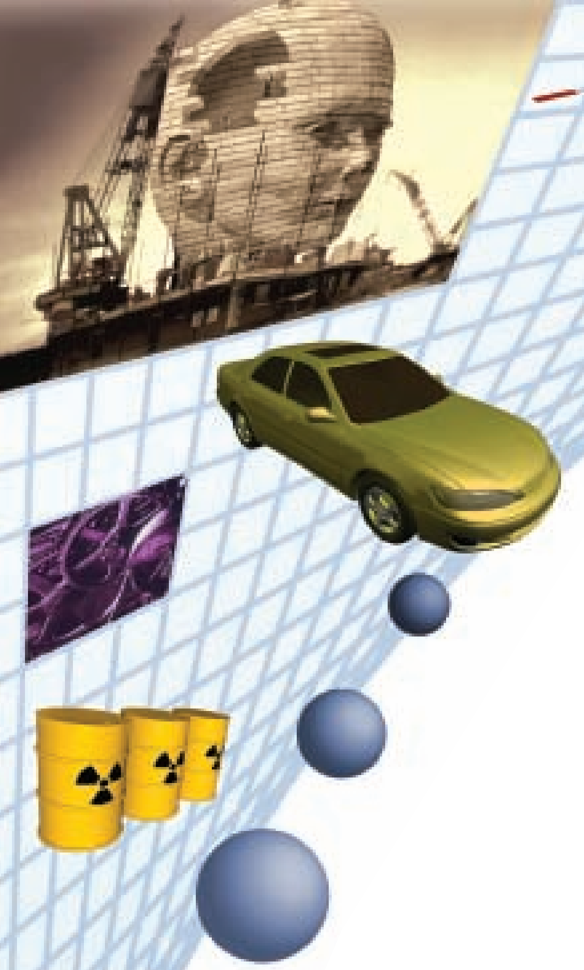
Volume 48, Number 1, Spring 2007

ENGINEERING
VANDERBILT



Cleaning the Past, Greening the Future

A Vanderbilt-led multi-university team is tackling the nation's nuclear waste issues.

Nuclear power might be "green power," but only if nuclear waste can be managed properly.

Vanderbilt is leading a multi-university consortium in a major effort to improve the nation's efforts to deal with nuclear waste safely and effectively. The consortium, originally formed to advise the U.S. Department of Energy (DOE) and its stakeholders on ways to manage the nation's defense-related nuclear wastes, consists of engineers and scientists who have participated in efforts in the last decade to clean up nuclear-weapons production sites and to dispose of nuclear wastes safely.

Now these nuclear waste experts hope to leverage their knowledge to help the U.S. find safe ways to effectively manage nuclear waste from civilian nuclear power as well. They see this effort as critical if the nation is to accept expanded nuclear power-generating capacities.

"We cannot move into the future of expanded nuclear power generation without cleaning up the legacy wastes of the past," says co-principal investigator Charles W. Powers, Vanderbilt professor of environmental engineering. "We must first solve nuclear waste management issues that have plagued defense and civilian nuclear waste management programs."

The multi-university Consortium for Risk Evaluation with Stakeholder Participation (CRESP) is being funded by a DOE cooperative agreement initially of $6 million per year for the next five years. The group will continue to work with DOE and its stakeholders on how to clean up legacy wastes from the nuclear arms race and extend its efforts to help establish a solid technical foundation for safe management of nuclear waste from a wide range of sources.

Vanderbilt's partners in CRESP include faculty members from Rutgers University, University of Pittsburgh, New York University, Robert Wood Johnson Medical School, Howard University, University of Arizona and Oregon State University. The team kicked off its collaborative effort with a meeting at Vanderbilt in December.

"CRESP has proven its capability and usefulness to the nation in investigating and recommending solutions to nuclear waste risk-management challenges," says David S. Kosson, Vanderbilt professor and chairman of civil and environmental engineering and co-principal investigator of CRESP.

"Now CRESP is focusing on helping the DOE to meet its most pressing challenges in nuclear remediation for the nation," he says.

