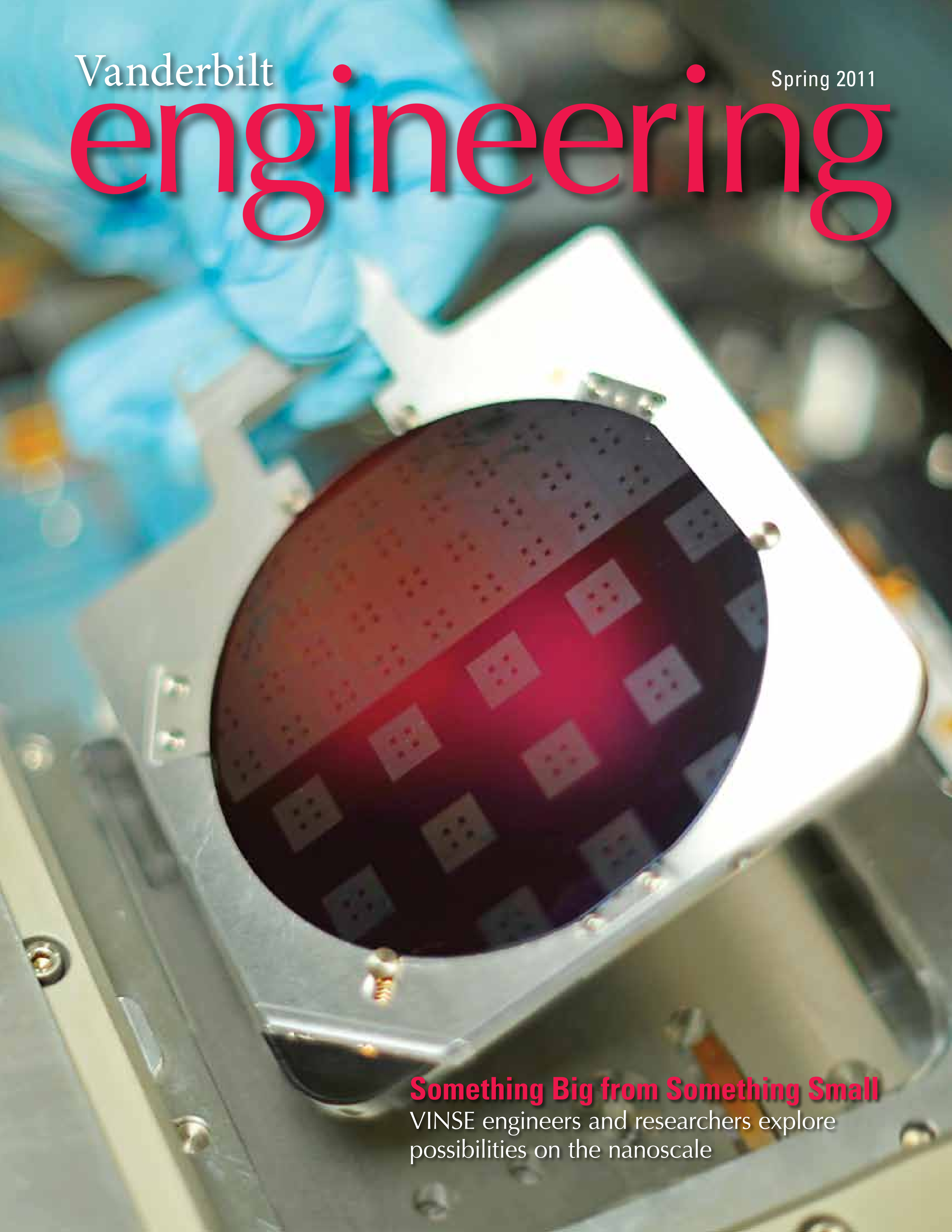
Vanderbilt

engineering

Spring 2011

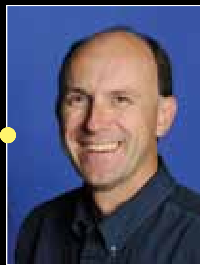


Something Big from Something Small

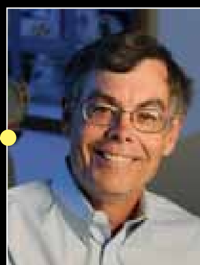
VINSE engineers and researchers explore possibilities on the nanoscale

honors and awards

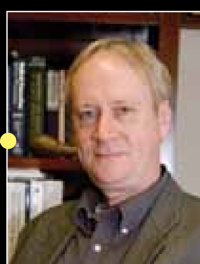
E. Duco Jansen, professor of biomedical engineering, was elected into the American Institute for Medical and Biological Engineering's College of Fellows.

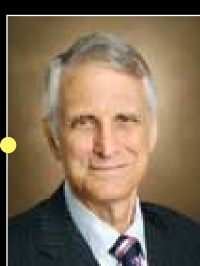


J. Michael Fitzpatrick, professor of computer science, computer engineering and electrical engineering, emeritus, has been named an IEEE Fellow.

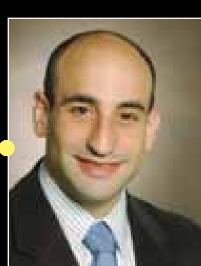


John C. Gore and **John P. Wikswo** have been named fellows of the American Association for the Advancement of Science (AAAS) in the categories of neuroscience and physics, respectively. Gore, Hertha Ramsey Cress Chair in Medicine and professor of biomedical engineering, was honored for distinguished contributions to the development and application of imaging methods for biomedical science, and as director of the Vanderbilt University Institute of Imaging Science. Wikswo, Gordon A. Cain University Professor, A. B. Learned Professor of Living Physics and professor of biomedical engineering and physics, was honored for distinguished contributions at the interface of physics, biology, bioengineering and medicine.





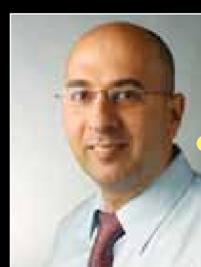
Bradley Malin, research assistant professor of computer science and assistant professor of biomedical informatics, has received a Presidential Early Career Award for Scientists and Engineers (PECASE) for pioneering approaches to managing and protecting the privacy of electronic health records and research data.



Sokrates Pantelides, William A. and Nancy F. McMinn Professor of Physics and professor of electrical engineering, has been named University Distinguished Professor of Physics and Engineering.

Associate Professor of Electrical Engineering **Robert Reed** has been elected one of three representatives from the Radiation Effects Technical Committee to the IEEE Nuclear and Plasma Sciences Society Administrative Committee.

Ron Schrimpf, Orrin Henry Ingram Chair in Engineering, director of the Institute for Space and Defense Electronics (ISDE) and faculty head of Memorial House on The Commons, received Vanderbilt University's Chancellor's Cup for the greatest recent contribution outside the classroom to undergraduate student–faculty relationships.



Associate Professor of Mechanical Engineering **Nabil Simaan** received the 2010 Benjamins Award from the Collegium Oto-Rhino-Laryngologicum Amicitiae Sacrum (CORLAS). It is regarded by many as the most impressive international award given by the otolaryngology society. Simaan and his research partners were honored for work on robotic insertions of steerable cochlear implant electrodes.

Janos Sztipanovits, E. Bronson Ingram Distinguished Professor of Engineering, professor of electrical engineering and computer engineering, and director of the Institute for Software Integrated Systems (ISIS), received the Air Force Meritorious Civilian Service Award Medal for his service to the Air Force Scientific Advisory Board. The honor is commonly the second highest award and medal provided to civilian employees within agencies of the federal government of the United States.

engineering

On the cover: A patterned diamond cold cathode emitter device created in the VINSE electron optics center. This research may lead to microelectronic applications such as high frequency wideband satellite communications. Photo: John Russell

INSIGHT ◦ INNOVATION ◦ IMPACT®

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What Engineering Deans Talk About

I am fortunate to work with a national group of engineering deans who care deeply about the quality and preparedness of engineering students. As I come to the end of my term as chair of the Engineering Deans Council of the American Society for Engineering Education, I want to share with you some of the contemporary issues that engineering deans face. The topics discussed and discussed again include accreditation, diversity and retention, involvement in K–12 education, and research collaboration with industry.


DANIEL DUBOIS

Dean Galloway

Great organizations constantly assess the current environment and forecast the future to ensure they remain relevant. The accreditation infrastructure maintained by ABET is important for ensuring quality and continuous improvement in engineering education. Engineering deans are concerned with how accreditation policies and processes evolve as engineering education changes. And engineering education and engineering practice are changing. New specialties evolve and new knowledge demands are placed on our students and faculty. As a private institution, we have special obligations to our students, parents, university leadership and Board of Trust. But as engineers, we also must serve business, industry and the public at large. Related to changes in engineering curriculum and educational practices is the evolving licensure process for engineers, which leads to the P.E. designation. This is a topic that generates lively discussion among engineering deans as well as many of our engineering graduates.

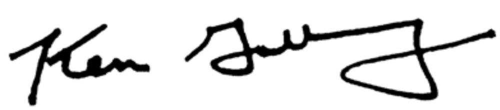
Issues of diversity and retention are of great concern to engineering deans. We worry about how to be more inclusive of underrepresented groups in the engineering work force, and deans are concerned with how to increase participation and retention of these students who, by some calculations, will make up more than 70 percent of the U.S. workforce by 2050.

The questions surrounding how to best partner with K–12 school systems are points of contention and deliberation. Should some engineering principles be taught at the kindergarten through 12th grade levels? Who should set the standards for engineering education in K–12 schools? According to a September 2009 report titled *Engineering in K–12 Education*, the National Academy of Engineering and the National Research Council concludes that the introduction of K–12 engineering education has the potential to increase awareness about what engineers do and engineering as a potential career, and to boost students' technological literacy. Deans all agree that young students need a better understanding of what engineers do.

Research drives invention, design, analysis and innovation for faculty and graduate students at U.S. engineering schools. Many of us think that industry–university partnerships are critical to maintaining and strengthening our country's economy. The technology transfer role that U.S. academic researchers are expected to play in economic development, what specific roles they can play in industrial innovations, and how they might go about collaborating with private industry are complicated by several factors. These include 1) declining federal R&D support, which threatens the vitality of the academic research enterprise, and 2) the impact of close university–industry cooperation on the freedom to pursue longer-term, more fundamental research not tied to a particular product or process. Determining the boundaries of university–industry collaboration is a balancing act between competing concerns. And these partnerships are complicated further when issues of intellectual property, open publication and indemnification become contractual items for negotiation.

These issues are not new. Many of you have discussed them and thought about them. The goal is clear and one that we all embrace. We must continuously improve the state of engineering education for future generations of engineers. This is critical for our country.

On a different and important note, the 2011–2012 academic year will mark the 125th anniversary of the establishment of the Vanderbilt University School of Engineering by vote of the Board of Trust in 1886. We are planning a yearlong, quasquicentennial celebration with special commemorative events and *Vanderbilt Engineering* magazine stories on the School of Engineering through the years. I hope you will join us in celebrating this important milestone in our history.



