analysis.

**“My experience with thermal and fluid sciences at Villanova has been great. I have been lucky enough to work with both Dr. Jones and Dr. Ortega. Through my research with both of them, I have learned that a seemingly simple problem often requires a deep level of thinking and a creative solution.”**

— Devin Pellicone MSME '11

## Data Center Thermal Management

The “OSHA blue” wind tunnels and airflow test chambers may be synonymous with his Laboratory for Advanced Thermal and Fluid

*Dr. Alfonso Ortega (left), The James R. Birle Professor of Energy Technology, with Trevor Misera (standing), a graduate student in Mechanical Engineering, and Marcelo Del Valle, a Mechanical Engineering Ph.D. candidate.*

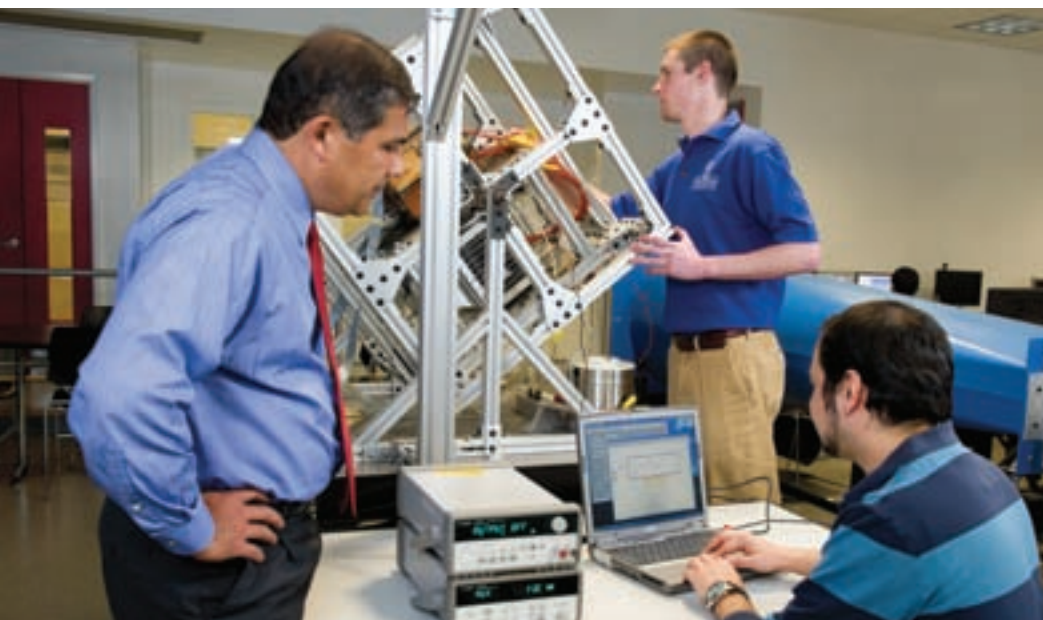


*Dr. Amy Fleischer, Associate Professor of Mechanical Engineering, was named the 2010 Woman Engineer of the Year by the American Society of Mechanical Engineers' Electronics and Photonics Packaging Division. Ryan Ehid ME '09, MSME '10 is pictured at right.*

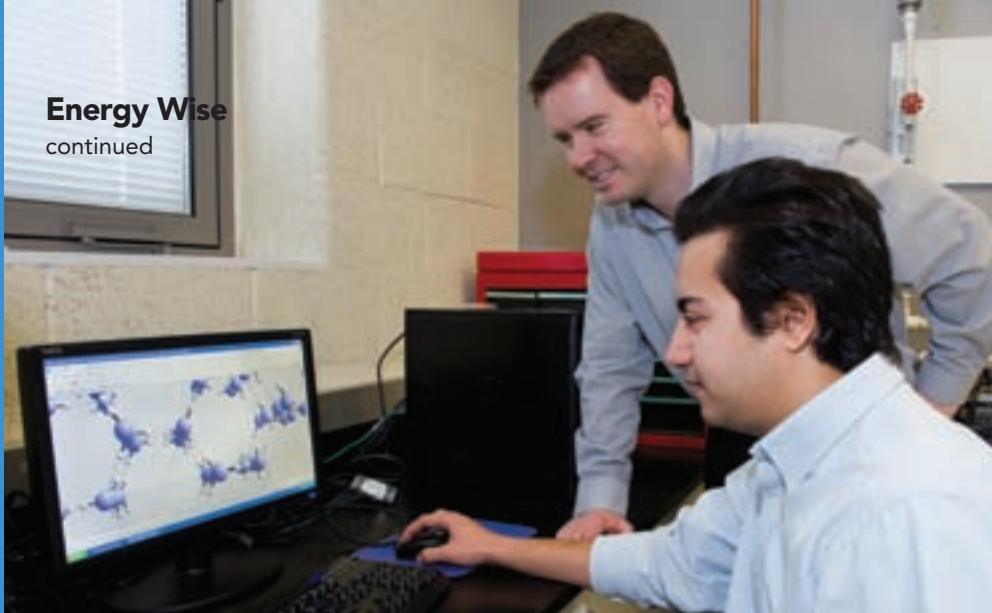
Systems, but these days Dr. Alfonso Ortega, Associate Dean for Graduate Studies and Research and The James R. Birle Professor of Energy Technology, conducts research on a much smaller scale.

He and his students are currently investigating how a single droplet of water removes heat from a surface as it impinges, spreads, and evaporates. They are also designing extremely efficient micro-scale heat exchangers that can be used to keep electronics, such as computer chips, cool. “We constantly demand ultra-fast performance from modern electronic devices, but this comes at a price, and that price is heat. Over time, these devices will degrade as a result of failures that are accelerated by thermal gradients. Eventually, they can fail if not cooled properly,” he says.

“Consider the outcome if the data centers that run everything from cable TV and banking, to stocks, wireless networks, and e-commerce experienced this failure,” he says. “These computer systems require vast amounts of energy to create information. In the process, they dissipate huge amounts of heat, most of which is wasted.”







Masoud Khadem, a Ph.D. candidate in Mechanical Engineering (seated), and Dr. Aaron Wemhoff, Assistant Professor of Mechanical Engineering, model and predict the thermal conductivity of nanofibers.

With support from the National Science Foundation, the College of Engineering is collaborating with Binghamton University, Georgia Tech, the University of Illinois Urbana-Champaign, and the University of Texas-Arlington to establish an Industry-University Cooperative Research Center to improve data center energy efficiency.

“How can we create more efficient heat and fluid flow processes inside these centers to reduce cooling needs? What can we do with the waste energy?” says Dr. Ortega. The greening of future data centers is an important technology challenge, and Dr. Ortega’s research group is poised to contribute to this revolution.

## Nanofibers in Phase Change Materials

Dr. Amy Fleischer ME ’91, MSME ’96, Associate Professor of Mechanical Engineering, has been investigating electronics cooling through the use of phase change materials to absorb transient heat spikes for 10 years. The idea originated in collaboration with Dr. Randy Weinstein, Professor and Chair of the Department of Chemical Engineering. Together, they used a chemistry method to create graphite nanofibers, which are embedded into phase change materials such as paraffin wax and inserted into an electronic device. As the device heats up, the wax melts and the wax/nanofibers blend dissipates the heat passively.

With approximately \$332,000 in funding over five years from the Office of Naval Research (which concluded in December), Dr. Fleischer explored the fundamentals of the fibers and whether they would work to keep shipboard electronics such as radar arrays and

pulse devices cool. “Now we want to understand how the fibers work so well, whether the transport of heat is enhanced, and how we can take the research further,” she says.

