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ENGINEERING VANDERBILT

The National Science Foundation recognizes VUSE’s junior faculty as among the best in the nation—
to the tune of millions in research grants.

T he National Science Foundation has bestowed prestigious Faculty Early Career Development (CAREER) Program awards to four Vanderbilt School of Engineering junior faculty members so far in 2007. That news caps a seven-year run that has averaged two CAREER grant awards per year—positioning the engineering school among the NSF’s top award recipients nationally.

“Compared to similar schools, we’ve done quite well,” says George Cook, associate dean for research and graduate studies and professor of electrical engineering, emeritus, “Of our 85 faculty, only 10 to 15 are eligible to receive CAREER awards in any one year.”

The NSF CAREER Program offers significant cash awards in support of the early-career-development activities of those teacher-scholars who most effectively integrate research and education within the context of their organization’s mission. The NSF receives about 2,500 applications each year for the 400 CAREER grants it ultimately awards. The grants are typically doled out over a five-year period.

“Competition is stiff,” says Cook. “The NSF is looking for two things: innovation in research, and the presence of an educational component that integrates graduate and undergraduate students into the work.”

Building a Research Legacy
CAREER Program award recipients typically are at the beginning of their research lives, says Cook. “They have published, but they have not established national reputations. Therefore, one of the objectives of the award program is to identify the next generation of leading researcher-educators.”

For Mark Does, assistant professor of biomedical engineering and assistant professor of radiology and radiological sciences, the CAREER award he received in 2005 has been invaluable in deepening his research on MRI techniques at cellular, subvoxel levels. “It’s allowed me to broaden the scope of my research and explore ideas that have been difficult to get funded without preliminary data,” says Does. “I have been able to augment my research program with some new studies, which, in turn, I anticipate will strengthen the pending renewal of my main NIH-funded project.”

Learning in the Lab
“One objective of the CAREER award is to give both graduate and undergraduate students a taste of what teaching and research are all about,” explains Cook. “Graduate students are typically just a few years [in their careers] behind the faculty proposer. They know they want to follow in those footsteps, and they’re looking for people with whom they can work and the opportunity to do work that interests them. CAREER awards can facilitate that.”

For undergraduates, working with a CAREER award recipient provides hands-on experience and a window into the working world of academia. “It gives them the opportunity to see what a career in this area would be like by exposing them to the many aspects of a research program,” says Florence Sanchez, assistant professor of civil and environmental engineering, who received a CAREER award in 2006. “Both undergraduate and graduate students bring a new perspective and energy to the work.”

Such experiences can motivate students to pursue advanced degrees and the career of a researcher-teacher, says Cook. Additional funds are available to cover the cost of including undergraduates in the research process.

2007 Award Recipients
Four VUSE faculty members are recipients of an NSF CAREER Program award in 2007.

Julie A. Adams, assistant professor of computer science and computer engineering, is developing technology that will help remote robot operators in dangerous situations. Her objective is to supply technology that enables operators to better understand the situation and control unmanned vehicles and remote robots while in remote improving interaction systems.

Amount awarded to date: $306,166

Frank Bowman, biomedical engineering: characterization of DNA molecule as it passes through the channel. The objective is to enable reading of a DNA molecule by passing it through the channel. Amount awarded to date: $40,250

Harold S. Park, assistant professor of computer science and computer engineering, is working to develop software that can help prevent Internet traffic jams by using peer-to-peer technology that transforms end-user computers into participants rather than passive recipients of data. Amount awarded to date: $78,848

Robert E. Bodenheimer Jr., computer science: teaching agents in educational computer animation; $428,558

Yi Cui, assistant professor of computer science and computer engineering, is working to develop software that can help prevent Internet traffic jams by using peer-to-peer technology that transforms end-user computers into participants rather than passive recipients of data. Amount awarded to date: $78,848

Kenneth D. Frampton, educational computer animation; $381,817

Robert E. Bodenheimer Jr., computer science: teaching agents in educational computer animation; $428,558

Eugene J. LeBoeuf, computer science: teaching agents in educational computer animation; $381,817

Frank Bowman, chemical engineering: ultra-high vacuum chemical vapor deposition of SiO2/Al2O3 Nanostructures: $374,985

Timothy Fisher, mechanical engineering: microscale direct energy conversion by field emission and microscale technology in thermofluids engineering education; $413,325

Xenofon D. Koutsoukos, computer science and computer engineering: computational methods for the analysis and design of stochastic hybrid systems; $400,000


Passion for Compassion

With a world in need, Nathan Rajalingam isn't taking life for granted.