Kenneth F. Galloway
Dean

An undergraduate population

that's a bit different from the rest

Vanderbilt Engineering		National average
30%	Females	15%
24%	Students who self-identify as people of color or international	20.4%
14.5%	2011 graduating seniors who studied abroad	2.5%

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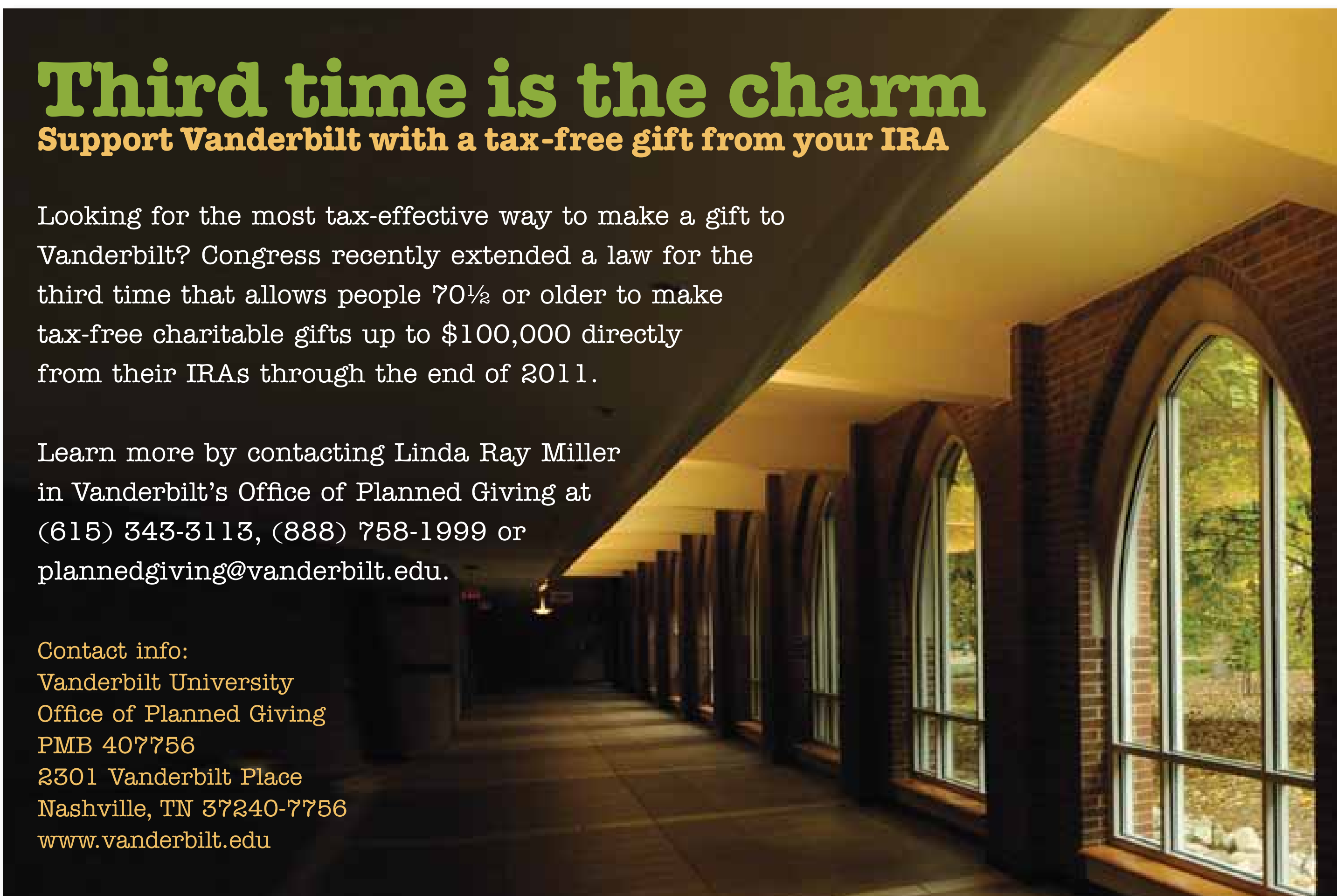


Student Recognized for Virtual Work

COURTESY ERIN MCMANUS

Erin McManus in motion capture suit

Junior **Erin McManus**, a computer science and mathematics major, was a finalist in the 2011 Computing Research Association's Outstanding Undergraduate Researcher Award competition. McManus was honored for research she conducted on avatars (computer users' representations of themselves in a computer game or other electronic environment) at the Max Planck Institute for Biological Cybernetics (MPI) in Tübingen, Germany. She used MPI's state-of-the-art facilities to design and run an experiment that looked at the effects of avatars on human performance in virtual environments. The research was in collaboration with MPI and the Learning in Virtual Environments lab in VUSE's Department of Electrical Engineering and Computer Science.

The CRA award program recognizes undergraduate students in North American universities who show outstanding potential in an area of computing research.

New Emeriti and New Faculty

Three longtime professors have been honored with emeritus status by the Vanderbilt University Board of Trust. **J. Michael Fitzpatrick** is now emeritus professor of computer science, computer engineering, electrical engineering, radiology and radiological sciences, and neurological surgery. **Frank L. Parker** is now Distinguished Professor of Environmental and Water Resources Engineering, emeritus, and professor of civil and environmental engineering, emeritus. **Carol A. Rubin** is now professor of mechanical engineering, emeritus.

Four new tenure/tenure-track faculty members joined the school in the 2010–2011 academic year. **Matthew Lang**, associate professor of chemical and biomolecular engineering, came to VUSE from MIT. **Melissa Skala**, assistant professor of biomedical engineering, came from Duke University. **Nabil Simaan**, associate professor of mechanical engineering, arrived from Columbia University, and **Jason Valentine**, assistant professor of mechanical engineering, joined the school from the University of California–Berkeley.

New Division Created

JOHN RUSSELL

Christopher Rowe

Effective August 1, the school created the Division of General Engineering, which serves as an umbrella organization for the management of the engineering science major, engineering management minor and the first-year program.

Christopher J. Rowe, assistant professor of the practice of engineering management, is serving as interim director of the division. In addition to these duties, Rowe is senior aide to Dean Galloway and oversees engineering communications.

Introducing Associate Dean Paschal

JOHN RUSSELL

Cynthia Paschal

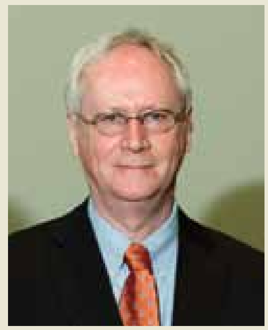
Cynthia Paschal, associate professor of biomedical engineering, has been appointed associate dean. Her responsibilities include corporate outreach, study abroad and coordination of international activities for the dean's office; Career Center liaison; course director for the new academic component of summer internships; and working with the School of Engineering's Committee of Visitors. Paschal has been a member of the School of Engineering since 1992; most recently, she also served as chair of Vanderbilt's Faculty Senate, the representative and legislative body for the university's faculty.

Getting a charge out of the Volt

DANIEL DUBOIS

President of GM North America Mark Reuss, BE'86, and Chevrolet Volt director of design Bob Boniface, BA'87, pulled some strings to give engineering students a sneak peak at a preproduction Chevrolet Volt. Boniface, director of the E-Flex Design Studio at General Motors Corporation, drove the innovative extended-range electric vehicle from Detroit to Nashville in October. Boniface (above left) charges the Volt behind Featheringill Hall before driving it onto Stevenson Center plaza where the 2011 *Motor Trend* Car of the Year charmed students, alumni and visitors. While Reuss attended the School of Engineering's Committee of Visitors' meetings, Boniface popped the Volt's hood and chatted with interested students.

John Gore Elected to National Academy of Engineering



STEVE GREEN

John Gore

John C. Gore, Hertha Ramsey Cress Chair in Medicine and professor of biomedical engineering, has been elected a member of the National Academy of Engineering, one of the highest professional honors in engineering.

Gore was named to the academy for his contributions to the development and applications of magnetic resonance and other imaging techniques in medicine. He directs the Vanderbilt University Institute of Imaging Science and holds additional professorships in physics and molecular physiology and biophysics.

NAE members are peer-elected, senior professionals in business, academia and government and are among the world's most accomplished engineers.

NATIONAL ACADEMY OF ENGINEERING

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Something BIG from Something Small

by Jennifer Johnston

Ben Schmidt, PhD'10, research associate in chemical and biomolecular engineering, measures thin film thickness using VINSE's profilometer.

JOE HOWELL

Vanderbilt researchers working at the smallest scale celebrate a huge milestone this year. The Vanderbilt Institute of Nanoscale Science and Engineering (VINSE), seeded from a university-funded $16 million venture capital fund initiative, celebrates its 10th anniversary in December.

There is much to celebrate, including the fact that in the past decade, VINSE has attracted more than $75 million in federal funding for nanoscience research, says VINSE Director Sandra J. Rosenthal.

An interdisciplinary institute devoted to the science and engineering of matter on the atomic scale, VINSE proves that even the smallest matter matters. Through nanotechnology, researchers make extremely small materials—far smaller than the width of a human hair—but with enhanced capabilities relevant to everything from energy use to the efficient delivery of medications.

“The fundamental thing that makes nanoscience interesting is that when you fabricate a material on the nanoscale, new properties are discovered all the time. These new properties open up a myriad of possibilities for potential applications,” says Rosenthal, the Jack and Pamela Egan Chair of Chemistry and professor of chemical and biomolecular engineering, chemistry, physics and pharmacology. “We study those possibilities and figure out what applications you can use for those properties.”

JOHN RUSSELL

VINSE Director Sandra J. Rosenthal in her lab, surrounded by components and examples of her groundbreaking research into quantum dots, also known as semiconducting nanocrystals.

> "One day I'm saving the planet trying to develop energy-efficient lighting. Another day I'm trying to do fundamental research that may … alleviate the suffering of people with mental illness."
>
> —Sandra Rosenthal

With partners that include Oak Ridge National Laboratory and Fisk University, VINSE fosters cutting-edge research in biology and medicine, optics, carbon-based nanostructures and sensors, as well as a new emphasis at the interface of nanoscience and energy. Roughly a quarter of Vanderbilt's engineering faculty are part of VINSE, comprising nearly half of the institute's researchers.

In recent months, the institute earned a $5 million stake in a $20 million National Science Foundation grant to strengthen research development infrastructure in Tennessee. A smaller but critically important $569,000 grant from NSF's American Recovery and Reinvestment Act allowed for the renovation of air-handling equipment in the VINSE clean room and an upgrade of the toxic gas monitoring system.

Power of Research

The core facilities of VINSE, created and equipped with $5 million of the initial investment from the university's endowment, provide highly specialized instrumentation. "The fact that we have this kind of fabrication and characterization available has allowed us to land some outstanding individuals who are nanoscience researchers," Rosenthal says.

Among the latest recruits is Assistant Professor of Mechanical Engineering Jason Valentine, an expert on cloaking—hiding objects from view by bending light around them.

While cloaking evokes images from the world of Harry Potter or *Star Trek*, its more practical applications include the possible creation of ever smaller, lighter and more efficient optical systems and materials for telecommunications and computing.

As a graduate student at University of California–Berkeley, Valentine was part of a research team that created a cloaking technique dubbed a "carpet cloak" made from a silicon sheet and drilled with precisely placed holes. The cloak alters the refraction of light as it passes through the material—thinner than a human hair—making an object appear flat.

"What we are doing is virtually ripping a hole in space," Valentine says, albeit a very tiny hole. Since naturally occurring materials do not have this kind of flexibility in their optical properties, Valentine and the Berkeley research team used metamaterials—artificial materials engineered with nanoscale machining methods—to achieve material structuring much smaller than the wavelength of light.

While the effect was achieved on the two-dimensional scale, Valentine is continuing the next step at Vanderbilt—working toward the fabrication of such materials on a larger scale and in 3-D. These developments could prove useful in manipulating light in silicon chips, the foundation of modern electronics, to enable more efficient and flexible light-routing architectures.

"Cloaking is a great demonstration of the technology and a great way to pull young students into the science field," Valentine says of the public interest in cloaking. "Normally, they wouldn't be aware of scientific breakthroughs."