A kind of phase two for this research is already underway with three-year funding of approximately \$325,000 from the National Science Foundation. “We’ve been able to create shape-stabilized phase change materials, which prevent the fibers from settling out of solution or clumping together over time. Our next step is to try to optimize the design,” says Dr. Fleischer. “We want to compare these nanofibers to other kinds to see whether they are successful because of the material used or because they are on the nanoscale. We also want to see how other fiber materials and shapes perform, such as alumina spheres and carbon nanotubes.”

**“I’ve been interested in the thermal fluids area ever since freshman year when I became involved with Water for Waslala. The idea that this area can be used in a simple way to help people is what really got me interested. The research experiences here are a great stepping stone to an internship. It’s something really valuable to have for the future, and I’m happy I did it.”**

— Chelsea Mackie ME ’12

## Predictive Modeling

“The graphite nanofibers Dr. Fleischer is using for electronics cooling diffuse heat through phase change materials like wax more quickly and evenly,” says Dr. Aaron Wemhoff, Assistant Professor of Mechanical Engineering. “But no one knows how well these nanofibers really conduct heat. That’s where my group comes in.”

Dr. Wemhoff has been interested in thermal modeling since his days as an undergrad. Adding his expertise to experimental proposals offers additional ways to validate research results. He and his students are using his Molecular Dynamics for Arbitrary Geometries code to model and predict the thermal conductivity of the nanofibers, especially in relation to their internal structures. They also hope to gain insight into the directional dependence of heat conduction and the relationship of thermal conductivity to the strain they experience when they bend.

“We want to determine how best to use the fibers in phase change materials,” he says. “We have been able to create very complicated models of how molecules interact. So far we are getting agreement between the models and experiments, and between our models and models by other investigators.” The code can also be used for device analysis, which may open the door to future research in fundamental areas.

Dr. Wemhoff is also using thermal modeling for the U.S. Navy, which awarded him a summer faculty fellowship in 2010. Using his Lumped HVAC code, Dr. Wemhoff wants to predict the moist airflow thermodynamic properties in a heating, ventilating, and air conditioning system and how they respond in certain situations. “We are trying out new control schemes to optimize control sequences and minimize the system’s HVAC energy use,” he says.

## Nanoengineering for Renewable Energy

“My undergraduate college had a high efficiency solar thermal panel for hot water, which fascinated me,” says Dr. Calvin Li, Assistant Professor of Mechanical Engineering. Today, he applies that fascination to nanoengineering, two phase heat transfer, and renewable energy research.

In 2010, Dr. Li served as a visiting scientist to the Department of Energy’s National Renewable Energy Laboratory. He and two un-



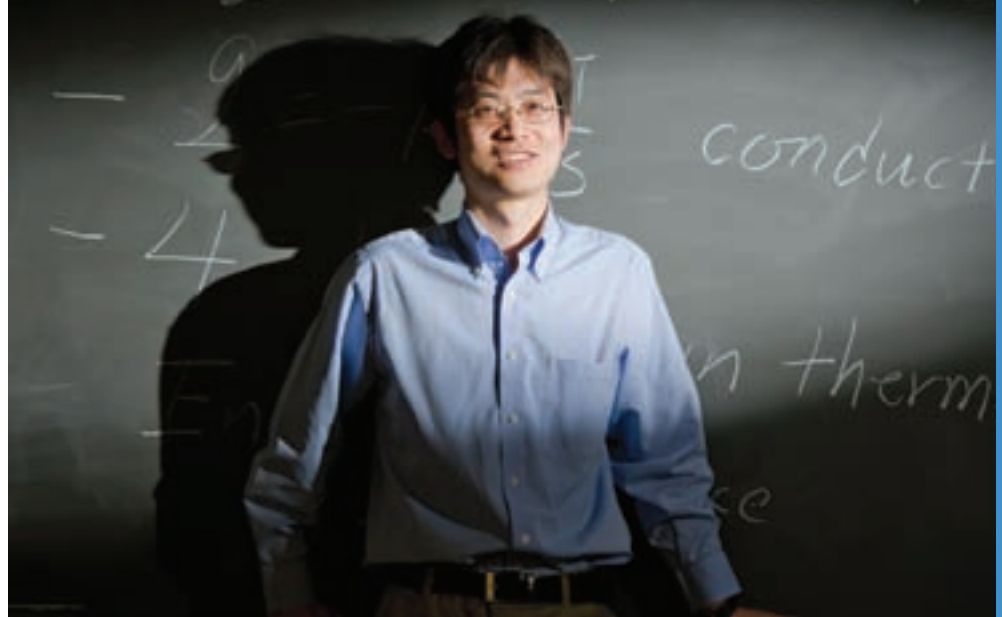
dergraduate students investigated nanoparticle phase change materials to improve the efficiency of solar power conversion. “Some energy from sunlight can be converted directly into electricity, but much more of it will be wasted as heat,” he says. “We want to recover that waste. Our phase change concentrated solar fluid contains nanoparticles that change from solid phase to liquid phase in the process and absorb heat energy. We can utilize the recovered heat to generate more electricity and significantly increase the solar energy efficiency.”

Dr. Li also works with the U.S. Air Force to improve efficiency for high heat flux thermal management. “An example of two phase heat transfer happens when you boil water. Liquid changes to vapor, but you need a nucleation site for bubbles to embryo before you can have efficient two phase transfer,” says Dr. Li. “I’m using nanotechnology to create surfaces and engineer nano-structures to generate more bubbles, smaller in size, more quickly. We can har-

**“I’ve done research on developing plots showing one campus dormitory’s usage of steam, hot water, and power on an hourly and weekly basis and finding trends that illustrate student usage of this facility. In the future, this type of monitoring will be useful as a reference for journal publications.”**

– Mark McGarity ME ’12

*Dr. Gerard Jones, Associate Dean for Academic Affairs and Professor of Mechanical Engineering, and Ledjan Qato MSME ’11 perform computational modeling for work to improve military blast shield armor.*



*Dr. Calvin Li, Assistant Professor of Mechanical Engineering, is the newest member of the Thermal and Fluid Sciences Research Group.*

vest the resulting energy for future use.”

The newest member of the Thermal and Fluid Sciences Research Group, Dr. Li is also exploring the use of nanoparticles to improve fuel cell power efficiency and to convert electromagnetic wave energy into thermal energy during the drug delivery process.

### Roadside Blast Protection

Dr. Gerard Jones ME ’72, Associate Dean for Academic Affairs and Professor of Mechanical Engineering, has tackled a wide range of research problems in his career – everything from thermal mechanical engineering for Mobil Oil and solar ponds and geothermal wells for Los Alamos National Laboratory, to gravity flow water systems in Latin America and heat transfer in the glass bottle industry. His current research has the

potential to save the lives of American military servicemen and women.

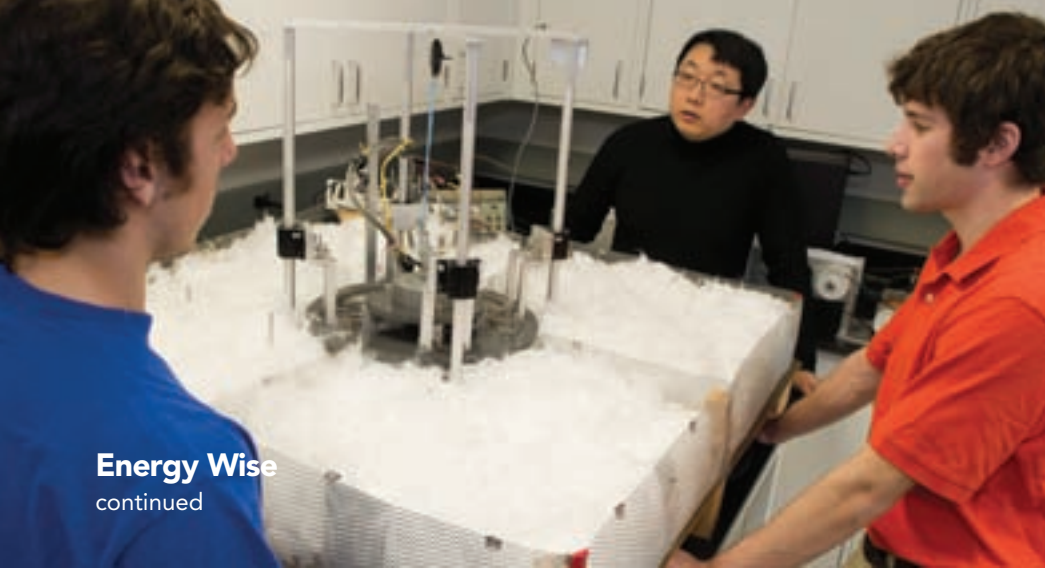
Originally funded by the Office of Naval Research and Ablaze Development Corporation in 2009, Dr. Jones’ research involves developing lightweight structures to minimize the impact of a high pressure blast wave on military personnel traveling inside a vehicle. “These vehicles are currently designed to absorb energy by deforming thick plates of steel embedded in their frames. This isn’t very efficient because most of the energy still comes through,” says Dr. Jones. “We propose replacing the plates with a panel comprised of a series of tubes filled with thick fluid.”