T
e more you give, the more you receive. For Nathan Rajalingam, BSE'03, it’s an approach to life that’s led to the 28-year-old Twin Cities native to stretch himself beyond his other, particularly passionate, commitment to his faith: “Serving others, there’s a huge need,” says Rajalingam. “So last year a group from my church joined with Hall Arts and went to Senegal, working on a two-week mission to the central African nation, where war, socio-economic devastation, and communities crippled by widespread rape, murder and human rights violations have torn the people and their economies in shambles.”

“The average age of the population is 18. One child had an arm gouged out. Another, because she didn’t have access to medication, had an arm and a leg amputated. When I think about the amount of work that these kids have gone through, it breaks my heart.”

“We made flyers with photos and bios of 65 and distributed them at all churches to get our point across,” says Rajalingam, who is a systems engineer for medical device manufacturer Medtronic. “While we were doing that, another 300 kids showed up outside.”

Rajalingam’s passion for giving reaches beyond last year’s Congo trip and a similar outreach effort into a four-year-old tradition that he and his family and two loving parents and a good education and jobs,” he says. “I always used to wait for late-night shows to see what I could and as a family, we do what I realize about appreciating what you have and being involved right now.”

— Mandy Fones

Senior Design Day 2007

A sampling of six design projects that engineering students take on design challenges from actual corporations, or agencies such as NASA, with real design needs.

Client: Standard Candy Co. (Nashville)
Challenge: Improve productivity on the production line.
Result: Students designed a system that modified the movement of candy on the conveyor belt so that materials would end up working on something they didn’t like, the team set out to change that. “SDD helped us develop relationships, so when we recruit engineers or need academic research, we have resources in our own community,” says Kruger. “It makes sense for local industries and universities to work together to compete in a global marketplace.”

Communication is Key

For J. Rachel Avril, BE’05, who is now a mechanical design engineer for Boeing in Seattle, working on the P8-A plane for the U.S. Navy, SDD positioned her to hit the ground running after her first engineering job. “SDD introduced me to skills that I apply in my job today, and I think the Design Day was great for that.”

The hardest part of SDD wasn’t the research or the intellectual challenge; it was scheduling, setting goals and sticking with them.

“Then this relationships you build with customers, showing the product in a small work setting, working one-on-one with them. It’s important that you deliver on time and using that safety without a net, everything about SDD mirrors the working world.”

“Communication is important for teamwork, for funding and for customer satisfaction. You can have the best design in the world, but if you can’t communicate it to others, it will never become reality,” says Avril. “SDD allowed us to present our projects and communicate in a productive way.”

A Call to Action: K-12 Education and the Future of Engineering

The report “Rising Above the Gathering Storm,” prepared by the National Academies for the U.S. Department of Education and released in early July, flags the need for talented students to enter and complete a rigorous engineering education.

“With each passing year, the gap between the U.S. and the world’s engineering leaders is growing wider,” the report says. “Our nation risks lagging behind the rest of the world in the race for technological supremacy.”

While the report states that it’s up to each state to act, among the ten recommendations made in the report is an appeal to universities to take a leadership role in this area. The report states that “departments that make significant contributions to K-12 education should have a portion of their research budgets dedicated to engaging K-12 educators and students.”

Many Tennessee educators are already doing this, says David M. Bass, associate dean of the School of Engineering and associate professor of biomedical engineering.

“SDD participants have the opportunity to improve their problem-solving, technical writing and computer application skills through the hands-on experience of juggling team dynamics,” says Bass. “The communication and collaboration skills SDD taught us were essential not only in working out our problems in the field, but also in communicating our solutions.”

Client: MAX Mobility LLC (Nashville)
Challenge: Improve productivity on the production line.
Result: Students were able to design and build a robotic arm, raise money that might be made with an SDD solution because it’s more than repaid by the solution it presents. "It's one thing to study a formula. It's another to work with a team to find a solution," says Joel Barnett, associate professor of the department of civil and environmental engineering and the Future of Engineering.

Life in the Real World

There’s no substitute for experience. That’s the philosophy behind the School of Engineering’s two-semester capstone Senior Design course, which culminates in the annual Senior Design Day, when students take on design challenges from actual corporations, or agencies such as NASA, with real design needs.