Saving Energy, Saving Lives

While Valentine works to manipulate light, Rosenthal's lab experienced a breakthrough by producing a new nanomaterial that for the first time emits a white light. Rosenthal aims to make the material bright and white enough to become commercially viable.

"A lot of people said this (discovery of white light on the nanoscale) would never happen. Nobody predicted it," she says.

Rosenthal's lab uses specialized instrumentation to synthesize semiconducting nanocrystals, also called quantum dots. A building block of nanotechnology, quantum dots are just a few millionths of a millimeter across, exhibiting unique electronic, optical and magnetic properties that can be utilized in a variety of technologies.

Among other projects, Rosenthal also is investigating ways to bind drugs to a cell's protein, providing a nanocrystal beacon to track the movement of proteins that control serotonin through the brain. This could be a potential breakthrough in mental health, as an imbalance of serotonin is associated with many major mental illnesses.

"My research is a lot of fun," Rosenthal says. "One day I'm saving the planet trying to develop energy-efficient lighting. Another day I'm trying to do fundamental research that may one day help alleviate the suffering of people with mental illness, and it's nanotechnology that's enabling all of it."

JOE HOWELL

A Raith eLiNE EBL (electron beam lithography) system allows researchers to pattern the smallest nanostructured materials. The cutting-edge instrument is housed in VINSE's Electron Optics Laboratory, supervised by Tony Hmelo, VINSE associate director and research associate professor of physics and materials science (pictured).

Assistant Professor of Electrical Engineering Sharon Weiss investigates nanotechnology that could potentially help a drug cocktail hone in on hard-to-reach tumors in cancer patients, among other potential applications.

Weiss works with porous silicon crystals. Sponge-like material filled with billions of tiny holes, the crystals can be manipulated through an etching process that allows scientists to load the tiny holes with other substances.

Weiss pairs with Paul Laibinis, professor of chemical and biomolecular engineering, in research that involves synthesizing DNA molecules inside the pores with certain drugs to create a highly selective sensor. By evaluating how light interacts with the porous silicon, it is possible to detect the presence of trace amounts of biological material. This can aid in a number of processes, including the delivery of medicines to very specific areas in the body, Weiss explains.

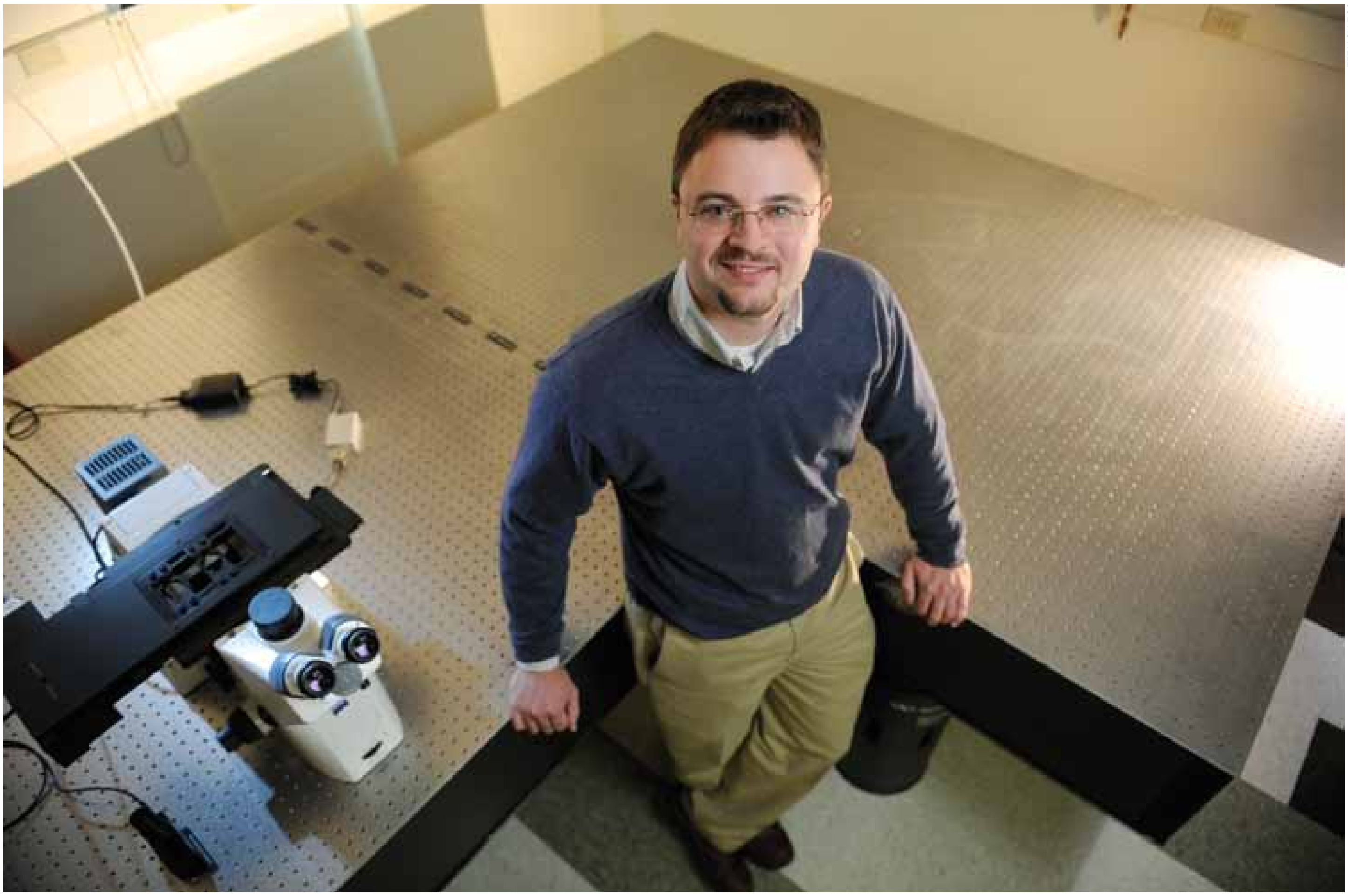
Looking Ahead

Peter Cummings, the John R. Hall Professor of Chemical Engineering, has been instrumental in shaping the government's National Nanotechnology Initiative Strategy. He recently participated in a strategic directions workshop to provide input into the government's blueprint for nanoscience research for the next decade. (For details, see www.nano.gov).

The science of small has quietly revolutionized many aspects of technology and that revolution is continuing, Cummings says.

He notes that researchers at Vanderbilt and elsewhere are making strides in molecular electronics, with the goal of constructing devices with a switch comprised of just one molecule.

This would represent the ultimate miniaturization of electronics. "People are contemplating what's going to happen beyond silicon," he says of the material that forms the basis of modern



JOE HOWELL

Cloaking research by Assistant Professor of Mechanical Engineering Jason Valentine (shown in the process of setting up his lab) could lead to ever smaller, lighter and more efficient optical systems and materials for telecommunications and computing.

computer chips. In fact, Vanderbilt's Weiss, who has a secondary appointment as assistant professor of physics, is working with Richard Haglund, professor of physics, on methods to speed computing processes by using light rather than metal to quickly transfer information. (See *Vanderbilt Engineering*, fall 2010.)

Cummings says that Vanderbilt engineers are using high-performance computing-based techniques, including the use of GPUs (graphical processing units, primarily developed for video games) to research other aspects of nanoscience, including study of nanoconfined fluids, which are important for lubrication of moving parts in nanoscale devices.

Vanderbilt has a grant, led by Associate Professor of Mechanical Engineering Greg Walker, to build a fast GPU cluster for scientific computation, and Oak Ridge National Laboratory, where Cummings is Principal Scientist in the Center for Nanophase Materials Science, is building a huge GPU cluster in collaboration with Georgia Tech.

JOE HOWELL

VINSE recently renovated the air-handling and toxic gas monitoring equipment in its clean room, thanks to an American Recovery and Reinvestment Act (ARRA) grant. Research Assistant Professor of Electrical Engineering Bo Choi works at the eBeam evaporator in the room.

Matter even smaller than that of the nanoscale—at the "femto" and "atto" scale—already is under exploration as well. Tools such as atomic force microscopes allow scientists to measure and watch individual chemical reactions take place, moving far beyond the theoretical stage. Cummings says it was just a short time ago that scientists could barely imagine the innovations happening today in nanoscience. "What was inconceivable a couple of decades ago is a reality today," he says. ●

International Pioneers

Vanderbilt and City University of Hong Kong exchange first student engineers

by Becky Green

Gaining a global perspective of engineering was important to Amanda Chen, but it wasn't the engineering junior's only reason for spending a semester in Hong Kong. "I wanted to become fully immersed in a culture through living, taking classes and traveling with local residents," she says.

Chen, a biomedical engineering major from Reston, Va., was Vanderbilt's pioneer engineering exchange student for a new program with City University of Hong Kong. She spent spring semester 2010 studying in Kowloon. At the same time, mechanical engineering major Nick Pappalardo studied in Singapore, and in fall 2010, Vanderbilt engineering junior Yi-Chin Sun became the second exchange student at City University.


YUAN ZHUANG

Exchange student Yuan Zhuang visited the Smoky Mountains during her semester at VUSE.

Vanderbilt University School of Engineering students first participated in exchange programs with City University of Hong Kong and the National University of Singapore in 2010. For spring 2011, the school added three engineering exchange programs, with direct-credit programs at Budapest University of Technology and Economics, Hong Kong University of Science and Technology, and a mechanical engineering exchange with the Politecnico di Torino in Italy.

Students who choose to study in Asia are forward-thinking, says School of Engineering Associate Dean Cynthia Paschal. "Hong Kong is a sophisticated economic powerhouse. Employers with worldwide operations will seek out students with international experiences," Paschal says.

Global Opportunities

Exchange programs are negotiated between specific schools rather than the university as a whole. The Hong Kong program grew from a relationship between administrators at Vanderbilt and the president of City University.

"The hope is that a variety of locations outside the English-speaking world will be appealing to our engineering students," says Isabelle Crist, senior program coordinator of Vanderbilt's Global Education Office. "Classes in these programs are taught in English, which makes study in these countries possible."

Chen was surprised to find that teaching styles and educational environment in Hong Kong were similar to those at VUSE. "The teaching strategy was nearly the same. The professors used PowerPoint presentations and would give weekly quizzes to make sure students were staying on top of their work," Chen says.

Experiencing Vanderbilt

On the other side of the exchange was computer science student Yuan Zhuang of City University. Zhuang embraced the exchange program during spring semester 2010 as an opportunity to broaden her outlook and learn more about other cultures.

At Vanderbilt, she found class sizes to be smaller and the atmosphere more relaxed than her home university. "I was impressed that most of the students are willing to express their ideas. I liked the feeling that professors are not just telling you things. Instead they discuss and interact with you," Zhuang explains.

Challenges and Triumphs

Foreign college life can present obstacles whether in the U.S. or abroad. Now a senior, Chen recalls the challenges of adapting to Hong Kong. "My main difficulties arose when communicating with the local residents because I cannot speak Cantonese and not everyone can speak English," she says. "The communication breach made group projects a bit frustrating."

City University's Zhuang also recounts occasional feelings of isolation at Vanderbilt. "By being alone I don't mean physically being by yourself, but the situation that you put yourself in a place where everyone else has the same culture, similar habits and familiar things except you," she recalls.