When the tubes encounter the blast wave, they will still deform and dissipate energy from the blast. “However, because of the liquid in the tubes, they won’t compress. Instead, they will absorb the energy from the blast and dissipate it in fluid motion, essentially by squeezing through a small restriction at both ends of each tube,” he says.

The research involves both computational modeling to predict the deformation and the speed of a structure when it undergoes the blast, as well as laboratory experiments, which will be supervised by Dr. Sridhar Santhanam, Professor of Mechanical Engineering. Ledjan Qato MSME ’11 and Devin Pellicone MSME ’11 also participated in this work.

### Developing Super Lubrication

When Dr. Qianhong Wu, Assistant Professor of Mechanical Engineering, looks at a research problem, he sees lessons from and benefits for both industry and the human body. For example, he has developed a new experimental and



**Energy Wise**  
continued

*Dr. Qianhong Wu, Assistant Professor of Mechanical Engineering (center) discusses functionalized nano-porous materials with Chris Vegliante ME '12 (left) and Peter Bruno ME '11 (right).*

**“It was my time spent working with Dr. McAssey over one Christmas break which helped me realize how practical and exciting the field of thermal-fluids can be. He helped me realize how all the abstract concepts taught in undergraduate courses can be applied to solve very technical problems. What I learned working with Dr. McAssey helped me in both my graduate research and, most recently, my new job.”**

*– Ryan Ehid ME '09, MSME '10*

theoretical framework for super lubrication to drive down energy-wasting friction in any moving part, from machinery to the cartilage in human joints.

In the Cellular Biomechanics and Sports Science Laboratory, Dr. Wu and his students experimentally examine this biomimicry theory using a novel experimental set-up involving functionalized nano-porous materials. The goal is to create a super lubrication layer that generates much higher lift force from the fluid phase instead of the solid phase, which significantly decreases friction force. The team has also developed a systematic approach to compare their theory with the experimental data through computational modeling.

“The key is to create a nano-porous structure to trap fluid inside,” says Dr. Wu. “Fluid has to move, but when you trap the fluid and compress these materials, there is nowhere for

the fluid to go. Instead it creates lift. The more lift you can create from fluid, the less friction you have. When you cut down on friction, you significantly reduce energy use and cost.”

Based on their findings, Dr. Wu’s team hopes to apply the theory to research questions pertaining to the human body. “For example, we can do a lot of theoretical work with cardiovascular systems and apply what we’re learning to microcirculation,” says Dr. Wu. He and his students are also interested in how the endothelial glycocalyx layer that lines the lumen side of a capillary provides super lubrication benefits to red blood cells as they travel throughout the body.

**Characterizing Engine Coolant**

Dr. Edward McAssey, Professor Emeritus, has been a fixture at Villanova for more than 40 years. He joined the Mechanical Engineering faculty in 1967 with a background in the air/space industry. Since then, he served as Department Chair, Acting Dean, Associate Dean, and College consultant; he was the first James R. Birlle Professor of Energy Technology; established the College’s nuclear energy course offerings; and directed Columbia University’s Heat Transfer Research Facility. He also supervised Dr. Fleischer’s master’s thesis and brought Dr. Jones onto the faculty.

Since “retiring” in 2005, Dr. McAssey can often be found in the Heat Transfer Lab, where he recently investigated “greener” engine coolant options for Chevron Belgium. With \$170,000 in funding over two and a half years (which concluded in late 2010), Dr. McAssey and three of his students compared the performance of a glycol-based engine coolant (currently used commercially) with a new “greener” non-glycol-based coolant. “Its function is to cool the engine’s cylinders, so you have to know how well it performs as a heat transfer medium,” says Dr. McAssey. “The new coolant has different characteristics than the one currently in use, but before they go to market, the manufacturer needs to know if it can work as well, if not better than, what’s already being used.”

This work has applications beyond the auto industry. “A typical engine is only 30 percent efficient. As engines get smaller, and their surface areas shrink, the heat flux increases for the same energy input,” he says. “The same thing is happening with electronics. As chips get smaller, we’ll need better micro-channel heat transfer. What we’re doing with Chevron works right into that area.”

*Dr. Edward McAssey, Professor Emeritus, has been a member of the College of Engineering family for more than 40 years.*





# ENGINEERING THE FUTURE OF BUSINESS

by Christopher Murray

**“Innovation is how we make our living,” declared President Barack Obama in his 2011 State of the Union Address, as he acknowledged past American accomplishments and enthusiastically imparted his hope for a prosperous, competitive future.**

That sentiment is alive and well on campus and is at the foundation of the Engineering

Entrepreneurship Minor, a unique collaboration between the College of Engineering and the Villanova School of Business (VSB).

What started as a collegial idea – a brainstorm between individuals in the College and VSB – quickly became a new academic offering thanks to a timely grant from the Kern Family Foundation. “It was a wonderful convergence of the right things happening at the right time,” says Dr. James Klingler, Assistant Professor of Management & Operations. “Talented minds from both disciplines converged and were helped along by available funding; that is how great things happen.”

This May, the first cohort of engineering undergraduate students will complete this

minor, which is in its third year. In line with the Kern Family Foundation’s request, the Engineering Entrepreneurship Minor is aimed at instilling an entrepreneurial mindset that will enable graduates to achieve success in the workplace.

“This minor is not about going out and starting a company,” says Edmond Dougherty EE ’69, MScS ’86, Visiting Assistant Professor of Electrical and Computer Engineering and Interim Director of the Engineering Entrepreneurship Minor. “Rather, it is about bringing an entrepreneurial way of thinking to any business or company; that is the real value.”

The minor, which consists of 15 credit hours taught by professors from the College

*Edmond Dougherty, Visiting Assistant Professor of Electrical and Computer Engineering and Interim Director of the Engineering Entrepreneurship Minor program (center), shares the prototype of an invention for cargo-handling with Megan Swaim CheE '13 and Brandon Orr ME '13.*





*Laura Krotowski ChE '13 and Monica Maschue ChE '13 attempt to guess the function of a patented prototype device, invented by Edmond Dougherty and George Simmons, Director of the Villanova Multidisciplinary Design Lab, as part of a lesson on intellectual property. (Answer: a heart monitoring device.)*

and VSB, exposes students to engineering concepts in a business context. The first course, Creativity and Innovation, is offered at the beginning of sophomore year, followed by classes covering topics such as opportunity analysis, new product ideation and development, intellectual property, project management, prototyping, basic accounting and finance concepts, new product marketing, risk management, team development, project funding, and product launch.

“The curriculum is meant to help students understand the whole picture,” says Dougherty. “For example, when you are designing a part for a machine, you still need to understand the business side of things and ask ‘why am I designing this part, what is the practical application, who will this part benefit, and how will it be marketed?’”