A $150 Billion Problem

Powers notes that, even without nuclear power generation expansion plans, much remains to be done to handle the nuclear waste that already has been created. Cleanup of the U.S. nuclear complex has already cost more than $70 billion, with future costs projected to exceed $150 billion. On the civilian side, spent nuclear fuel is currently stored in 39 states at some 122 sites, awaiting final disposition. Plans to use Yucca Mountain in Nevada as the national nuclear waste repository have been sidetracked by a variety of technical and political challenges, and despite nearly $6 billion spent to develop the facility, no firm date has been set for completion.

Kosson delineates several issues that Vanderbilt faculty and CRESP are helping the DOE address: safe and reliable management techniques and processes for handling of nuclear wastes; remediation of nuclear weapons complex sites; development of final-disposition site plans for nuclear waste (Yucca Mountain); optimizing the nuclear fuel cycles of the future; and education and communication of nuclear waste issues to the public.

CRESP has built a strong foundation from which to help DOE tackle these issues. Since 1995 CRESP has been researching ways to advance cost-effective cleanup of the nation's nuclear weapons-production waste sites and test facilities. Although CRESP focuses on site remediation, its work requires engineers and scientists to understand the complete life cycle of nuclear power generation, weapons production, and environmental impacts from nuclear weapons tests.

Expertise for Successful Solutions

The consortium draws on the expertise of faculty in disciplines such as engineering law, ecology, public health, health physics, policy and organizational dynamics.

Vanderbilt will lead the organization into a new phase of development designed to improve the clarity of the technical standards for nuclear waste management, based on experience developed earlier by CRESP to help guide both nuclear weapons sites remediation and safe management of wastes produced by nuclear power plants.

"The proposed Global Nuclear Energy Partnership raises additional nuclear management issues," Kosson says. "The DOE plan to reduce waste management problems and to promote nonproliferation through this partnership depends in large measure on spent fuel reprocessing, which presents a variety of new challenges for nuclear waste management.

"There is great overlap technically between the remediation of former nuclear weapons residuals and the effective and safe management of peaceful nuclear power operations, so CRESP's expertise will be made available to help integrate solutions for nuclear waste management."

The selection of Vanderbilt to lead the consortium is based on the breadth and depth of expertise at the university in nuclear remediation. "Frank Parker is one of the world leaders in nuclear energy and remediation and served as head of radioactive waste disposal research for the International Atomic Energy Agency," says Kosson. "Jim Clarke is on the U.S. Nuclear Regulatory Commission Advisory Committee on Nuclear Waste. Mark Abkowitz is on the president-appointed Nuclear Waste Technical Review Board. The list goes on and on."

—*Vivian F. Cooper*

4

6

8

IN THIS ISSUE

DANIEL DUBOIS

Professors Charles Powers, left, and David Kosson are co-principal investigators on a five-year, multimillion-dollar initiative funded by the U.S. Department of Energy to help the nation manage waste from civilian nuclear power sources.

Sid Banwart

The Globalization of Engineering

Sid Banwart, senior vice president for the Human Services Division at Caterpillar Inc., spoke to senior engineering students at a design seminar last fall. This article is an excerpt from his remarks. An engineer himself, Banwart started working for Caterpillar in 1968 and has held engineering, supervisory and management posts at Caterpillar facilities in Illinois, Indiana and in Mexico. He was first named a vice president in 1997.

I'd like to challenge you today with an idea that may be uncomfortable: You will be competing not just in the United States but around the globe, because engineers are available everywhere these days. *Everywhere.* Lots of them.

I can tell you from living in Mexico that Mexico, for one, is graduating more engineers per capita than the U.S. If you can put *ingeniero* on your business card in Mexico, that's a big deal. It's a status job. In the U.S. the number of engineering grads is not keeping pace with the number of engineering jobs. And what do you suppose the impact of that is? Large companies like Caterpillar are beginning to develop engineering centers outside the United States. We're importing engineers into the U.S. who are educated in other countries. But we're also working hard to help promote engineering as a career field in the U.S., and to enhance opportunities for women and minorities.

Globalization and communications are changing the landscape of how we work. We're all looking globally for talent. We're creating more international teams of engineers. Did you ever think you might be on a team with people who are working in other countries? Or how about designing products in one country for sale in another?