Chen has considered graduate programs that incorporate international experiences. "Studying abroad is a truly unique opportunity to learn what cannot be taught in a classroom," she says. "It reveals capabilities you may not know you had and introduces you to people with drastically different backgrounds." ●

Olin's Innovative Transformation

STEVE GREEN

by Becky Green

One of the School of Engineering's landmark buildings, Olin Hall, recently benefited from a $1 million-plus interior renovation. The 36-year-old building currently houses the mechanical engineering and chemical and biomolecular engineering departments.

Peter Pintauro, H. Eugene McBrayer Professor of Chemical Engineering and chair of the chemical and biomolecular engineering department, worked closely with contractors to accomplish changes.

"The goal of the project was twofold. One was to renovate our teaching labs to improve the quality of our undergraduate programs while supporting a greater number of undergraduate students," Pintauro says. "The other was to better the teaching environment to support enrollment figures and increase laboratory space for new faculty."

He noted that chemical engineering enrollment figures have doubled over the last five years, adding to the need for renovated space. Revamped lab space also allows for flexibility in types of teaching experiments. The most innovative new component was restructuring Olin's spatial configuration to convert a multifloor undergraduate teaching lab into a single floor state-of-the-art teaching and research lab space. The overall amount of useable lab space will increase when the basement research laboratory is fully renovated next year.

GOBBELL HAYS PARTNERS INC.

1. Five small rooms were gutted and converted to over 1,000 square feet of lab space for Associate Professor of Mechanical Engineering Nabil Simaan (right). 2. The multifloored chemical engineering undergraduate teaching lab before renovations. 3. The renovated chemical engineering lab has room for 40 students to work at once. 4. The new layout transforms the lab to approximately 2,200 square feet of useable lab space. 5. Visitors to Olin Hall now enter an inviting, well-lit lobby. 6. Updated classrooms provide a more inviting environment for students and professors. 7. When finished in 1975, Olin housed the mechanical engineering and engineering sciences departments in then state-of-the-art facilities.

The renovation of Olin Hall has also been transformative for mechanical engineering, says Robert Pitz, professor and chair of mechanical engineering. The overhaul provided updated classrooms and modern undergraduate and research laboratories for the rapidly growing mechanical engineering department. “An expanded and updated system dynamics/instrumentation laboratory is providing exciting hands-on experiments for undergraduates,” Pitz says. “Graduate students are sitting in renovated laboratories and in a new 20-student graduate office suite. Four new mechanical faculty members have renovated research laboratories in surgical robotics, microfluidics and nanophotonics.”

To establish sustainable heating and cooling, Olin Hall’s HVAC was upgraded to include new variable speed drives on air handlers with the ability to use outside air when the temperature allows, says Gary Walker, Olin Hall building manager. “By replacing the variable air volume boxes throughout the building, it greatly improved the air quality. We are also reducing the power requirements for the building in accordance with Vanderbilt’s policy for energy savings,” Walker says. ●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STEVE GREEN


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VANDERBILT UNIVERSITY SPECIAL COLLECTIONS AND UNIVERSITY ARCHIVES

Giant Talent

by Cindy Thomsen

AARON HOUSTON/THE NEW YORK TIMES/REDUX

Jonathan Goff

Fluid mechanics … thermodynamics … biomicroelectromechanical systems—subject matter that Vanderbilt University School of Engineering mechanical engineering students must master before graduation.

Play action … double reverse … screen pass—subject matter that Vanderbilt football players must master before competing in the Southeastern Conference.

Rarely do you find a student who excels at both. But then rarely does a student like Jonathan Goff, BE'07, come along.

For the time being, Goff's football career is taking precedence over his mechanical engineering career. As starting middle linebacker for the NFL's New York Giants, Goff has his hands full defending against the likes of Peyton Manning and Michael Vick.

In 2008, Goff was drafted in the fifth round and 165th overall by the Giants after a standout career at Vanderbilt. During his time dressed in Commodore black and gold, Goff became only the 10th player in school history to lead the team in tackles in consecutive seasons. He was twice named to the All-SEC second team and was also Commodore team co-captain in his junior and senior years.

Though SEC wins were rare during his time, there are three that stand out.

"My redshirt sophomore year, we played the University of Tennessee at Neyland Stadium for the last game of the year," Goff says. "We had started the year 4 and 0 and then we just went on a losing streak. Everybody kept saying we only needed two more wins to become bowl-eligible, but we just never got there. We were playing for pride by the time we got to Knoxville, but we did beat them and it's one of my best memories of playing football at Vanderbilt."

Wins at heavily favored South Carolina and Georgia were also memorable to Goff, especially since Vanderbilt spoiled their homecoming festivities. (At least that's Goff's version of the story, and he's sticking to it.)

> “I have to be able to understand the general concept behind each coverage or package and apply it to the given situation.”
>
> —Jonathan Goff

Math and Science Guy

Goff is the first to admit that engineering students are rare on most SEC football rosters. It was the combination of top-tier academics and athletics that sold him on Vanderbilt.

“I felt like Coach Bobby Johnson and his staff really had my best interest at heart, both as an athlete and a student,” Goff says. “Getting to play in the SEC was a really big deal for me, but I knew that Vanderbilt would challenge me academically as well. It was the best of both worlds.”

Though he has always had a natural affinity for math and science, the course work at the School of Engineering initially proved difficult.

“Time management was definitely an issue for me at first,” he says. “I went through a bit of a rough spot the second semester of my first year. But I’ve always been a math and science guy. I’d rather do algebra than analyze poems or write short stories.”

As a middle linebacker, Goff is charged with leading the defense. Just like the quarterback on offense, the 25-year-old is responsible for calling out the plays for the defense and making sure that the players are in the right positions. He, along with the coaches on the sidelines, must be aware of the other team’s tendencies and weaknesses. It’s a job that requires a lot of study and one that is similar in some ways to his engineering studies.

“A lot of my engineering classes involved understanding certain concepts,” he says. “You have to understand different formulas and different laws. The connection between that and football would be that in football, there are different offensive packages. I have to be able to understand the general concept behind each coverage or package and apply it to the given situation.”

Helmet and Hardhat

That Goff is successful in football and engineering is no surprise to his family of high achievers. His mother, Gwendolyn Tyre, was the first female African American law clerk at the Georgia Supreme Court; in 1996, Attorney General Janet Reno appointed her as executive director of a Department of Justice program of law enforcement, crime prevention and community revitalization. Today she is a juvenile court judge in Cambridge, Mass. Goff’s brother, Jason, has two bachelor’s and two master’s degrees, and is a staff engineer for Langan Engineering and Environmental Services.

Goff kept his own engineering wits sharp two years ago when the football pro interned during the offseason with Skanska, a

DANIEL DUBOIS

Vanderbilt Commodore Jonathan Goff in his senior year

construction management firm.

“It was interesting to me because they were overseeing the construction of the New Meadowlands Stadium,” Goff says. “I went over once or twice a week and shadowed a couple of people—the field supervisor and the safety inspector.”

“I’m definitely open to working in engineering after football,” he says. “I’ll use my Vanderbilt degree, somehow, someway.”

For the present, football takes center stage, even with the toll it takes on Goff’s body.

“I never really feel recovered from the season until February or March,” he says. “It starts in training camp and you just get used to being sore all the time. Football is all about competition and camaraderie, but really we’re just regular guys who happen to be in the limelight.”

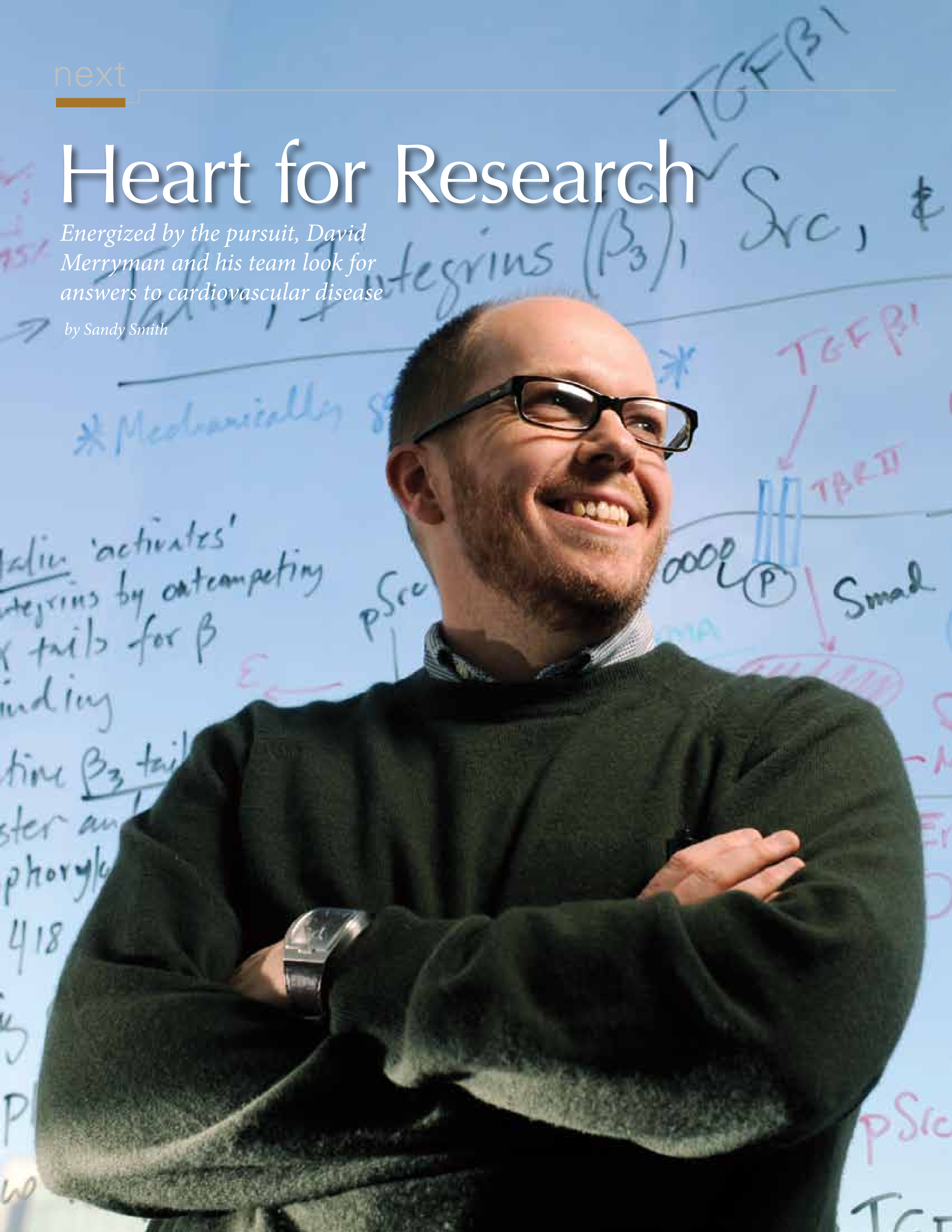
Goff also had a few words for any prospective football-playing engineers.

“Vanderbilt is a great university. The School of Engineering will challenge you, and because you’re in the Southeastern Conference you’re going to be playing against the best, week in and week out,” he says. “Vanderbilt definitely helped me make the most of myself.”

Heart for Research

Energized by the pursuit, David Merryman and his team look for answers to cardiovascular disease

by Sandy Smith



Talk to people who know David Merryman best, and one adjective is heard frequently: passionate. Talk to Merryman yourself and it is easy to see why.

Discussing his research, the assistant professor of biomedical engineering seems ready to leap out of his chair at any moment, perhaps to tweak the complex formulas written in grease pencil on the windows of his office overlooking Vanderbilt University Medical Center.