“It’s one thing to study a formula. It’s another to work with a team to find a solution,” says Joel Barnett, associate professor of the department of civil and environmental engineering and the Future of Engineering. "Through SDD, we emulate work in a true engineering practice with multidisciplinary student teams who work together as they would in the real world.”

Senior Design Day 2007 was held April 24, featuring some 65 design projects by senior engineering students on the Vanderbilt University campus. Each project is designed to strengthen the academic skills of high school seniors and juniors who are planning to enter a college engineering program. VUSSE is also proud to be home of the Vanderbilt Instructional Program in Engineering for Secondary Sciences (VIBES).”

VIBES is a national after-school program that provides bi-weekly sessions for students in Grades 9-12. Its objective is to assist in meeting the National Science Education Standards.

“VIBES is one of the largest programs in the country,” says Joel Barnett, associate professor of the department of civil and environmental engineering and the Future of Engineering. "Through SDD, we emulate work in a true engineering practice with multidisciplinary student teams who work together as they would in the real world.”

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High Hopes for Cancer Detection System

A Vanderbilt University engineering research team has developed a novel liquid-based device that can produce a new type of cancer detection tool. The device, known as the Quantum Dot-Detector (QuD-MAP), promises to revolutionize cancer detection by using a combination of quantum dots, fluorescent beads, and machine learning algorithms.

**Innovative Technology**

The QuD-MAP system utilizes quantum dots, which are nanoparticles that can absorb and emit light at specific wavelengths. These dots are chemically attached to antibodies that target specific biomarkers associated with cancer. The device is designed to detect these biomarkers in a liquid sample, allowing for rapid and accurate cancer screening.

**Integration of Engineering and Medicine**

Professor Todd Giorgio, the leader of the research team, explains, "Our device is designed to detect cancer biomarkers with unprecedented sensitivity and specificity. By leveraging quantum dot technology and machine learning, we can create a non-invasive, point-of-care test that could revolutionize cancer screening and diagnosis.""
In Search of Communication: Robots and Autism

Galloway Wins IEEE Award in Nuclear and Plasma Science

O utsiders young children with autism spectrum disorder (ASD) have difficulty understanding and responding to physical and social cues in the environment. As a result, the child’s quality of life is affected and the environment is perceived as stressful and non-understood. In this research, the robot is endowed with intelligence to decipher nonverbal communication and the ability to progressively engage and challenge the child. Galloway, who presented his paper at In August at the IEEE International Symposium on Robotics and Human Interactive Communication in Korea, a robot can present a task in an engaging way that kids like. Using interaction technology, professor Xiaofan Sarkar hopes to help children with autism learn to communicate more effectively.

Emotion-Sensing Basketball

Sarkar’s earlier work with a robotic system that senses and responds to physiological cues that are related to emotion, such as heart rate, grimacing and perspiration, is at the heart of his new work. Sarkar collaborated with Wendy Stoner, an investigator in the Vanderbilt Kennedy Center for Research on Human Development and director of the center’s Treatment and Research Institute for Autism Spectrum Disorders, to explore the project’s potential and application.

Through grant from the National Institute of Child Health and Human Development, they developed a basketball game that includes a robot arm that can adjust the difficulty of the game by moving the hoop based on the mental state of children with ASD through assessment of nonverbal signals obtained from wearable physiological sensors. “To this research, the robot is endowed with intelligence to decipher nonverbal communication and the ability to progressively engage and challenge the child,” says Sarkar, who presented his paper at the symposium. “In August at the IEEE International Symposium on Robotics and Human Interactive Communication in Korea, a robot can present a task in an engaging way that kids like. Using interaction technology, professor Xiaofan Sarkar hopes to help children with autism learn to communicate more effectively.’’

VUSE Team to Develop Pollution Sensors

Vanderbilt University engineers have won an award from a program for software integration technologies to develop a real-time online, ubiquitous platform for the accurate measurement of air quality in large metropolitan areas like Nashville. The mobile platform will make it possible to monitor air quality more accurately than the current system, which uses fixed stations performing low-resolution sampling by utilizing car-mounted sensors that measure a variety of specific pollutants.

Designer of Dreams

Hibbett Neil is rebuilding communities and leaving his mark across the Southeast.

One Giant Leap

Nicholas Roberts, graduate student in mechanical engineering, explains rocket propulsion during a tour of the Student Rocket Propulsion course, followed by a demonstration of a kawasaki rocket launch.