After the classroom introduction to entrepreneurship, which includes research and guest lectures from real-life entrepreneurs, the program culminates with the opportunity for students to work in teams to develop and launch a new business, service, or product.

Students who complete this program not only learn valuable engineering skills, but also how to link technology with marketplace needs, giving them the opportunity to become entrepreneurs themselves or intrapreneurs in the companies where they work.

### Market Needs

To put it simply, “innovation and creativity cannot be outsourced,” says Dr. Klingler. “That is one big reason we need to teach entrepreneurship; there are great engineers all over the world, but there aren’t many engineers who can be entrepreneurial and truly understand marketing and customer needs.”

Dougherty, an entrepreneur himself for the past 30 years and current President and CEO of Ablaze Development, concurs. “Companies can only grow with engineers who bring an entrepreneurial mindset to their work,” he says. “The role of engineers is changing, as a lot of people can do the nuts and bolts; there needs to be a focus on innovation and creativity to keep American companies thriving. It is becoming less about the details and more about high-level, creative technologies.”

This new dynamic and focus on integration is reflected in how students are being taught to think. “Business students and engineering students are used to finding solutions to problems within the confines of their own disciplines; we wanted to change that,” Dr. Klingler adds. “Engineering students with strong business acumen can help save American innovation from obscurity; the feeling of creativity in our country needs to be rekindled.”

Dr. Klingler offers the example of microhydro power. “Building a system and distribut-

ing energy is an engineering solution, but understanding how to implement a system and determining appropriate rates and cost structures are business solutions that are critical to making a hydro-power system run effectively.”

“Engineers need to know enough about various disciplines including business processes and markets,” adds Dougherty. “The market wants and needs students who understand more; American engineers need a broad education.”

### Student Demand

Students also expressed their desire for this opportunity.

“I was interested in diversifying my educational portfolio,” says Lauren Pugh EE '11. “This minor gives me the experience and foundation that I am going to need in my future career.” David Reichman CE '12, agrees. “It provides the necessary business knowledge I want, through a more hands-on and practical approach.”

Perhaps most interesting about this minor is its ability to convey business realities that many engineers spend years – even decades – working to understand.

“The one thing this minor has taught me to do is fail, and fail at different stages in a project,” Reichman adds. “This is a great lesson to learn that will prove valuable in the workplace because I will know not to panic, but rather to



approach problems in a different manner and plan for and expect unanticipated obstacles.”

This minor is also helping students examine how they can live Augustinian values post-graduation.

“Most people at Villanova want to use their education and career to help others,” believes Megan Swaim ChE ’13. “With the Engineering Entrepreneurship Minor, we learn about business and entrepreneurship so that one day we can provide products and services to those in need.”

Dougherty affirms that his students often ask “how can I help people” not “how can I make money,” and he brings a slightly different perspective to that desire.

“I tell them making money is OK, because that money may be how you help people, by developing products that help individuals in need, or by sustaining a company over time, employing a number of people. I stress their engineering skills can help people too, just as their time and treasure can.”

According to Dr. Klingler, all of this is piquing the interests of companies. “When students go on interviews, this minor is what they talk about; it’s often what interests the employer.”

## All (Alumni) Hands on Deck

According to Dougherty, the hope is to involve more alumni and representatives from friendly companies in the program, mentoring students, fine-tuning the curriculum, reviewing business plans, observing presentations, and perhaps partnering on projects and ideas.

“I want to stir up the alumni and get them excited about this,” Dougherty says. “There is a real opportunity to connect like-minded businesses, and perhaps get students in front of potential investors.”

*George Simmons discusses the procedure for filing a patent.*



*Conducting classes for the Engineering Entrepreneurship Minor in the new Villanova Multidisciplinary Design Laboratory allows for easier student collaboration at state-of-the-art work stations. See page 2 for more about this new facility in the Center for Engineering Education and Research.*

The practical experience students receive from working with active engineers is invaluable.

“The great thing about hearing from real-life entrepreneurs is that every single one of them has had different experiences and approached their endeavors in different ways,” says Reichman. “There is great value in listening to all these different speakers talk about the effort and planning that must go into any business.”

Pugh adds, “It has been very interesting and helpful to hear about the career paths of successful entrepreneurs, including the failures that occurred prior to the successes.”

Most entrepreneurial-minded engineers in business today picked up their skills over time, on the job.

“Most alumni will say, ‘why wasn’t this around when I was there,’” Dr. Klingler adds.

While a fair question, this new program gives alumni the opportunity to share their experiences with the next generation of engineering talent.

## Instilling Entrepreneurial Spirit Across Campus

Both Dr. Klingler and Dougherty hope to expand the reach of this minor, first to all engineering students and then to other schools and colleges at the University.

“We want to touch every engineering student with this and then establish a way to touch all students,” says Dr. Klingler, who adds that the realness of this minor and its practical application are very much in line with St. Augustine’s concept of learning, which stresses how theory and concepts are applied, something Father Peter Donohue, O.S.A., University President, also touched on in his inaugural address.

“Father Peter addressed a similar topic,” concludes Dr. Klingler, “as he talked about the future of education, getting us out of our silos, and creating a culture in and out of the classroom where things are done in new ways.”

Now more than ever, engineers are required to bring a broad view of the world, business environment, and best approaches to problem-solving to their work. Students who complete the Engineering Entrepreneurship Minor gain unique insight into each of these areas and the opportunities that emerge when they intersect.

To get involved with the Engineering Entrepreneurship Minor, contact Edmond Dougherty at [Edmond.J.Dougherty@Villanova.edu](mailto:Edmond.J.Dougherty@Villanova.edu)



# BRINGING LIGHT TO IFUGAO

by David Erickson



**At the northern end of the island of Luzon in the Philippines lies a remote, mountainous province called Ifugao. The region is known for the beauty of its rice terraces, built by hand by the indigenous Ifugao people over the course of hundreds of years.**

Their traditional culture revolves around agriculture, and they have been famously resistant to interference from outsiders. The modern metropolis of Manila is seven hours away by bus, but it might as well be on the other side of the world as far as the Ifugao are concerned. Yet even the Ifugao realize that the

*Villanova students have an ongoing relationship with the people of Maggok, a remote village in the Philippines. Picture front to back (and left to right): J.P. Gunn ME '10; Jordan Ermilio, Assistant Professor of Mechanical Engineering; Marlon Martin, SITMo, Chief Operations Officer; Dr. James Klingler, Assistant Professor of Management & Operations; Dr. Pritpal Singh, Professor and Chair of the Electrical and Computer Engineering Department; Diane Tamir ME '11; Ean Mulligan ME '09; Eric Baker ME '10, MSME '11; Daniel Stewart, ME '10; Jonathan Martin, SITMo; and other SITMo volunteers and local government development workers.*

time has come for change; because of limited economic opportunity, people are leaving the region to seek opportunity elsewhere. To preserve their culture, they must find ways to improve the quality of life for the poorest of the poor living within the region.

This was the nature of a talk given several years ago by Jordan Ermilio ME '98, P.E., Assistant Professor of Mechanical Engineering, who spoke to a group of sophomore engineering students about his experience living in Ifugao as a Peace Corps Volunteer. Inspired, the students approached him about conducting a service project in the region.

“The students wanted to provide assistance to an existing renewable energy project to take what was already being done and make it better,” says Ermilio. “It was important, however, that the students included the local community in the design process so that everyone involved retained a sense of ownership of the project.”

Beginning in 2007, a group of students and faculty from the College of Engineering traveled to northern Luzon to evaluate possible projects. They found what they were looking for in the village of Maggok, one of the oldest and most remote settlements of central



Ifugao. There they found a small hydro-electric power generation system, built two years earlier and now on the brink of failure, in part because the turbine that powered the system had been poorly designed and because there were no controls for balancing production and consumption of electricity.