Merryman's energy and enthusiasm is simple: He hopes to bring that similar vitality to people with valvular heart disease. According to the American Heart Association, it affects more than 13 percent of the population ages 75 and older and directly accounts for more than 21,000 deaths each year. Its cause remains unknown.

> "David is not only fantastically brilliant, but he's also extremely creative."
>
> —Phil LeDuc
> *Carnegie Mellon University*

Merryman's lab is currently conducting multipronged research into valvular heart disease. One prong focuses on studying the effect of the growth factor, transforming growth factor-beta 1 (TGF-β1), on heart valve disease under a grant from the National Institutes of Health. "It's like steroids for the cells," Merryman says. "The cell gets overactive and starts making more protein than it's supposed to. We're trying to look at how mechanical forces change the way cells make TGF-β1. If TGF-β1 is the underlying cause, we think we can prevent it with drugs."

That's led to additional research that is exploring whether the specific serotonin receptors on heart valve cells can be targeted to prohibit TGF-β1 when necessary. That work, funded by the American Heart Association, is in its early stages, though Merryman terms its potential as exciting.

Merryman is also working on other, nondrug methods of fighting the disease. He has developed a percutaneous catheter which one day may take the place of open-heart surgery for certain types of heart valve disease. "With most valve disease, the valves become stiff," Merryman explains. "But with this type, myxomatous mitral valve disease, the valves become floppy and loose." His invention combines two clinically used catheters: one catheter to freeze and stick to the valve, and a second to deliver radio-frequency energy.

"We've patented this technology to use a dual-energy catheter that uses energy centrally released to ablate the tissue," he says. "The radio frequency energy essentially cooks the valves, like a microwave cooks food, making them stiffer." Use of the dual-energy catheter would likely be an outpatient procedure, dramatically reducing hospital stays and recovery times for patients by avoiding open-chest surgery.

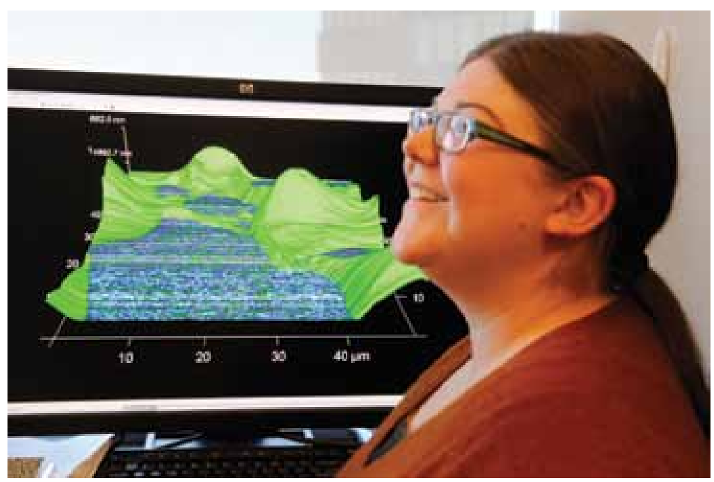
JOE HOWELL

Left: The windows in David Merryman's office also serve as a whiteboard for ideas and working out formulas.

Bringing Engineering to the Bedside

A Nashville native, Merryman received his undergraduate and master's degrees from the University of Tennessee. He received his doctorate from the University of Pittsburgh in 2007 and was an assistant professor at the University of Alabama–Birmingham before joining the Vanderbilt faculty in 2009.

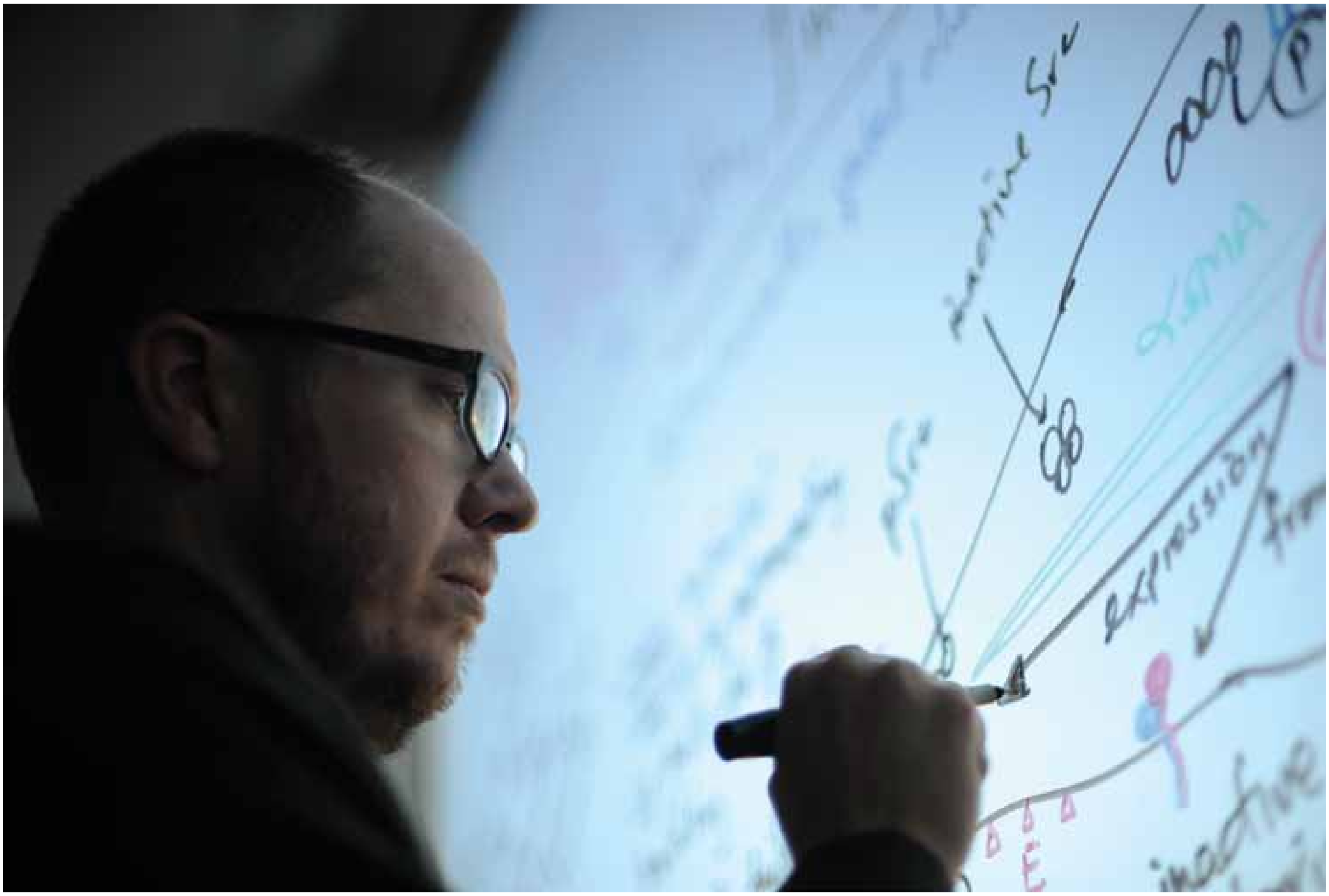
"One thing that is impressive about David is No. 1, his enthusiasm and passion for research and questions," says Dr. Lou Dell'Italia, professor of medicine at the University of Alabama–Birmingham. "His whole personality is infectious. He lights up a room when he comes in. He's brilliant and loves sharing his knowledge. He's a wonderful translational scientist bringing engineering to the bedside."



JOE HOWELL

Doctoral candidate M.K. Sewell-Loftin works on a topographical map, created through atomic force microscopy, of heart valve cells. It's part of research into how the environment surrounding cells leads to disease conditions.

Merryman says he initially wanted to be a doctor, but disliked organic chemistry. Meeting his future wife during his senior year at the University of Tennessee—she was a junior—kept him in Knoxville for an additional year. He decided to pass the time by pursuing a master's degree, where his research focused on spine mechanics. He soon turned his interests to heart valves.



JOE HOWELL

Merryman studies multiple approaches to fighting valvular heart disease. "I love the research, the not knowing what is going to happen," he says.

"Orthopedics is really focused on reducing pain—and chronic pain is terrible—but it's not as life-threatening as cardiovascular disease," he says.

For his doctoral work, he sought out Michael Sacks, the John A. Swanson Endowed Chair in Bioengineering at the University of Pittsburgh, and an expert in heart valve mechanics. "He was at the tissue level and I had done cellular work in the spine. I wanted to do valve cell work and he wanted to start working at the cell level," Merryman says. "It was nice because we both worked together to start this area."

Merryman says it casually, but influencing a mentor's research—especially a world-renowned one such as Sacks—in a new area is unusual. "David is not only fantastically brilliant, but he's also extremely creative. He took the research of his adviser and really pushed the boundaries of moving down to a smaller scale," says Phil LeDuc, associate professor of mechanical engineering at Carnegie Mellon University and a member of Merryman's thesis committee. "It's a one-in-a-long-time student who is able to comprehend what you're doing … to push you in new directions is extremely rare."

Energized by the Pursuit

Working with one of the top researchers in the field provided Merryman with a tremendous education. It's one that he has put to good use, says Harvey Borovetz, chair of the Department of Bioengineering at the University of Pittsburgh. "I could tell from day one, here was someone who was going places," Borovetz says. "He was trained in a world-class lab and he benefited from that experience and was exposed to so many aspects of regenerative medicine. He was inquisitive and had his own ideas to run with."

Merryman is also not afraid to take the best of what he learned from mentors and do things his own way. Unlike many labs, the Merryman Mechanobiology Laboratory is family-friendly. Merryman hosts family events, understands when one of his researchers has to be off with a sick child, and encourages taking breaks for a few minutes of Nerf basketball in the lab. "I try to recruit the people who fit into that type of environment," he says. "I give the students a lot of autonomy and try not to micromanage. … I want the students to own their research. If I have to stay on a student, they're not the kind of student I want in my lab."

Not micromanaging also allows him time at home with his wife and two daughters, ages 4 and 1. Even at home, though, his mind is constantly thinking.

"I just try to be as efficient as I can when I'm here. At night, sometimes I can't sleep and I send a bunch of emails. When our youngest was an infant, I would feed her at night. Sometimes I'd be up at 3 a.m. and sending emails. I was up and it was time to think," Merryman says.

Essentially, he wants students and fellow researchers as dedicated to the work as he is, energized by the pursuit. "I love the research, the not knowing what is going to happen, figuring things out and looking at systems. For the most part, it's exciting to come to work and say, 'Today I want to do this,'" he says. "We don't have a mandate from a board of directors saying that we have to have this product made. Everything is out in the open and anything is possible."

And anything is possible for the young researcher, as well, LeDuc says. "He's one of those people who'd like to say he's on his way to becoming a star. I'd say he's already there. He's a tremendous asset," LeDuc says. "His potential is only beginning to be tapped, not just as a researcher, but as a human being." ●


JOE HOWELL

Merryman and doctoral candidate Steve Boronyak (right) explain how a dual-energy catheter could supplant certain open-heart surgery procedures.

All Fired Up

Bob Pitz investigates burning questions about rockets, combustion and space

by Joanne Lamphere Beckham, BA'62

When Bob Pitz studies a problem, it really *is* rocket science.

Vanderbilt's combustion expert, Robert W. Pitz, professor and chair of the Department of Mechanical Engineering, explores ways to make aircraft and rocket engines burn more efficiently, safely and powerfully for clients that include NASA and the United States Air Force.