The demonstration was in preparation for the Aerospace Rocketry Club’s First-Fly entry into the NASA-sponsored University Student Launch Initiative—a competition intended to groom a new generation of engineers to work on planned manned flights to Mars. Eight teams from seven universities participated in the competition, which was held in May at Marshall Space Flight Center in Huntsville, Ala. The Vanderbilt student team placed third.

“Having conceived a huge concept and a passion for the cause,” says Robb McAlister, electronic technician in the mechanical engineering department. “We learn for the love and the fun of it.” This year a name change—Vanderbilt Aerospace Club—is expected to attract more students interested in aeronautics and space exploration.

NASA’s University Student Launch Initiative encourages college students to tap their science, technology, engineering and mathematics knowledge to design and build their own rockets, complete with scientific payloads. Rockets were required to reach an altitude of one mile during flight and be reusable. NASA engineers and scientists evaluated each rocket design, including propulsion systems, materials used for construction, payload and safety features.

Robert Radosi, professor of bioengineering and chemical engineering, has received the American Society for Engineering Education’s 2007 William Elgin Wickenden Award. Sponsored by the Journal of Engineering Education, the award is given to the author of the best paper published in the Journal during the previous January-to-October publishing cycle.

Greg Walker, assistant professor of mechanical and electrical engineering, was named in the spring a recipient of a Young Faculty Award from the Defense Advanced Research Projects Agency (DARPA), the primary research and development agency for the U.S. Department of Defense.
You’re stuck on a deserted island with four people and a one-person escape raft. The situation is desperate. Which person do you trust to take the raft alone, on the deep ocean, to search for help? A musician, a political scientist, a teacher or an engineer?

An engineer, obviously, says G. Kane Jennings, associate professor of chemical engineering. Armed with his insights, props, persuasive arguments, and jokes loaned from previous engineering faculty winners, Jennings was declared the 2007 winner of Vanderbilt’s annual Raft Debate.

Launched in the late 1960s and modeled after a similar debate at Oxford University, each year the Raft Debate pits the wit and strategies of faculty members from Vanderbilt’s four undergraduate schools against one another. Each competitor gets 10 minutes to convince a panel of judges and a raucous audience of their peers and students that his or her expertise would save the day.

Best Laid Plans

“I spent a month putting together a killer PowerPoint presentation,” says Jennings. “It had everything: it was funny, it made good points, the timing was perfect.”

But then, much as happens to people stranded on islands, his hopes were dashed, rekindled and then dashed again. “They said I couldn’t use it. Then, three days before the debate, they said I could. Then, the day of the debate, they said the Sarratt Center couldn’t accommodate it.”

Known for his lively lectures that combine planned material with spontaneous discussions, plus demonstrations and active problem solving that mimics the working world, Jennings was undeterred by the shift. Armed with a rotary phone, a cassette player, a dictionary, and other technology that was once cutting edge, he argued that the myriad engineering-driven advances that displaced his props signals the fact that an engineer is the only logical choice in the raft.

“Joel Barnett gave me one of my best punch lines: ‘NASA employs five engineers for every scientist, so it’s not really rocket science, but rocket engineering,’” says Jennings. (Barnett is associate professor of the practice of mechanical engineering.) “He used that four years ago when he won. I figured it was OK to use it again. It was a fresh audience.” When the debate was over, Jennings was the winner, based on applause from fellow faculty and students and the decision of the judges.

Everyone in the Boat

All kidding aside, Jennings is quick to acknowledge that an engineer isn’t an island unto himself, even when he wins the Raft Debate. “Ultimately, many of the biggest advances come through collaboration. We need everyone—teachers, writers, musicians, scientists and engineers working together to come up with the best solutions.”

Jennings is already preparing for the 2008 Raft Debate, where he will have the task of introducing the competitors. He readily concedes that the other debaters this year were good humored about the whole event and that, while they may have been more polished and clever in arguing their points, he won because of his engineer’s knack for problem solving and ability to turn an obstacle into a solution.

“Basically, I won by applying the Law of Relative Ability,” Jennings explains. “Just ask yourself: What would you rather have, a poem written by an engineer or a bridge built by a poet?”