There are still a few companies, like Caterpillar, where you can have several different careers inside the same company. We have more than 11,000 engineers employed in 157 locations worldwide, but look at the areas they work in. Some serve the more traditional engineering functions, but others work in logistics and marketing, and we have a few engineers like me working in human resources. Half the marketing people we hire every year have degrees in engineering. Most of our design control is in the U.S., but we also have design control in Japan, France, Belgium, Brazil, India, the UK and China. We value that global engineering experience.

Citizens of the World

Because we're an international company, because half our sales are outside the U.S., and because half our people are outside the U.S., we're in the middle of a cultural transformation as a major company that is trying to be truly global. One of my colleagues was born of Italian parents in Belgium, was educated in Belgium, worked for Caterpillar in Brazil, in France and in Switzerland, and is now running a major operation within Caterpillar in the U.S. He speaks five languages and is truly a global citizen—and he's an engineer. That's what the future is like.

We view diversity broadly: Yes, it's gender and ethnicity, but it's also international experience and cross-functional experience. We believe that bright people—and engineers certainly fall into that category—have a lot to offer. We look for leaders, people who can lead in any function, not just in engineering.

So how can you prepare for the future? First, I encourage you to seek opportunities to work with people from different backgrounds. You can do that at a place like Vanderbilt. Second, work in teams. This is how you learn to communicate with others. Your ability to communicate is almost second to none in terms of your ability to be successful. Third, learn a second language. Fourth, understand business. When an engineer is involved on a team to design a product, it's not just pure design. You must meet constraints in cost, constraints in time, constraints in function. If you don't understand business, you won't be as relevant as someone else who does.

Finally, seek educational experiences. In fact, demand them. The real world is cross-functional, and you need some cross-functional experiences. Seek educational experiences that demonstrate the implications of globalization and allow you to manage projects with other disciplines.

With technical expertise being an integral part of creating growth in business today, engineers can find themselves responsible for all different ages in the life cycle of a product.

Globalization and communications are changing the landscape of how we work. We're all looking globally for talent. We're creating more international teams of engineers.

SNAPSHOT OF CATERPILLAR:

Headquartered in Peoria, Ill., Caterpillar Inc. is the world's largest manufacturer of construction and mining equipment, diesel and natural gas engines, and industrial gas turbines. With annual revenues approaching $40 billion, Caterpillar has 300 operations in 40 countries and sells its products in more than 200 countries. The company employs 90,000 people worldwide, and its equipment dealerships employ an additional 100,000 people.

Engineering Vanderbilt, the newsletter of the Vanderbilt University School of Engineering, is published in cooperation with the Office of Advancement Communications for alumni, parents of current students, faculty, and other friends of the School of Engineering.

Volume 48, Number 1, Spring 2007

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Student Kudos

First Place for Computer Science Undergrads

A team of Vanderbilt computer science undergraduates took first place in one of the 10 site-based competitions of the annual Association for Computing Machinery International Collegiate Programming Contest, Mid-Central Region. Juniors Evan Makowski and Dan Smith and sophomore Roger Wu defeated 16 area collegiate teams at the five-hour event, held Nov. 5, 2006, at Tennessee Technological University, by correctly solving six of the seven problems in the shortest amount of time. The team also finished second in the region behind Northwestern University, defeating 122 other teams. By doing so, the Vanderbilt team is eligible to compete in the International World Finals this year in Japan.

Senior Matthew DeVries was responsible for team practices and training, and electrical engineering and computer science lecturer Julie Johnson acted as the faculty team coach. Another Vanderbilt team, consisting of DeVries, freshman Andrew Jallouk and senior Ari Wilson, finished fourth at Tennessee Tech and 21st in the region.

Engineering Posters Take Honors

Senior biomedical engineering student Erica Bozeman won the first-place research award at the Tennessee Louis Stokes Alliance for Minority Participation Undergraduate Research Conference in November for her poster, "Development of an Adherence Diagnostic Assay for the *In-Vitro* Analysis of *Streptococcus Pneumoniae* Surface Adhesin A (PsaA) Protein and the Human Cell Receptor E-cadherin." The conference was held in Murfreesboro, Tenn. Bozeman, who is from Decatur, Ga., is president of the Vanderbilt collegiate section of the Society of Women Engineers.