In his current research, Pitz and his colleagues work on fueling what could potentially be the next generation of jet engines: hypersonic (super fast) engines for space and air flight. Most modern fighter jets (and even the Concorde) are supersonic, reaching speeds of Mach 2 to 3 (approximately two to three times the speed of sound); hypersonic crafts could be the faster, better, next step. Capable of speeds at Mach 5 to 10 (or 4,000–8,000 miles per hour), they could be used in space and military applications, as well as possibly civilian aircraft.

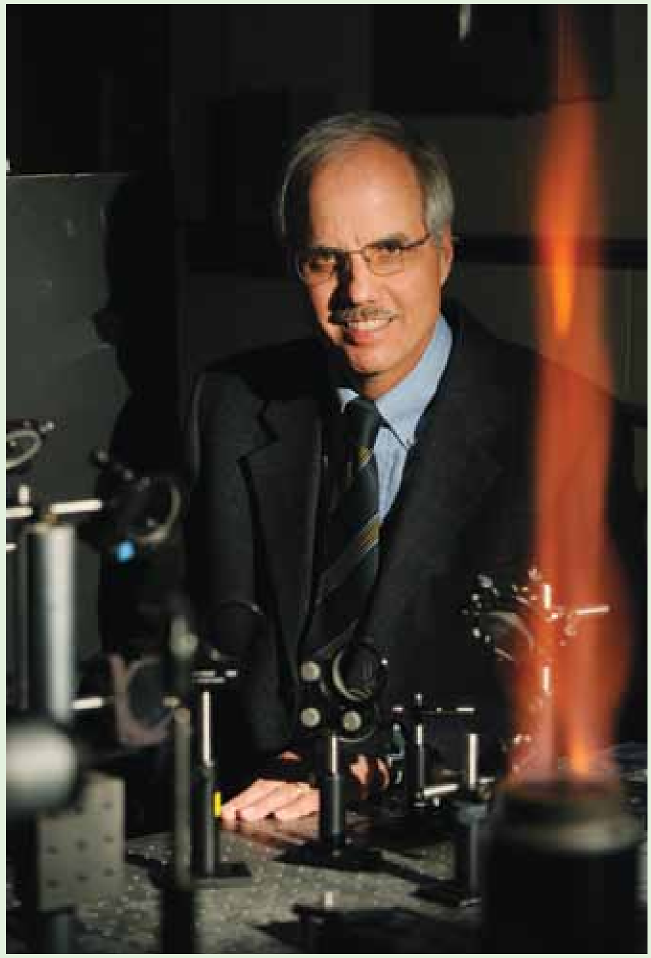
These experimental engines are known as scramjets (supersonic combustion ramjets) because they use supersonic combustion rather than rockets for propulsion. In the lab, Pitz and his team study supersonic combustion flow, making measurements to refine computer models that can accurately predict what will happen to such engines at hypersonic speed.

Hypersonic space planes with scramjet engines have the promise to lower the cost of earth-to-orbit flight by eliminating the need to carry oxidizer to burn with fuel as rockets do. In space vehicles, these engines could power the vehicle after liftoff but while still in the Earth's atmosphere. During this air-breathing phase, space planes would travel at hypersonic speeds but air would be slowed to supersonic speeds in the plane's scramjet engine intake to burn with the fuel.

Research on this promising but experimental technology is challenging. "When designing such engines, it's very difficult to predict perfectly how they will behave at hypersonic speeds," Pitz says, thus velocity research in his Vanderbilt lab and in other study settings is critical.

Traditional methods of using probes to measure velocity can't be used at hypersonic speeds, as they would burn up or interfere with performance. To solve that problem, Pitz developed nonintrusive laser diagnostic techniques that can measure supersonic airflow for hypersonic propulsion. His pioneering technique uses two lasers that first mark, or "tag," and then illuminate molecules in the air that can be measured. The data is then used in computer models to predict and simulate the flow dynamics.

"We use our lasers to measure the velocity of combustion at supersonic speeds in the wind tunnel at the Air Force Research



JOHN RUSSELL

Bob Pitz is a fellow of the American Society of Mechanical Engineers and an associate fellow of the American Institute of Aeronautics and Astronautics. He has received the National Science Foundation Presidential Young Investigator Award in recognition of his achievements in combustion and laser diagnostics, as well as a GE Star Award. Pitz was also named a Summer Faculty Fellow by the American Society for Engineering Education and the National Research Council. He has chaired the mechanical engineering department since 1998.

To support his internationally recognized research, Pitz has received funding from the National Science Foundation, the U.S. Department of Energy, and the U.S. Environmental Protection Agency, as well as NASA and the USAF. His commercial clients include Air Products and Chemicals Inc., Gas Research Institute and MetroLaser Inc.

Laboratory at Wright Patterson Air Force base in Ohio," Pitz says. "We then compare our data with computer models developed by researchers at Georgia Tech."

On Deadline for NASA

Pitz has patented two award-winning molecular tagging techniques to use in measuring velocity: Ozone Tagging Velocimetry (OTV) and Hydroxyl Tagging Velocimetry (HTV). His techniques have wide application in the study of aerodynamics, combustion and fluid dynamics.

In HTV, multiple beams from one ultraviolet laser split the airflow's water molecules to form a grid pattern of hydroxyl molecules in the combustion chamber. Two microseconds later, the second laser causes the molecules to light up. Next, a digital camera records the movement of the lighted grid of tagged molecules.

"Once the HTV grid is formed, the grid moves with the flow," Pitz explains. "The displacement of grid over a fixed time period yields the velocity, much like you would judge the speed of a river with a stick."

The researchers are fabricating an HTV system for NASA to use in testing the J2X engine, a new second-stage rocket engine being developed for the next generation of rockets that will replace the Space Shuttle. The system will be delivered in June to John C. Stennis Space Center, NASA's large rocket testing center, in Mississippi.

Fueling the Future

Pitz is also working on basic research into the development of hydrogen burners. Calling hydrogen the fuel of the future, he says hydrogen burners could be used in gas turbines, aircraft and possibly long-distance automobile travel.

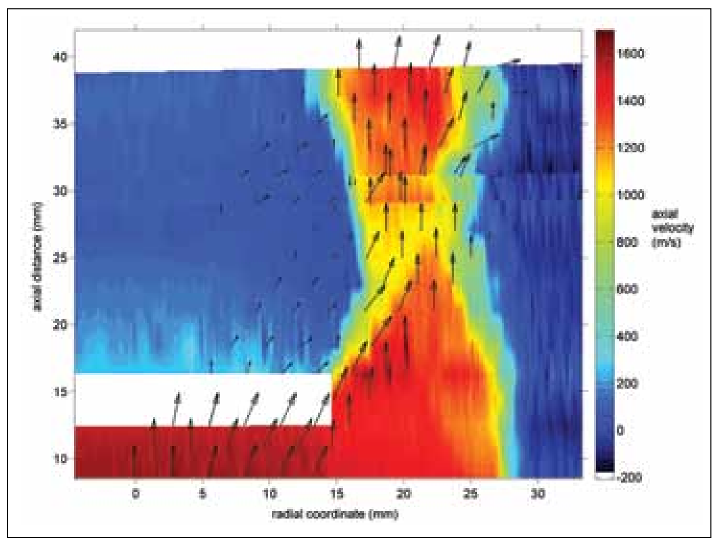
That research employs a method called Raman scattering, which uses ultraviolet light to measure fuel concentration and combustion products and then determine how well the fuel and oxygen are blending.

In addition to research and chairing the Department of Mechanical Engineering, Pitz teaches undergraduate thermodynamics and several graduate courses. He supervises the studies of five graduate students and directs the research of a Fulbright Scholar from Cairo, Egypt. His former students include researchers, professors and administrators at international universities, military engineers and other scientists.

His current students show equal promise. Pitz points to research being conducted by students, including graduate student Marc Ramsey and senior Kyle Bloemer, as noteworthy.

JOHN RUSSELL

Graduate student Marc Ramsey (left) and Pitz use lasers to split, tag and then measure molecules. The goal is to understand how similar molecules would react at hypersonic speeds.



LASER DIAGNOSTICS AND COMBUSTION LABORATORY

Demonstrating velocity in the cap shock pattern of a hydrogen-fueled rocket exhaust

Ramsey and Bloemer are studying cap shock, a specific shockwave pattern found in truncated rocket nozzles optimized for high thrust and low weight. Unstable cap shocks, which occur when engines are turned on, can damage the nozzles.

"Marc Ramsey has developed a new computer-based template to analyze the HTV grid displacement that gives very accurate velocities," Pitz says. "This will help improve our existing computer models, which can then be used to design the nozzles more reliably." ●

Vanderbilt Engineering's Greatest Generation

His own WWII story long secret, alumnus and Los Alamos veteran Ralph Gates now dedicates himself to preserving others' life stories

by Mardy Fones

JOHN RUSSELL

Ralph Gates, BE'47, at the World War II Memorial in Tennessee

When Ralph Gates enrolled in the Vanderbilt School of Engineering in 1941, World War II was raging in Europe and Japan was marching across the Pacific. The 17-year-old Nashville native knew he would enlist when he turned 18.

In the meantime, there was survey camp, a fraternity and chemical engineering classes. For Gates, BE'47, and the other men of Sigma Chi, it was coursework, football games and tea dances with sororities. "There were probably 50 of us in the fraternity in the summer of 1942," Gates says. "By '44, there were less than 10 not in uniform."

When he tried to enlist at 18, the Army and draft board mysteriously told Gates to stay in engineering school and that it would let him know when his service was needed.

In 1944, Gates was finally called to active duty and sent to infantry basic training. Then unexpected orders arrived and Gates wound up in the Army Specialized Training Program for a few weeks. Before long, Gates was sharing a sealed Pullman car with other bewildered young men, heading west. They didn't know where they were going or why.

"Our car was detached from the train in the middle of the New Mexico desert," Gates says. "A bus picked us up. Finally we passed through well-guarded gates into the Los Alamos Ranch School for Boys and there we stayed until the war was over."

"There" was Los Alamos, N.M., and the 20-year-old was soon working on the supersecret Manhattan Project, which developed and built the atomic bombs that ended World War II.

"Los Alamos apparently needed people with at least some technical training to do the grunt work in building the bombs," he says, explaining that degreed engineers were already overseas or committed to other government work. "I'd had three years of chemical engineering and all the physics that was offered, but essentially no knowledge of radiation."

Gates helped cast high-explosive lenses designed to compress plutonium to critical mass in the Nagasaki-type (Fat Man) bomb. As the junior member of a group handling explosives, he helped sweep up small bits of TNT at shift's end. "The first time I stepped on one and it went 'bing,' it scared the daylights out of me," he chuckles.

Telling Their Stories

Gates, now 86, says the story of Los Alamos is only one of many that his generation—and others—can tell. Since retiring, he's launched Life Stories, a personal mission to record people recounting their personal histories in their own words.

"I want the stories of my generation recorded for their children and great-grandchildren," he explains. He tapes participants as they recount their memories and stories, capturing the emotions, thoughts and motivations of everyday people. Gates provides DVDs to his subjects so they can give them to family or historical societies.

So far, he's done 75 Life Stories interviews. "People talk about all kinds of things, frequently personal things or opinions they want their descendents to remember," Gates says. "A 30-year Marine colonel's story extended over 12 hours. Another person talked about working as a foreign missionary."

Friends at Arms

Among his most prized Life Stories are those of his Vanderbilt classmates—Bill Akers (BE'47), Lyt Anderson (BE'48), Bruce Crabtree ('46), John Jeffords ('47), Henry "Buddy" McCall (AS'47), Ernest Moench (BE'47), Ed Winn ('46) and the late Bill Stumb ('46) and Bill Wells (BA'48). Each served in the military and Gates has recorded their wartime experiences.