### Micro-hydroelectric Power

J.P. Gunn ME '10 describes what he and his colleagues found: "They'd covered [the old turbine] with wood and rope, because it was vibrating so much," he says. "We ran it once without the wood, and I was very concerned that it would fall apart completely. When it broke, which was every few weeks, the whole village would be without electricity." The student group (including engineering students Eric Baker ME '10, MSME '11; Brenda McEvoy ME '10; Daniel Stewart ME '10; and Gunn) became known as the Ifugao Sustainable Innovation Team (I-SIT). Their goal was to come up with an improved turbine that would provide reliable energy, have automatic controls, and could be built and installed by a Philippines-based manufacturer. Another important goal was to build the capacity of the Maggok Sustainable Energy Cooperative and design a system that could be easily maintained by local technicians.

"From an engineering perspective," says Gunn, who is now a Regional Engineer with Air Products and Chemicals, "you want to pro-



*Dalmas Wambura ME '10 and current graduate student in the Chemical Engineering Department, reads temperatures from different probes located at varying levels in a lemongrass oil retort.*

vide new technologies...but anything new has to be sustainable, in the sense that [the local people] are the ones who have to take care of it; it's going to be their system. So unless they know how it works, unless they can make repairs, based on what they have available to them, it's not going to be sustainable."

Working within the limitations of the existing site – including a powerhouse with a crumbling concrete foundation and limited physical space for expansion, not to mention the absence of road access – the I-SIT team designed a new turbine. The design team worked up calculations for a more efficient turbine runner (the bladed wheel that is the heart of a water turbine), bearings, and bearing attachments. Then they translated these calculations into actual part designs using a CAD-CAM program. "Some of the parts were not conventional shapes," says Baker. "That was difficult. Because of restrictions on the surrounding land, the floor plan of the existing powerhouse couldn't be changed. Everything had to be sized to fit in a restricted space." At the same time, he says, parts had to be designed within the limits of local manufacturing capabilities.

As this is being written, final installation of the new power system is ongoing. When it goes online, it is expected to provide a reliable supply of sustainable energy to 110 homes in Maggok.

The students' work did not end with just a technological fix. The I-SIT team also made recommendations for running the utility: doing a better job of monitoring household consumption, providing incentives to get local households to install energy-efficient light bulbs, and creating a budget for ongoing maintenance of the system. Currently, a team of engineering entrepreneurship students, headed by Dr. Pritpal Singh, Professor and Chair of the Electrical and Computer Engineering Department, is finalizing a business plan to expand this initiative to provide micro-hydro electricity to as many as 54 potential sites in Ifugao.

### Lemongrass Oil Extraction

At around the same time as the Maggok hydroelectric project, a second I-SIT project was underway, this one to help a local entrepreneur find a more efficient way to distill lemongrass oil extract. The product has good potential to produce revenue for its properties ranging from pain relief to insect repellent, but the production method was inefficient, and there was no system for product distribution.

Villanova engineering students Kent Grosh ME '10 and Dalmas Wambura ME '10 visited the existing distillery site and met with owner Fernando Bahatan to collect data on the distillation unit's performance. Based on the data they collected on retort chamber temperature and production capacity, they built several prototypes for a more energy-efficient system, while keeping in mind the need to make as

*Patrick McDonald, Construction Adviser; Brenda McEvoy ME '10; Alfred Patzig, Turbine Design Consultant; and J.P. Gunn ME '10 on a trail leading from the remote power house back to the town center after inspection of the existing system infrastructure.*



## Bringing Light to Ifugao

continued

much use of the existing system as possible to keep costs down.

Their final design kept most of the original system intact but doubled its efficiency. Wambura, now a graduate student in Chemical Engineering at Villanova, echoes Gunn in his comments about the project: “We didn’t want to just buy fancy equipment and bring it over there,” he says. “We kept our ideas as simple as possible so that our local partner would be able to take our designs and actually implement them.”

“These projects require a lot of innovation,” says Ermilio. “One of the ultimate goals is to integrate the lemongrass project with the hydro-electric facility. The byproduct of the electric load control system is heat. We are currently investigating opportunities to use this excess heat for the purposes of improving the livelihood of the local community.”

A more efficient distillery means less expense associated with buying fuel (wood) and an improved profit margin. The idea of increasing the value density of raw products is extremely important in rural areas where the only means of transporting goods entails manual transportation over very rugged terrain. Whereas improvements in the process can lead to increased production, marketing

and distribution constraints have to be considered. Enter Dr. James Klingler and Dr. Debra Arvanites, Assistant Professors of Management & Operations, and their team of students from the Villanova School of Business. VSB students were tasked with finding new markets for lemongrass oil, according to Thomas Meehan VSB ’10, who now works for Rocaton Investment Advisors in Norwalk, Conn. Bahatan was bottling lemongrass oil extract and selling it locally within the project area. “We believe he can sell the product in nearby metropolitan areas, like Manila,” he says. For example, Meehan’s group found a Manila-based chain of small stores selling only indigenous goods.

“If we hadn’t been in-country, talking with local people and learning the culture, we would never have made these kinds of connections,” says Gunn, who spent three months in 2009 living in Ifugao Province while working on the project as part of a summer service internship program. Since the project began, four Villanova students from both engineering and business have participated as summer service interns, including Diane Tamir ME ’11, Serena Cheung VSB ’11, and Palak Patel VSB ’13.

### Crossroads of Success

Every student involved speaks highly of both the service and interdisciplinary aspects

of these projects. The engineering students say they learned a lot by observing the way the business students approached problem-solving, and at least one business student admitted to being “a little bit jealous” of the engineers’ abilities to produce tangible results from their work.

The I-SIT service projects were funded in part by a grant from the National Collegiate Inventors and Innovators Alliance, secured by Dr. Singh and co-principal investigators Dr. Klingler and Ermilio. The projects were also underwritten in part with grants from the University, the Villanova Engineering Alumni Society, and Air Products and Chemicals. In the Philippines, the projects were achieved through a partnership approach with a local non-governmental agency, the Save The Ifugao Terraces Movement (SITMo), the Ifugao Provincial Governor’s Office (PGO), and the National Commission on Indigenous Peoples.

Follow the team’s progress on Facebook at [www.facebook.com/VillanovaEngineering](http://www.facebook.com/VillanovaEngineering) or [www.facebook.com/sitmo](http://www.facebook.com/sitmo).

To discuss opportunities to support service-learning initiatives within the College, please contact Jordan Ermilio, Assistant Professor of Mechanical Engineering, at [Jordan.Ermilio@Villanova.edu](mailto:Jordan.Ermilio@Villanova.edu)

*J.P. Gunn ME ’10 assesses the turbine in use in Maggok.*





# NURTURING FUTURE ENGINEERS

by Anna Heleniak



**Villanova engineers enhance their studies in a number of creative ways. Among the most popular opportunities for enrichment are service-engineering projects. Many lead activities that excite younger students about engineering, which aligns with a national endeavor to improve middle and high school students' interests and abilities in science, technology, engineering, and math (STEM) subjects.**

Through Villanova Community Action by New Engineers (NovaCANE), one of the newest student-led, STEM-supportive organizations within the College of Engineering, Villanova students inspire young minds to consider a future in engineering. Founded by Dr. David Dinehart, Professor of Civil and Environmental Engineering, and a group of

*Timothy Harrington CE '09, MSCE '11 (center) helped establish NovaCANE, one of the newest STEM-supportive initiatives within the College.*

structural engineering graduate students in fall 2009, NovaCANE brings after-school engineering programs to middle school students in the Greater Philadelphia area.

## Answering the Call to Serve

While at Mass one Sunday, Dr. Dinehart learned that St. Martin of Tours School in Northeast Philadelphia was looking for career-oriented professionals to speak to the students. Knowing that his work with the annual service-learning Spring Break trip to Amigos de Jesús children's home in Honduras was coming to an end (more than a decade after he helped initiate the program), Dr. Dinehart jumped on the opportunity to continue his commitment to engineering service.