DANIEL DUBOIS

Erica Bozeman

Vanderbilt engineering graduate students were awarded first and second place in the 2006 Nanoscience and Nanotechnology Forum Poster Competition for their presentations on campus Nov. 8. Chemical engineering student Christina Payne won first place for "Molecular Dynamics Simulation of a Nanoscale Device for Fast Sequencing of DNA," and materials science student Anuradha Bulusu won second place for "Modeling of Thermoelectric Properties of Nanofilms and Nanowires."

Forecasting the Spread of Cancer

A multidisciplinary effort offers new hope for predicting the growth of malignant tumors.

The physician clicks on a small black dot on his computer screen. The dot—which represents about a thousand cancer cells—begins to "grow," morphing into a mass with finger-like projections that looks like an invasive tumor.

This is more than a frighteningly ugly projection. In the future it could mean the difference between successful treatment and the euphemistically termed "negative outcome" for the cancer patient.

The Vanderbilt engineers and physicians who developed this powerful computer simulation anticipate that tools like this will be used to predict an individual tumor's clinical progression and help formulate personalized treatment plans.

The model was developed by John R. Hall Professor of Chemical Engineering Peter T. Cummings with Professor of Cancer Biology Vito Quaranta. They and their associates have worked for the past two years to develop the mathematical model for cancer invasion powerful enough for this purpose. The result was published as an entirely theoretical paper in the journal *Cell*. If they are right, this approach represents a sea change in how biology is done.

Actually, it's not so different from forecasting the weather.

"Today we can know pretty well that for the next few days, we're going to expect good weather or that there's a storm on the way," says Quaranta. "That's the kind of predictive power we want to generate with our model for cancer invasion."

Virtual Predictions

The Vanderbilt team and colleagues at the University of Dundee in Scotland developed a computational model for cancer invasion and described the model in the Dec. 1, 2006, issue of *Cell*. The model—a series of mathematical equations that drive computer simulations of tumor growth—suggests that the microenvironment around tumor cells determines the tumor's ultimate cellular makeup and invasive potential.

Today a tumor's size and shape are evaluated, but they can be poor indicators of invasive potential; a very small tumor, for example, can be highly invasive. Even "molecular signatures"—profiles of molecules that suggest how tumor cells will behave—are not entirely predictive, adds Quaranta.

"When a patient comes in with a tumor," he says, "we'd like to understand that particular tumor and the chances that metastasis is going to occur. Does that patient need to be treated very aggressively, or not so aggressively?"

He and colleagues opted for a new approach: using the tools of mathematics to tackle the complex problem of cancer behavior. "Particularly in cancer biology, we know so much about tumors, but we can do so little. Why is that?" asks Quaranta. "I think the reason is that we need additional tools, and those are the tools of mathematics."

The scientific team responsible for creating this new computational model includes core members Cummings; Quaranta; Alissa Weaver, assistant professor of cancer biology at Vanderbilt; and Alexander Anderson, associate professor of mathematics at the University of Dundee, working with a highly interactive group of cancer biologists, bioengineers, imaging scientists, computational biologists and mathematicians. The development was supported by funding from the National Cancer Institute's Integrative Cancer Biology Program.

"We have mathematics driving experimentation," says Quaranta. The team will tailor its biological experiments to test and validate the model. If the experimental data don't fit the predictions from the model, either the experiments or the model needs to be corrected, he says.

"What is happening in biology is similar to trends seen in recent decades in the physical sciences," says Cummings, who is an expert in computer simulation. "Computational models like this, in which complex behavior emerges from computer simulations grounded in understanding phenomena at a smaller scale, have been a staple of chemistry, physics and related engineering disciplines for a long time. In those disciplines the smaller scale is the single atom or molecule.

"In the case of the cancer invasion model, the smaller scale is the single cell, for which our experimental collaborators can measure many properties—how it moves, how it responds to its environment, how it mutates."

Microenvironment of a Tumor

The team's model is an initial effort. It is sophisticated enough to begin capturing tumor behavior without being so complicated that computing power and running time for simulations become limiting. The current model simulates about four months of tumor growth in about eight hours.