The men's friendship continues today and they meet for reunions whenever they can.

"At engineering camp near Sparta in the summer of 1942, we practiced surveying for a theoretical road project up the mountain and through the woods. John Jeffords is well-remembered for placing a large sign over the camp entrance that said, 'Dean Lewis' School for Wayward Boys,'" Gates recalls. "A bunch of us shaved our heads, probably because our mothers weren't there to stop us."

Dating was a group activity in the era before the war, and few went steady. Hettie Ray's on Nine Mile Hill was the favored gathering place for dancing and as a watering hole—usually for Cokes. "There was nothing but an empty field between the Sigma Chi House on 21st Avenue and Furman Hall," he says of campus life. "McTyeire Hall was a new girl's dorm and the boys were more than happy to help them move in."

It was a more innocent time, he concedes, and he is committed to documenting it. "On video, people become real and future generations can hear their ancestors firsthand as they talk about their lives and possibly traumatic things that made them who they were," Gates explains.

> "The first time I stepped on [a bit of TNT] and it went 'bing,' it scared the daylights out of me."
>
> —Ralph Gates

After the War

Discharged from the military, Gates finished his Vanderbilt degree and earned a master's from Massachusetts Institute of Technology. He joined Victor Chemical Co. (later Stauffer Chemical Co.) in product development and sales. He married fellow alum Thaniel Dozier Armistead, BA'52, and raised a family of four.

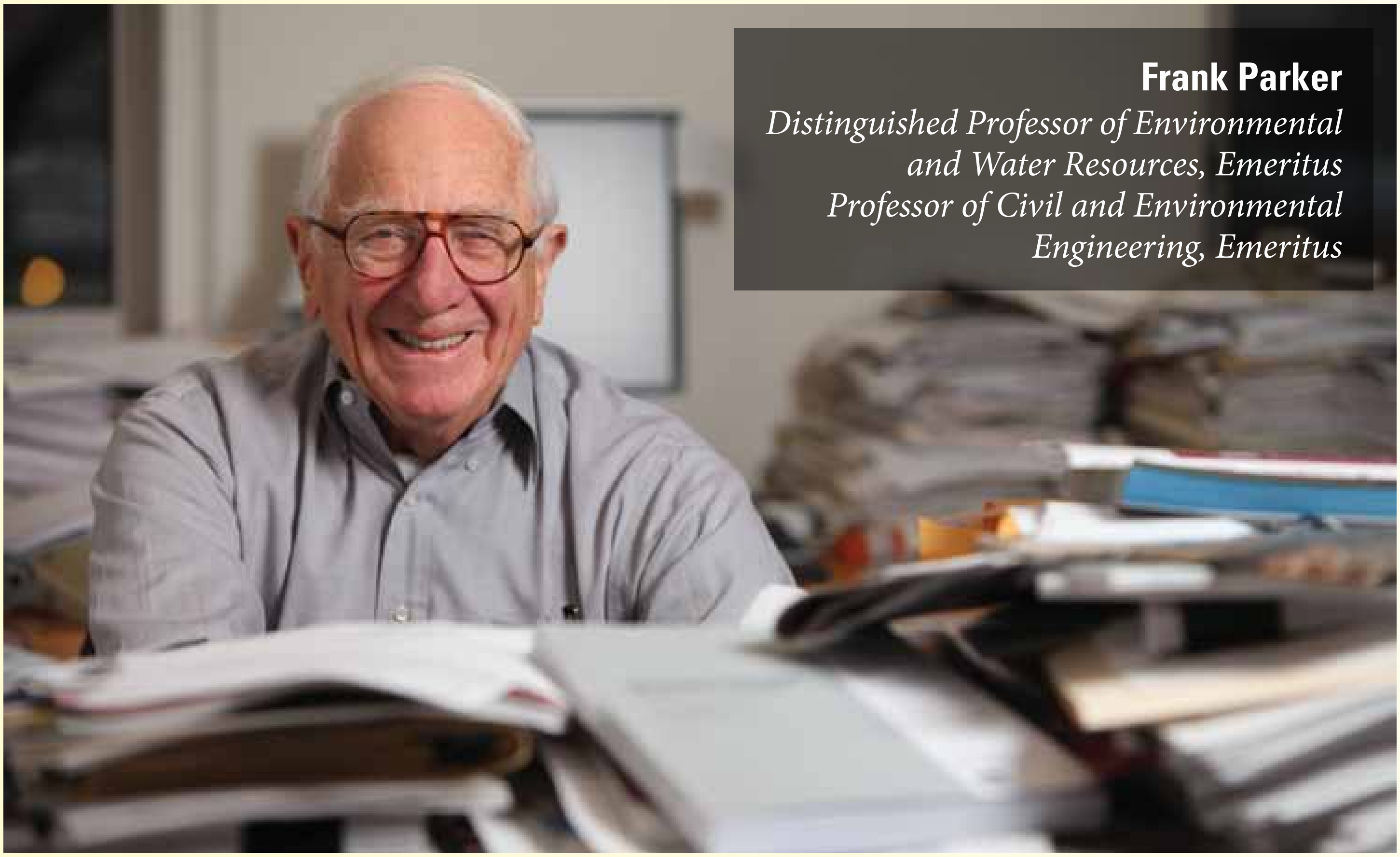
For many years, Gates' war work was a closed chapter. Los Alamos workers were told to say nothing of their service. That silence continued through what he calls "the flower power years" of the '60s and '70s and anti-war sentiment. "I am aware of a certain feeling of guilt for having involvement in killing so many instantly, even in time of war," Gates says. "But if you insist on numbers, I am certain the bomb ended the war and saved many more people that would have been killed, both American and Japanese."

Today, Los Alamos vets—including Gates—have been featured in news articles and documentaries about the Manhattan Project. Gates says like other American veterans, he and his cohorts were there to do their part.

"We felt like we'd done something worthwhile—our particular part, so to speak," Gates says, explaining that the possibility of Germany readying its own atomic weapon increased the urgency of their work. "Did anyone have doubts? Sure. ... You can point to the destruction the bombs brought to Japan, but it was nothing compared to the number of lives that would have been lost on both sides if the war had continued." ●

Unforgettable

On December 31, 2010, one of the School of Engineering's most respected and revered professors retired. After 43 years, Frank Parker is cleaning out his office and moving on to new adventures. Vanderbilt Engineering *asked three alumni to share why Frank Parker is unforgettable.*



SUSAN URMY

Frank Parker

Integrity: An Example for All

Frank Parker is amazing. Before I tell you why, I will set the stage. I have a bachelor's in chemical engineering, and as an undergraduate, was never in Dr. Parker's department. I did spend a couple of weeks in one of his classes during a brief flirtation with graduate school; however, virtually everything I know about him has been because of my involvement in the last 15+ years with the Engineering Alumni Council and the Committee of Visitors.

He is without debate a genius in his field and is very highly honored, credentialed and decorated. I have spent many hours with him alone, and with him and his lovely wife, Elaine. The two are very well-traveled and extremely interesting. Dr. Parker is intriguing professionally and personally. He is a great storyteller, with adventures dating back to World War II. Above all, his integrity is an example for all, and his engineering knowledge and experience are breathtaking.

For whatever reason, he has taken an interest in me over the years, and for that, I am grateful. I am happy at any opportunity to spend time with him, and that time always lifts my spirits and professional ambitions. My business partner of 33 years, Ron Gobbell, and I have our own tradition of asking each other often, "What do you want to be when you grow up?" This is our way of talking seriously, but simultaneously light-heartedly, about the future.

Well, when I grow up, I want to be another Frank Parker.

—Steve Hays, BE'73
Chairman, Gobbell Hays Partners Inc.

Warm, Encouraging and Engaging

I was studying in Caracas, Venezuela, in the mid '70s, planning to attend graduate school in the U.S. I wrote letters (snail mail of course) to many well-known faculty members in various environmental engineering programs. The majority of my letters were never answered and some schools returned generic materials that had little to do with my inquiries.

One response I received was warm, encouraging and very detailed; it will not take much guesswork to know that it was Frank Parker's letter. Hence, Vanderbilt jumped to the top of my list of schools.

I know that I lucked out having Frank as my Ph.D. adviser and long-term mentor. He was always warm, caring, witty, interested in what you had just worked out, and treated you not as a student but as a colleague. Frank was active on multiple committees, traveling extensively, and working on various high-level reports dealing with nuclear waste disposal, but when I went to look for him in his office (and could find him behind the multiple book towers on his desk and office floor), he always had time for me. He provided technical guidance, but allowed me to explore topics that interested me, and he enriched my educational experience by engaging in extended discussions far beyond my dissertation topic.

Most important, by being his student I learned from Frank how to conduct good research by being excited about what you are investigating, being rigorous, discussing your findings with colleagues, focusing on the important questions, and being honest about what your findings mean. I seldom left his office without having at least a short chat about something that was not directly related to my research, but about science and policy in general. These interactions have profoundly shaped my academic life and I do my best to pass some of the broader vision and perspectives I learned from Frank on to my students.

When I have visited Vanderbilt either by myself or with my family, we have had the best of times staying at Frank and Elaine's home. It's been almost 30 years since I graduated from Vanderbilt, but still today, when I need someone to run something by—like a major professional move—I do call Frank.

I am delighted to have Frank Parker as a mentor and friend.

—Peter Jaffe, MS'80, PhD'81
Professor of Civil and Environmental Engineering
Princeton University

People Are Important to Him

During my Vanderbilt Engineering campus visit in 1990, I spent the typical day meeting faculty, touring facilities and eating pizza with graduate students. Then I walked around campus with a distinguished, white-haired, very personable gentleman named Frank Parker. We talked about Vanderbilt and how it compared to other universities. We talked about life after Vanderbilt and many other things. We talked like colleagues.

Who was this Frank Parker?

Back in my hotel room, I reviewed the school catalog: Distinguished Professor, National Academy member, adviser to several international organizations and countries, and many other important roles. I later learned that the catalog didn't tell the whole story.

Why was Frank Parker spending so much time with a prospective student? The only answer I ever discerned: That's Frank, and people are important to him!

This vignette has been consistently repeated throughout our last 20 years. Thanks to Frank, I've lived in Europe twice, studied conditions at former Soviet nuclear weapon sites and many in the U.S., and served on IAEA and National Academy panels. I have my job thanks to Frank. The realization that "You're Frank Parker's student?!" instantly gives credibility by association.

Even more rewarding is the way that Frank and his wonderful wife, Miss Elaine, have made my family feel part of their family, and how Frank made me feel like a colleague and peer from that very first day.

Thank you, Frank, for being who you are: a wonderful human being.

—Bob Waters, MS'92, PhD'93
Distinguished Member of the Technical Staff
Sandia National Laboratories, Albuquerque, New Mexico

Just a little about Frank Parker

As part of his life's work, Parker served for decades as one of the leading experts in helping the United States and Russia clean up after accidents and inadequate handling of nuclear wastes during and after the Cold War.

He's the first VUSE faculty member to be elected to the prestigious National Academy of Engineers while at Vanderbilt.

Parker is the only engineering professor to have received Vanderbilt's Alexander Heard Distinguished Service Professorship and the Harvie Branscomb Distinguished Professorship.

An internationally recognized expert in nuclear remediation, he was named a national associate by the National Academies, which includes the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine and the National Research Council.

Growing up to Gratitude

by Gerry Hull, BE'64

How I got into the Vanderbilt University School of Engineering as a freshman is still a mystery. The filtering process at the admissions office was not as good as it is today, of course, but the standards were reasonably high even in 1959. My SATs were fine but my high school record of achievement was extraordinarily unimpressive. All my energy had gone into my automobile—a highly polished, lightning-fast, chromium-plated beauty. The younger kids marveled as I drove by. I thought I was king.