He rounded up a group of students who worked with him in the Structural Engineering Teaching and Research Laboratory (SETRL) and were interested in volunteering to help him reach out to the middle schoolers. Then, the team began to brain-

storm unique experiences they could bring to the school community.

"We determined that a monthly after-school engineering club would be a valuable way to connect with the students," says Timothy Harrington CE '09, MSCE '11. "While organizing the club consumed most of our efforts for the first year, we wanted to leave room for growth within NovaCANE and developed the broader mission to contribute to the community by serving needs within the realm of engineering."

The group formed its first partnership with the sixth grade class. Each session of the program started with an educational presentation on a specific structural engineering topic. Then, the middle school students participated in a one-hour, interactive activity led by members of NovaCANE. Topics included stability design, brittle and ductile material behavior, connections, impact and earthquake loads, and bridge design. Activities included building newspaper crosses to withstand a seismic

## Nurturing Future Engineers

continued

tremor, architecturally inspired gumdrop domes, sturdy Popsicle® stick bridges, and the formation of cylinders by hand-mixing cement.

### Sparking an Early Interest

The hands-on activities engaged the students academically as their excitement for engineering grew. The students celebrated the completion of their first year in the program with a NovaCANE-sponsored visit to Villanova to test their concrete specimens in SETRL and participate in other activities. Along the way, they also caught a glimpse of college life and saw their own potential in engineering.

“We wanted to put engineering ‘on the map’ for these students as a serious option for their future careers,” says Dr. Dinehart. “We thought that NovaCANE would start as just a yearlong initiative to set up the program; but, at the end of the year, the sixth graders were begging for more. They all wanted to know what we were going to do in the next year!”

Dr. Dinehart and the NovaCANE team saw that their work at St. Martin’s was far from finished. They decided to expand the program to the seventh and eighth grade classes to provide three years of engineering club continuity. They also created a new NovaCANE partnership with the sixth and seventh grades at St. Edmond’s Academy in Wilmington, Del.

This year, the seventh graders, many of whom returned from the sixth grade program, are participating in a “Green Club.” Their curriculum, developed and executed by Villanova

undergraduate and graduate students, focuses on water resources and Chemical and Environmental Engineering topics. They plan for the eighth graders to explore the Mechanical and Electrical disciplines within engineering in fall 2011. Dr. Dinehart anticipates that NovaCANE will be able to lay the foundation for the programs and leave the clubs in the capable hands of the teachers at each partner school. By providing a complete set of activities and presentations, he hopes they will keep the program going on their own from year to year.

### Expanding Their Reach

With an eye on the future, the team plans to add a new partner school to the program every year. Their goal is to give as many students as possible the opportunity to learn more about engineering. They even hope to start a NovaCANE chapter at Villa Maria Academy in Chile, sister school to the all-girls’ academy of the same name located in Chester County, Pa. Dr. Dinehart recently visited the South American students as part of a research trip through the College’s faculty exchange program with Universidad de Santiago de Chile.

“We have seen many benefits from the NovaCANE program here,” says Chuck Pavonarius, the sixth grade teacher at St. Martin of Tours. “The activities give real-world applications to what we are teaching in our science classes. The key to education is to break down the wall that so many students put up, thinking that learning has to be boring. We want to end this stigma, and so far, it seems to be working. The students do not



*Students in the 6th grade Engineering Club at St. Martin of Tours School learn monthly engineering lessons and participate in hands-on projects.*

even realize they are learning with each session – and they really do love it!”

### Laying a Solid Foundation

The NovaCANE team could not be more thrilled that the students look forward to their lessons and activities each month. Currently, Dr. Dinehart is developing a strategy to measure the success of the program.

“I am curious as to how we can track our progress. The data sets are all different, by gender, location, and ages, but all of the students have something in common by attending Catholic schools,” says Dr. Dinehart. “We would like to see how many students from NovaCANE clubs continue their interest in engineering by joining our Villanova Engineering, Science, Technology, Enrichment, and Development (VESTED) program for high school students. We hope that NovaCANE can serve as the bridge to connect these age groups.”

The team also wishes to study how the program impacts Villanova students. NovaCANE now has more than 20 members and continues to expand as an organization. With a corporate sponsorship from AECOM, an international engineering firm based in Los Angeles, and the support of the Villanova community, NovaCANE members look forward to creating new activities for the students and maintaining strong relationships with their middle school partners.

*Chuck Pavonarius, 6th grade teacher at St. Martin of Tours School (left), with members of the Engineering Club testing an apparatus designed to help a raw egg survive a drop from a third-story window.*





# ONCE A VILLANOVA ENGINEER, ALWAYS A VILLANOVA ENGINEER

by Carly Keeny



**Ask any alumnus what distinguishes a Villanova engineer, and the answers will include: excellent technically; strong leadership skills; well-rounded; great team player; sees the bigger picture; and places a premium on ethical standards and practices.**

Dedicated alumni across the country steward this reputation and in the process, help the College shape the next generation of Villanova engineers in new and meaningful ways.

## **Student and Faculty Development Opportunities**

In addition to being active participants on the College's advisory boards, Villanova alumni at The Boeing Company connect with engineering students throughout the year, from one-on-one mentoring and speaking opportunities, to on-site plant tours and encouraging applications to the company's summer internship program.

"Enhancing the student experience helps prepare students to enter the workforce," says Colleen Burke ME '90, MBA '99, Director,

Strategic Development, Phantom Works at Boeing. "Villanova can provide the technical foundation, but it is up to others to create the experience to apply what is learned."

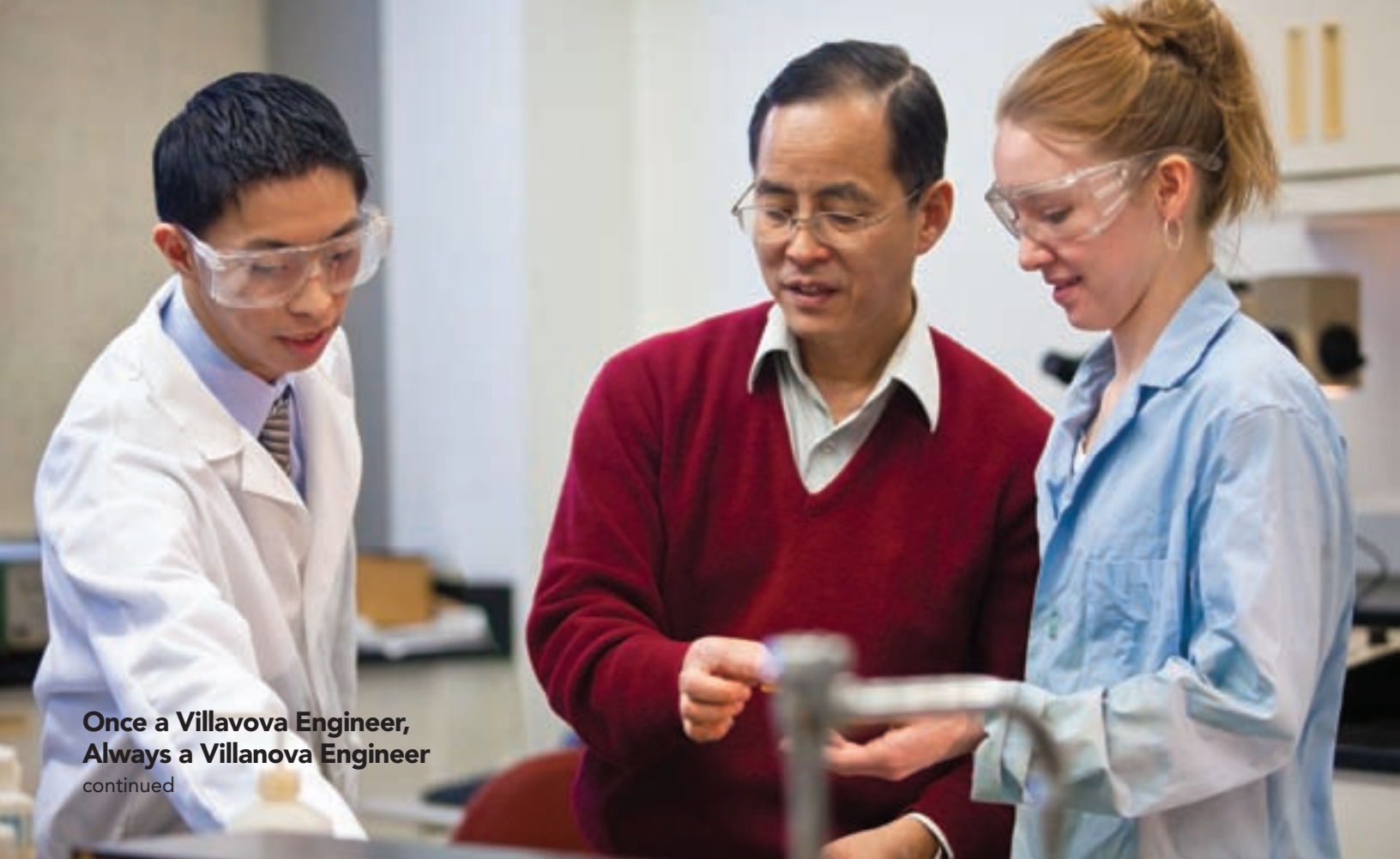
Engineering faculty members have also been selected for the highly competitive Boeing Welliver Faculty Fellowship Program for the past two years. As Fellows, they offer new perspectives on Boeing environments, processes, and procedures. "As faculty better understand advancements and applications [in industry], they can channel that knowledge into a more relevant learning experience, which produces a more-prepared graduate," says Burke.