In the model, when cells divide they randomly choose from a set of 100 "phenotypes"—behaviors that result from distinct genetic characteristics. For example, a cell might choose characteristics that allow it to divide more quickly or to detach from its neighbors. The investigators set the environmental conditions, which include the oxygen and nutrient concentrations and the landscape of connective tissue that surrounds the cells. They were surprised to find that the microenvironment around the tumor determines both the tumor's shape and its composition.

"What we get is a picture of cells that are evolving and growing within a microenvironment," says Quaranta.

The current model predicts that in mild environmental conditions—imagine a lush rainforest, says Quaranta—many cell types coexist and the tumor shape is round with smooth edges, characteristic of a noninvasive tumor. Under harsh environmental conditions—imagine a desert—the most aggressive cell types dominate and the tumor shape has fingering, invasive projections. In particular, the investigators found that they can modulate the tumor's degree of invasiveness by changing a single condition: oxygen concentration.

The findings suggest that current chemotherapy approaches, which create a harsh microenvironment in the tumor, may leave behind the most aggressive and invasive tumor cells. And there is anecdotal evidence, says Quaranta, to support the idea that changes to the microenvironment result in a tumor with more or less invasive potential. Such manipulations of the microenvironment could offer new directions for cancer treatment, he says.

Next up for the group are *in vitro* and *in vivo* experiments designed to test, validate and refine the mathematical model.

—Leigh MacMillan, for Exploration, *Vanderbilt's online research journal, with Vivian F. Cooper*

The model suggests the microenvironment around tumor cells determines the tumor's ultimate cellular makeup and invasive potential.

SUSAN URMY

Key members of the international research team are Alissa Weaver, Peter Cummings, Alexander Anderson (telecommuting from the University of Dundee in Scotland), and Vito Quaranta. Together they are developing a powerful new computer simulation of tumor growth that could set the stage for customized cancer treatment.

Vanderbilt Helping to Ensure Helicopter Safety

All it took to rip the roof off Aloha Airlines Flight 243 in 1988 was the gradual corrosion around rivet holes that had, over time, created tiny cracks in the Boeing 737's fuselage. The results were sudden—and fatal.

The incident, which caused one death, 65 injuries, and a traumatic open-air ride in an "airplane convert-ible" for the rest of the passengers, sparked two decades of national programs designed to make aging airplanes more reliable.

DANIEL DUBOIS

Professor Sankaran Mahadevan and his team of Vanderbilt researchers are helping the Federal Aviation Administration in its efforts to ensure helicopters against mechanical failure.

Now the Vanderbilt School of Engineering is leading a new Federal Aviation Administration initiative to apply and expand aging aircraft reliability techniques to helicopters. Although the project is focused on helicopters, researchers believe much of what is learned could be applied to other types of aircraft. The five-year, $1.5 million project kicked off with a meeting last November in Atlantic City, N.J.

Helicopter safety has become an increasing concern in recent years because the number of emergency medical-service helicopter accidents in the United States nearly doubled from the mid-1990s to 2004. Although most of these accidents were caused by challenging weather, difficult terrain conditions and pilot error, the FAA wants to ensure that the equipment gives pilots every advantage.

"The margin for error in flying a helicopter, especially in rescue missions, is very slim," says the project's principal investigator, Sankaran Mahadevan. "We want to make sure helicopter pilots don't have to deal with equipment failure, such as metal fatigue, on top of the challenges of shifting winds, unseen obstacles like power lines, and space limitations of maneuvering in tight spots."

As the aviation industry moves toward using new, lighter materials in their designs, more understanding is needed about the characteristics and performance of these materials under various operating conditions, says Mahadevan, a professor of civil and environmental engineering.

"Lighter materials can translate into fuel economies," he says, "but the industry needs more data on how these new materials will perform over time. We are going to help develop that knowledge base to guide rotorcraft design as well as maintenance schedules."

Reliability Put to the Test

Mahadevan and his Vanderbilt team will work with subcontractor Bell Helicopter Textron Inc. of Fort Worth, Texas, to test the mettle of the materials used in helicopter components. "In addition to needing information about the materials, we need better understanding of how the entire structure of a helicopter functions under a variety of performance requirements," says Mahadevan.

The team's first step will be to perform controlled laboratory tests on new materials to get an idea about how and where cracks and other flaws might materialize under various conditions.