When I arrived on the Vanderbilt campus from Georgia, it was without my highly polished suit of armor—we were not allowed to bring our automobiles. It would not have made much difference anyway, because the values of my classmates had moved on. I went abruptly from being ruling monarch of my tiny kingdom to the lowliest serf in a bigger world. It is what happens when you are a couple of years behind the curve, out of step and unprepared.

I did not adjust well to my new environment. I was lost. Daniel Boone was once asked if he had ever been lost. He answered, "I can't say I was ever lost, but I was bewildered once for three days." I can attest that I was bewildered once for four years at Vanderbilt.

Socially, I faked it the best I could. Some of my classmates went along with me, but my professors were not fooled, of course. It is difficult to fake thermodynamics. I did find some of the courses on mechanics quite interesting, and on occasion, I actu-

“I did find some of the courses on mechanics quite interesting, and on occasion, I actually applied myself.”

ally applied myself. History and English, on the other hand, were, I thought, a complete waste of my valuable time. I expressed my disdain by flunking them, only to have to take the courses again. My approach was highly inefficient.

I actually loved the School of Engineering and identified with it, but forward progress at that time was in slow motion and difficult, like in a bad dream. A quote by E. B. White (paraphrased) helps explain the awkwardness of the time—“When one simultaneously wants to graduate and have one helluva good time and enjoy one’s personal hobbies, it makes it difficult to plan the day.” I had difficulty planning the day. Priority was not yet a meaningful concept in my development.

It is true. A professor actually stopped me in the hall one day and asked, “Why are you here?” I was speechless. I had no answer. I kept showing up though—in spite of myself—and graduated in 1964 with a degree in mechanical engineering.

A Continuing Process

A university can do just so much. I find it remarkable that there is such a great chasm between the relatively sound judgment of a mature 19-year-old, as an example, and the incredibly poor judgment of an immature 19-year-old. (I represented the latter, in case you have not already figured that out.) But it is far more relevant to understand that immaturity at a young age does not mean immaturity for life. It is true the maturation process can be, and I hope is, a continuing process for life. A desire to understand, a willingness to put your ego aside and make corrections, along with a failure or two and a couple of hard knocks, can do wonders.

I enjoy coming back to the reunions at Vanderbilt from time to time. It is an opportunity to see old friends, of course, but also to show that I did grow up, I am normal, and I can converse in complete sentences.

So why do I think so highly of Vanderbilt today and choose to give back now that I can? It’s not a mystery. I always loved Vanderbilt and what it stands for. I had great respect for my professors even when they saw straight through me. I came up short; the university did not.

GKW

Before I came to Vanderbilt, I had learned about giving back. My grandfather was successful in the corporate world and made cash donations to individuals in need from time to time. My grandmother balanced the family checkbook and when she found a disbursement that was unexplained, she had a pretty good idea what it was about. She noted in the margin “GKW,” which stood for God Knows What.

When I started a charitable foundation, initially with funds left by my grandfather many years ago, I called it the GKW Foundation. It seemed an appropriate way to carry on the tradition. Since then it has gotten more specific. A fund to assist teachers with travel and research grants during their summer months is called the God Knows Where Fund. A scholarship for a School of Engineering student is the GKW Scholarship, but maybe should be the God Knows Who Fund. Each student who receives it has the potential and opportunity to do God Knows What with his or her education, career, life, dreams. That’s exciting to me. And it’s fun.

And giving should be fun, don’t you agree?

Gerry Hull, BE’64, is the former CEO of Automated Logic Corporation of Kennesaw, Ga. He says he has always reserved time from his corporate management duties to work hands-on with engineering design projects, which he so enjoys, and he holds a number of patents. Hull is a longtime supporter of the School of Engineering and serves on a variety of community boards. In keeping with the GKW giving philosophy, Hull made possible the construction of Jacobs Believed in Me Auditorium in Featheringill Hall as a tribute to legendary former professor Dillard Jacobs. Gerry Hull was inducted into the School of Engineering’s Academy of Distinguished Alumni in 2004. He and his wife, Patricia, live in Atlanta.

Opposite: Pictures he took while traveling hang in Gerry Hull’s den. “Seeing some of those pictures bring back the trip—the people I met, the sights, the sounds, the smells,” he says. “I try to come back with two or three shots that are worth looking at from time to time.”

Commemorate and Celebrate

The 2010 Engineering Celebration Dinner attracted more than 250 alumni, parents and friends in October. Attendees included Fred J. Lewis Society members and alumni returning for Reunion festivities. Alumni in attendance covered seven decades (from 1941 to 2009), represented 12 classes reuniting during Reunion Weekend, and traveled from 22 states and as far away as Singapore.

Highlighting the evening was Dean Kenneth Galloway's presentation of the Distinguished Alumnus Award to three accomplished graduates of the School of Engineering: André L. Churchwell (BS'75), W. Hibbett Neel Jr. (BE'63) and J. Roy Wauford Jr. (BE'52). The three became members of the school's Academy of Distinguished Alumni.

Hosted by the Engineering Alumni Council and the dean, the dinner commemorated the lifelong impact of a Vanderbilt engineering education and celebrated engineering alumni, particularly Lewis Society donors and members of the Vanderbilt School of Engineering Academy of Distinguished Alumni.

If you'd like to attend the 2011 dinner, join the Fred J. Lewis Society today. For more information, email alumniengineering@vanderbilt.edu or call (615) 322-4934.

PHOTOS BY ZACHARY GOODYEAR PHOTOGRAPHY

From left, Dean Kenneth F. Galloway with new Academy members Dr. André Churchwell (BS'75), Hibbett Neel (BE'63) and J. Roy Wauford Jr. (BE'52)

Welcome New Members of the Academy of Distinguished Alumni

Dr. André L. Churchwell, BS'75

Dr. André L. Churchwell is associate professor of medicine, associate professor of radiology and radiological sciences, associate professor of biomedical engineering, and associate dean for diversity in graduate medical education and faculty affairs at Vanderbilt University School of Medicine.

Churchwell graduated from the Vanderbilt School of Engineering magna cum laude in 1975. He won the Biomedical Engineering Student Program Award that same year. He received his medical degree from Harvard Medical School and later completed his internship, residency and cardiology fellowship at Emory University School of Medicine and affiliated hospitals in Atlanta. In addition, he was the first African American chief medical resident at Grady Memorial Hospital (1984–1985).

Churchwell received Emory's J. Willis Hurst Award for Best Clinical Teacher in 1991. In 2004, he was awarded the Emory University School of Medicine Resident Alumni Distinguished Achievement Award. He has been named one of the nation's top cardiologists in "The Best Doctors in America" for nine years.

Churchwell lives in Brentwood, Tenn., and is married to Doreatha Henderson Churchwell, a nurse educator at Vanderbilt University Medical Center. They have two children, Crystal A. Churchwell and André L. Churchwell Jr.

Hibbett Neel, BE'63

A native of Rutherford County, Tenn., Hibbett Neel was the third generation of his family to attend Vanderbilt. After receiving his undergraduate degree in civil engineering in 1963, Neel earned a master's degree at the Georgia Institute of Technology and served as a U.S. Army officer. In 1983, he founded Neel-Schaffer Inc., a multidisciplined engineering firm with more than 400 employees and offices throughout the Southeast and Texas.

Neel has been a member of the Institute of Transportation Engineers for more than four decades, and has received numerous awards. He was recognized in 2004 by the American Society of Civil Engineers for his work fostering diversity within the industry. In 2007, Neel received the American Council of Engineering Companies Community Service Award, and in 2009, the National American Public Works Association's lifetime achievement award.

In 1992, Neel created scholarships for disadvantaged minorities at various universities and began a mentoring program for upcoming minority firms at Neel-Schaffer. He is active in community service organizations and has committed both time and resources to Vanderbilt's School of Engineering as a member of Vanderbilt's Engineering Alumni Council and the Lewis Society.

Neel and his wife, Susan, live in Jackson, Miss. Their six children, spouses and grandchildren live nearby.

J. Roy Wauford Jr., BE'52

J. Roy Wauford Jr. entered Tennessee Technological University in the fall of 1948. One year later, he made his only appearance on an electoral ballot after his father entered him as a candidate for the Cartmell Scholarship to Vanderbilt University. The scholarship's recipient is decided by vote of the people of Lebanon, Tenn., and running unopposed, he won.

Wauford earned his bachelor of civil engineering degree, cum laude, from Vanderbilt in 1952, and began his career with D.A. Duplantier, Consulting Engineer, as a junior designer. In 1953, he joined the Tennessee Highway Department as a soils and research engineer. In 1956, Wauford formed J. R. Wauford & Co. Engineers, which specializes in environmental engineering and services related to water and wastewater projects. The company is considered among the top water supply and wastewater consulting firms in the Southeast.

Wauford is a member of Tennessee Society of Professional Engineers and served as president of the society's Consulting Engineering Council. He is also a member of the Water Environment Federation and the American Water Works Association.

Wauford and his wife of 58 years, Lois Ann, live in Lebanon, Tenn. They have four children, six grandchildren and two great-grandchildren.

Academy Members in attendance at the 2010 Engineering Celebration Dinner. From left, standing: **Fred Cassetty** (BE'60), **Don Orr** (BE'56), **Jim Johnson** (BE'63, PhD'72), **André Churchwell** (BS'75), **George Trabue** (BE'55), **Hibbett Neel** (BE'63) and **Ed Thackston** (BE'61, PhD'66). Seated: **Bill Akers** (BE'47), **George Cook** (BE'60, PhD'65) and **Roy Wauford** (BE'52).

If we'd given prizes for seniority, **Henry Tomlin** (BE'41) and **George Kalanzis** (BE'41) would have won. They graduated from VUSE 69 years ago.

Ralph Jolly (BE'85) with **Ron Schrimpf**, Orrin Henry Ingram Chair in Engineering, and his wife, **Kathy Schrimpf**

Fellow members of the Class of 1963 attended to congratulate Hibbett Neel on his induction. From left, **Jim Johnson** (BE'63, PhD'72); **Kent Shalibo** (BE'63, MS'67); **Neel**; **Wally Crow** (BE'63); and **Jim Zeigler** (BE'63).

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Olin Going Up

In April, 1973, Garland at Highland Avenue resounded with the sound of construction as the School of Engineering's new Olin Hall rose. Designed by Robinson Neil Bass and Associates, the building was built using a $4 million gift from the F.W. Olin Foundation. Announced in 1969, the nine-story classroom and laboratory building was finished in 1975.

According to the late Dillard Jacobs, legendary professor of mechanical engineering, a highlight of the 1974–1975 school year was Olin's opening and dedication. He also noted, "there were delays in construction, however. First there were building foundation problems due to the eroded limestone under the area. The Olin people insist that their buildings be architecturally unique; they got their wish at Vanderbilt. … In general, forms could not be reused on this monolithic concrete structure and so costs were high and construction slow. However, the building is unique and adequately houses Chemical Engineering and Materials Engineering, which boast some of the finest and most modern research equipment on any college campus."

Fast-forward nearly 40 years and Olin needed updating. See p.12 for its latest renovations.

IMAGE COURTESY OF VANDERBILT UNIVERSITY SPECIAL COLLECTIONS AND UNIVERSITY ARCHIVES; QUOTE FROM DILLARD JACOB'S HISTORY OF THE SCHOOL OF ENGINEERING, *113 IS A PRIME NUMBER, A SUPPLEMENT TO 102 YEARS.*