Similarly, Villanova alumni at Naval Air Systems Command (NAVAIR) offer student and faculty educational opportunities rooted in real-world needs.

"Naval aviation equipment has become increasingly more complex and demands a highly skilled and trained workforce," says Kathleen (McFadden) Donnelly ChE '84, Director, Support Equipment & Aircraft Launch & Recovery, Equipment Engineering Department. "NAVAIR Educational Partnering Agreements [provide students and faculty the opportunity] to work with expert engineers, unique facilities, and state-of-the-art equipment related to naval aviation at NAVAIR in Lakehurst, N.J. We [also] offer Capstone/design clinic projects, typically six months in duration."

These experiences offer access to aircraft systems and subsystems not available in a university environment. The result is a win-win. "[These programs] stimulate novel thinking as student engineers conduct research on issues

*When companies sponsor research led by Villanova engineering faculty, they gain access to the College's state-of-the-art facilities, faculty expertise, and input from Villanova's top engineering students.*



**Once a Villanova Engineer,  
Always a Villanova Engineer**

continued

*Dr. Kei-Peng Jen, Associate Professor of Mechanical Engineering (center), was selected for the Boeing Welliver Faculty Fellowship in summer 2010.*

that benefit naval aviation,” says Donnelly. “The NAVAIR community benefits by the promotion of the education of future engineers who may seek employment with the Navy.”

**Student Internships and Research Opportunities**

Central to the College’s mission is the practical application of theory; internships and undergraduate research opportunities provide invaluable ways for students to begin the transition from students to professionals.

“The engineering program at Villanova is dynamic and remains current. The faculty mirror what’s going on in the industry and support involvement in many industry professional organizations. When students have the chance to work with groups outside the College, it keeps them in tune with industry needs and trends,” says Brian Lange ME ’88, Operations Director/PMO, The Americas Operations and Consumer Care, Merck & Co., Inc. Lange recently helped Dr. Jens Karlsson, Associate Professor of Mechanical Engineering, and Dr. Noelle Comolli, Assistant Professor of Chemical Engineering, develop funding opportunities for summer undergraduate research.

Companies that take on student interns or provide undergraduate research experiences gain valuable insight from fresh perspectives and a direct line to the College’s top tier talent. “Working with students allows an organization to evaluate their capabilities over a period of time,” says Lange. “You can see how they think, how they work, and how they work within a team.”

George Bitto EE ’81, Vice President, Treasurer and Chief Risk Officer for Air Products and Chemicals, has had a similar experience. “Air Products has recruited Villanova engineers for both intern and full-time roles for many years. These students not only possess strong technical skills but also the leadership skills and work ethic which are essential for success at Air Products,” he says. “The internship

*Alumni support the College’s nearly one dozen STEM outreach programs through gifts of funding, time, and materials.*





program at Air Products enables the company to evaluate prospective employees in the working environment while affording students the opportunity to apply their academic training to actual work situations. It has been a win-win for both sides!”

## Graduate Fellowships

Graduate fellowships provide unique ways for alumni and their companies to tap the talents of the College’s master’s students through original research. To support this work, partnering companies often structure fellowships to include internships for the fellow and to cover costs associated with his or her time, laboratory fees, and any customizable components to the program.

“We hope to attract students who can be innovative and bring new technologies and abilities to help us serve our clients,” says David Didier CE ’92, MBA ’10, P.E., Associate Vice President, Transportation and Philadelphia/Delaware District Manager for AECOM, which sponsored a graduate fellowship in 2010. “In addition, we can utilize the facilities at Villanova to provide additional services and capabilities to our clients.”

McCormick Taylor also recently engaged a master’s fellow. “It gave us the opportunity to meet and work with some of the best and brightest graduate students Villanova has to offer,” says Thomas Caramanico CE ’71, MSCE ’83, P.E., President of McCormick Taylor. “How does a student know what the job he or she will do will be like every day? We hope that through our fellowship, Villanova engineers will get to see, feel, and experience what it’s like to work at McCormick Taylor. I was a graduate student at Villanova 30 years ago and was connected with the opportunity to work part-time at McCormick Taylor through my advisor, Dr. Robert Lynch, who eventually became Dean. The rest, as they say, is history. Maybe it will be the same for some of the students we’re working with now.”

## Endowed Faculty Positions

“Anything I could do to enhance the quality of the College of Engineering was high on my list,” says James R. Birle ME ’58, Founder and Chairman of Resolute Partners LLC. “Dr. Alfonso Ortega was a highly respected professor and researcher in heat transfer, and being able to attract someone of his caliber to Villanova was terrific.”

Birle’s gift to endow the faculty position of The James R. Birle Professor of Energy Tech-

nology played a role in Dr. Ortega’s decision to come to Villanova in 2006. In addition to being a prestigious honor for any senior academic professor, an endowed faculty position affords additional freedom to pursue creative and independent scholarly research topics that may not yet be ready for funding.

Faculty may also use endowed funds to compensate graduate and undergraduate research assistants and cover costs associated with equipment and laboratory needs, conference travel, and other expenses necessary to conduct the business of modern engineering research. In turn, these students enjoy enriched academic experiences.

“Al has been a positive factor at the College and is a wonderful person,” says Birle. “In my opinion, there couldn’t be a higher return on this investment.”

## Support for STEM Outreach

In addition to facilitating research engagements, scholarships, and internships, Villanova alumni at Lockheed Martin have helped garner support for the College’s efforts to improve local middle and high school students’ interests and abilities in science, technology, engineering, and math (STEM) subjects through the College’s STEM outreach initiatives.

“STEM efforts are a major catalyst to enable the next generation of engineers, and the en-

tire industry and nation benefit when we have a strong technical position in the world,” says Robert Slegelmilch EE ’84, Vice President, Delaware Valley Site Executive for Lockheed’s Space Systems Company. “In my experience with Villanova, many of the programs that the College and University support are aligned to our strategy for STEM.”