This data will be leveraged to predict the materials' behavior throughout the life of the aircraft using various computer models, including computer simulation and probability software. These and other computational tools will be used to determine how a helicopter most likely would be affected by failures within various components.

"Finally, this information will guide us in recommending inspection and maintenance schedules," Mahadevan says. "The FAA wants to create the optimal schedule of inspection and maintenance to ensure against catastrophic failure without wasting resources by redundant inspections."

Bell Helicopter Textron, which produces a wide range of commercial and military helicopters, will contribute data about helicopter components and materials, as well as how defects grow in size. The company also will advise Vanderbilt researchers on useful and practical demonstration problems with which to test the research.

NEIL BRAKE

More emergency medical-service helicopters fill the skies than ever before, including those in Vanderbilt University Medical Center's LifeFlight fleet—and the FAA wants to make sure pilots are given every safety advantage.

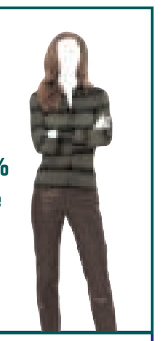
"This research differs from most studies on helicopter-damage tolerance in that it will incorporate uncertainties in geometry, material behavior, mission operations, and initial flaw distribution within the rotorcraft components," Mahadevan says. "As in the Aloha Airlines accident, sometimes more than one flaw can interact, causing catastrophic results."

The computing methods to be used in the research have been utilized in a variety of other risk and reliability applications for automotive, spacecraft and aircraft components, but this is the first time they have been applied to helicopter components and materials. In addition to providing a risk and reliability foundation for helicopters, the research project will refine and expand the computing methods, says Mahadevan.

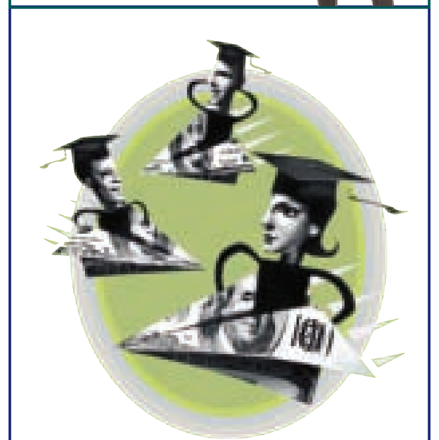
"In the past few years, our group has been successful in developing such models for complex fatigue and fracture, which have shown excellent performance for a wide variety of materials. The FAA project will build on this success and will have a strong impact on design methods and risk management."

—Vivian F. Cooper

Factoids:



Of the students currently enrolled in the Vanderbilt School of Engineering, 27% are women. Nationally, the number of women enrolled in engineering schools is only 17%.



For the 2006–07 academic year, 66% of engineering students are receiving financial aid.

VUSE in *Science Watch* Top 10

Vanderbilt University School of Engineering is ranked among the top 10 universities nationally as measured by the impact that their publications have had on the field.

The rankings were published in the January/February issue of Thomson Scientific's newsletter *Science Watch* and are based on a survey of research publications in the physical and social sciences between 2001 and 2005. It is the first time Vanderbilt engineering has appeared in *Science Watch*'s Top 10 list.

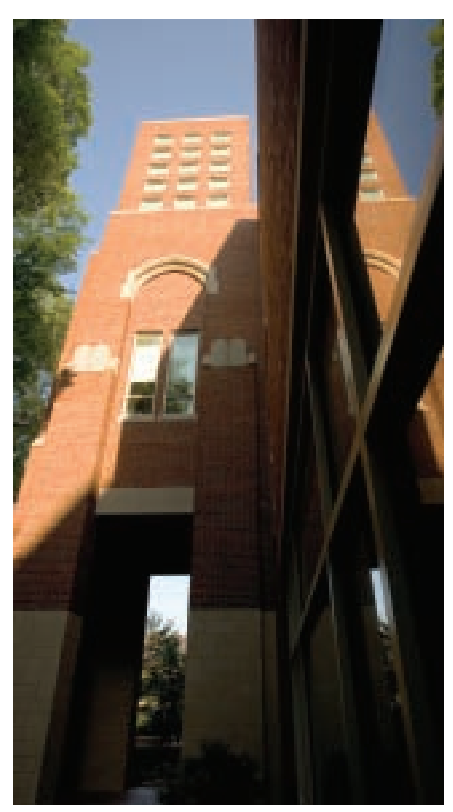
The basis of the rankings is what *Science Watch* calls "citation impact," which is defined as the average number of times that papers written by an institution's researchers are cited in papers published by other experts. This is considered to be a measure that does a good job of comparing the research quality of different-sized institutions.