—Mardy Fones
Join the Lewis Society

Many of the School of Engineering’s most dedicated donors are members of the Fred J. Lewis Society. Established 30 years ago, the Lewis Society honors the legacy of Dean Fred J. Lewis. Under his leadership (1955–1959), the school enjoyed a great upswing in enroll- ment, an expansion of facilities, and an emerging program of overall academic excellence at Vanderbilt. It makes a positive difference in the lives of our students and faculty, and ensures continual growth of the school.

Please consider joining the Lewis Society today and investing in the future of the School of Engineering. If your company has a matching gift program, your gift may be doubled or even tripled. Use your matching gift to join the Lewis Society today.

For more information please contact Lesa Park in the school’s Development and Alumni Relations Office by calling 615-343-4210.

Alumni Can Help with School Ranking

Of the 353 undergraduate engineering programs ranked by U.S. News & World Report magazine, the Vanderbilt School of Engineering ranks prominently among the top 50. Alumni gifts directly impact that ranking. The percentage of alumni who give back is a key factor in the magazine’s ranking methodology. Currently, only 21 percent of VUSE alumni make a gift to the school. You can help the school by giving a gift of any size. To support your school and send a message that VUSE engineering matters, contact the Vanderbilt Fund Office at 1-866-922-ENGR or online to www.vanderbilt.edu/theschoolofengineering.

The School of Engineering has opened so many doors for me. I’m proud to do my small part to ensure those same opportunities are available to future students as well.

—Stephen McGinn, BE'76, MD'80

Alumni Honored at Vanderbilt

The School of Engineering is making its way around the country, presenting a place of Vanderbilt to our parents, alumni and friends. Our 2007 stop was in Atlanta on May 22. Dean Kenneth J. Gallaway and other engineers made our way south to meet Douglas C. Darwin, BE’58, and Samuel McClay, BE’51, into the School of Engineering of Distinguished Alumni. (Look for a full report on Doug, Sam, and other members of the Academy in the spring 2008 issue of Engineering Vanderbilt.) Nearly 100 Vanderbilt faithful turned out to show their support for our honored and learn about the exciting things happening at the School of Engineering. We look forward to connecting with even more of our travels continues in 2008!

—Richard Robinson, BE’76 (left) with Habib Abbasi, BS’89 (right)

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Check us out online at www.vuse.vanderbilt.edu

July 1, 2007 – June 30, 2007

VANDERBILT SCHOOL OF ENGINEERING

The Fred J. Lewis Society

Alumni Honored at Atlanta

—Howell Adams Jr., BE’53 (second from left), with Modeste Adams, BSN; Nancy Wilson, BSN; Larry Wilson, BE’57; and Kate Hatunson, BSN

Doug Davis, BE’65, and Mike McCloskey, BE’51 (right), shown here with Dean Kenneth J. Gallaway and other members of the Academy in the spring 2008 issue of Engineering Vanderbilt. Both were inducted into the School of Engineering of Distinguished Alumni in Atlanta in May.

Cornellus Vanderbilt

—J. Ralph L. Seals, BE’59

Dean’s List (Gifts of $13,000 and above)

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—Lisa S. Hall (BE’71, MBA ‘72, Parent)

Members

(Any size gifts)

Dean’s Honor Dee (Henderson, emeritus)

Members

(Any size gifts)

Laura A. and John M. (BE’87) Brin (Parent)

Members

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Monica L. and Robert L. (BE’49, MD’52) Copeland

Members

(Any size gifts)

Karen A. and David B. (BS’76) Dyer

Members

(Any size gifts)

Mary E. and Robert P. (BE’42) Galloway

Members

(Any size gifts)

Jay and Gabrielle (BE’98, MD’00) Galloway

Alumni Can Help with School Ranking

The financial support of alumni, parents and friends helps deserving students receive an education that will prepare them for successful careers. Today the same tradition continues through the generous support of Lewis Society members.

Through my contributions of time and money to the School of Engineering, I have had the privilege of staying in touch with advances in education and the people making them happen. It is very important to know that Vanderbilt and I both benefit.

—Rebecca Robinson, BE’76 (left) with Habib Abbasi, BS’89

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—Richard Robinson, BE’76 (left) with Habib Abbasi, BS’89

Bobbi and Dr. Sam McClay, BE’51, shown here with Dean Kenneth J. Gallaway and other members of the Academy in the spring 2008 issue of Engineering Vanderbilt. Both were inducted into the School of Engineering of Distinguished Alumni in Atlanta in May.

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