Lockheed Martin recently contributed \$10,000 to support key College service engineering initiatives such as Villanova Engineering, Science, Technology, Enrichment, and Development (VESTED), which brings low-income high school students from the Philadelphia area to campus for hands-on engineering experiences. Other funds were distributed to the Villanova chapter of Engineers Without Borders.

## Endowed Scholarships

“Rarely do I meet someone who went to Villanova who didn’t absolutely love it,” says Robert Catalanello EE ’86, Managing Director, Foreign Exchange, Americas at Calyon, Crédit Agricole Corporate and Investment Bank. “Higher education is competitive, and it’s up to us as alumni to ensure that others get the opportunity to enjoy Villanova as much as we did.”

Catalanello and his wife Brenda established the The Brenda H. and Robert G. Catalanello

*Dr. Alfonso Ortega currently holds The James R. Birle Professor of Energy Technology position, which was endowed by alumnus James Birle ME ’58.*





*The College has benefited from the generosity of alumni and corporate and foundational partners who have contributed funding or equipment that advances research facilities.*

## Once a Villanova Engineer, Always a Villanova Engineer continued

'86 Endowed Scholarship for Engineering to give the gift of the Villanova experience to future engineers in perpetuity.

“The U.S. has a real need to produce top-quality engineers. It’s important that we continue to be excellent in science, math, and engineering. We wanted to help give someone the chance to pursue these areas,” he says.

### Funded Faculty Research

“In academia, faculty researchers delve into the original engineering theory behind what you are trying to do,” says Peter Naccarato CE '65, P.E., co-founding partner of O'Donnell & Naccarato and founding member of Girder-Slab Technologies, LLC, a new structural composite steel and precast system.

Girder-Slab Technologies needed a partner for tests required prior to going to market. Naccarato brought the opportunity to the Structural Engineering Teaching and Research Laboratory (SETRL) to work with Civil and Environmental Engineering faculty members Dr. David Dinehart, Professor; Dr. Shawn Gross, Associate Professor; and Dr. Joseph Yost P.E., Associate Professor and Director of SETRL.

“They had an unbelievable understanding of our needs, which they used to design the test system. They added great value by combining their individual areas of expertise and approaching the research problem together,”

says Naccarato. “We had lots of interaction with them during the process, which allowed us to make changes and fine-tune the product along the way — which also saved us money.”

### Research Facility Support

Chemical Engineering is in the White family's DNA. Kevin White ChE '80, Senior Project Engineer at E.I. duPont de Nemours & Company, Inc.; his wife Patricia ChE '82, college preparatory and advanced placement chemistry teacher at Salesianum School in Delaware; and his father Gerald ChE '57, former Chief Financial Officer of Air Products and Chemicals, all graduated under then-department chair Dr. Robert White (no relation). Kevin's younger son Samuel ChE '08 is also a Villanova chemical engineer and currently teaches biology and chemistry at Salesianum School.

“Dr. White was the face of the ChE program when my father and I attended Villanova. He was very involved in the academic and post-graduation lives of his students,” says Kevin. “My father wanted to support the ChE department and honor someone who had a substantial influence on himself, his family, and the department's students. So, he helped set up a fund at Villanova named for Dr. White.”

“Dad also recognized that for fields like nanoengineering and bioengineering, the College needed facilities to allow students and faculty to explore these emerging areas more fully,” says Kevin. “He worked with the current ChE department to set up the Gerald A. White Biotechnology Research Laboratory to help

make the facilities as current now as they were when he and I attended Villanova.”

Alumni have also helped connect the College with equipment their companies may no longer need. Although not an alumnus, Dr. Charles Coe, Visiting Assistant Professor of Chemical Engineering, knows the impact these gifts can have. Upon retiring from Air Products, Dr. Coe arranged for donations including synthetic equipment for preparative catalysis techniques and an X-ray diffraction unit. “The donated equipment is expanding the range of experiments and projects that can be carried out,” he says. “It gives students access to equipment and experiences that directly improve the research practice.”

### Service on Departmental Advisory Boards

Many alumni serve on departmental advisory boards, which are charged with improving the success of each major discipline and ensuring that industry members value the education provided.

“The advisory boards help the faculty consider changes to the curriculum, credit hours, and course offerings, as well as the implications of those changes,” says Rachel McCaffery CE '02, Project Manager at Weston Solutions and member of the Civil and Environmental Engineering Advisory Board.

According to Arthur Ryan III EE '65, retired Development Vice President - Bell Laboratories, and member of the Electrical and Computer Engineering Advisory Board, “Without [this] guidance, it would be difficult for the department[s] to remain current and adapt to the changing needs of the industrial environment. The strength of the board[s] comes from the commitment of [alumni] and their desire to give back to the University, the College, and the department[s]. The demands facing these individuals in the real world are invaluable inputs to strategic planning and curricula development.”

Advisory board members also cultivate resources for the departments, including internships, scholarships, fellowships, faculty research grants, gifts of equipment, and participation in the new Multidisciplinary Design Laboratory.

To find out how you can get involved, please contact Burton Lane, Director of External Relations, at [Burton.Lane@Villanova.edu](mailto:Burton.Lane@Villanova.edu) or Cynthia Rutenbar, Director of Development for the College of Engineering, at [Cynthia.Rutenbar@Villanova.edu](mailto:Cynthia.Rutenbar@Villanova.edu).



# 10

## *Easy Ways to Strengthen Your Ties to the*

### *College of Engineering*

You can help us shape the next generation of Villanova engineers. Consider these 10 easy ways to strengthen your ties to the College and your fellow Wildcats.

- **Consider** the College of Engineering's faculty and dozens of state-of-the-art laboratories for your organization's real-world research needs. Or, sponsor a project for the new Multidisciplinary Design Lab, designed to give students real-world research experience for industry.
- **Join** the Villanova Engineering Alumni Society, which supports academic programs and offers networking opportunities for members.
- **Connect** with the University's Career Center to make them aware of internship and career opportunities within your organization for new engineers – and to secure the best new engineering talent for your company.
- **Mentor** an undergraduate to share your insights as a seasoned professional and help a new engineer prepare for life after graduation.
- **Contribute** financially to the College of Engineering, which will support the College's goal of becoming the premier engineering program in the country.
- **Establish** a Villanova Corporate Alumni Partnership within your organization to bring together fellow alumni for timely updates from the College, professional development and networking opportunities, and the chance to build a Villanova identity within your company.
- **Visit** the College of Engineering's website for news and information about student programs and achievements; faculty research, recognition, and accomplishments; and special events.
- **Host** an information session for students at your company, or serve as a guest speaker for one of the student branches of professional engineering societies.
- **Share** information about opportunities for sponsored research or faculty fellowships available within your company.
- **Follow** the College's news and updates via Facebook and LinkedIn.

#### **Next steps...**

- For more information about the College of Engineering, visit [www.engineering.villanova.edu](http://www.engineering.villanova.edu).
- For inquiries about alumni events or involvement, **visit [www.Villanova.edu](http://www.Villanova.edu)**.
- To make a financial contribution, contact Cynthia Rutenbar, Director of Development for the College of Engineering (**[Cynthia.Rutenbar@Villanova.edu](mailto:Cynthia.Rutenbar@Villanova.edu)**).
- For inquiries about Villanova Corporate Alumni Partnerships or questions regarding corporate partnerships or research, contact Burton Lane, Director of External Relations (**[Burton.Lane@Villanova.edu](mailto:Burton.Lane@Villanova.edu)**).
- To serve as a student mentor or to connect with student organizations, contact Gayle Doyle, Administrator of Student Support Programs (**[Gayle.Doyle@Villanova.edu](mailto:Gayle.Doyle@Villanova.edu)**).



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## ENGINEERING