Vanderbilt School of Engineering ranked ninth in the engineering category, with 414 papers and a relative impact score of 117. The first-ranked institution was Yale, with 389 papers and a relative impact score of 181.

The *Science Watch* Top 10 rankings cover 21 fields of university research, surveying publishing activities of researchers from the top 100 federally funded universities.

"We are pleased with this recognition," says Vanderbilt Dean of Engineering Kenneth F. Galloway. "Our faculty and students publish significant papers, and the *Science Watch* ranking recognizes both their productivity and the quality of their work." The dean noted that the achievement is especially impressive in light of the fact that Vanderbilt's engineering school is relatively small, with fewer than 100 faculty.

In addition to the *Science Watch* honor, Vanderbilt recently ranked No. 23 in one of the principal national rankings of the value of federal science and engineering research grants awarded to faculty members, according to an annual report by the National Science Foundation.



GIS Technology Helps Caribbean Islands in Transition

For more than 350 years, sugar was king on the Caribbean islands of St. Kitts and Nevis. Changing global economics, however, have ended sugar's reign, and a cadre of Vanderbilt engineering researchers is using geographic information system (GIS) technology to help the islands map suitable land for non-sugar agriculture.

"GIS is a computer-based tool for mapping and analyzing locations in combination with factors such as weather, geography, soil, hydrology and topography," says Edsel B. Daniel, research assistant professor of civil and environmental engineering. He is team leader on a St. Kitts study funded by the United Kingdom's Department for International Development (DFID). "GIS data allows us to make recommendations on the potential for new income sources and land uses." St. Kitts ceased production of sugar for export in July 2005 after years of government support left the nation's economy in the red.

Vanderbilt researchers were already working on and exploring new GIS projects in St. Kitts when they were asked in October 2005 to do the preliminary land-suitability study. The team utilized valuable local knowledge from Daniel (a national of St. Kitts and Nevis), who served 11 years as a planning officer with the Ministry of Development early in his career.

DANIEL DUBOIS

Professor Edsel Daniel, who grew up on a sugar-cane estate on St. Kitts in the Caribbean, is leading a study of the island's land-use options now that sugar production for export has ceased there.

"Better information leads to better economic decisions," says Daniel. Toward that goal, the team collected hard-copy data from a variety of sources on the islands and input it into the GIS database, combining it with a variety of weather, geographic, population, development, community and agricultural information. They also talked with government officials and community groups.

"In the process we assembled an important land-use layer [of information] and superimposed it to find where land use would conflict," explains Daniel. For instance, while a site might be ideal for grazing livestock, its proximity to homes would be a barrier. Or while peanuts might be a good replacement crop for sugar cane, it's not possible to grow enough on the islands for it to be profitable.

According to Derek L. Bryant, a Vanderbilt research associate of civil and environmental engineering and member of the project team, the greatest challenge lay in coping with the absence of key data such as soil chemistry while maximizing the GIS analysis. "The islands' dependence on rainfall as the only meaningful source of fresh water limited the possible options for agricultural recommendations," he says.

Since the study's completion, the team has observed St. Kitts' use of their recommendations. Under consideration are expansion of tourism, increased residential development, and serious consideration of pineapples, peanuts and other fruit as cash crops.

Meanwhile, the GIS data collection for the land-suitability study may serve as the foundation for the islands' search for a new solid waste disposal site. "Accurate information is crucial to making the right choices," says Daniel. "It's exciting to be part of this process and to see how valuable information can be when it's collected and displayed in a way people can understand and use it."

—Mardy Fones

Making "Smart Systems" Even Smarter for Spacecraft

Because no human pilots will guide the aerial vehicles and autonomous spacecraft of the future, the computers flying them will have to be pretty darned smart—maybe even a few orders of magnitude smarter than the ones running "smart" equipment these days.

Vanderbilt engineering researchers have kicked off a $5 million groundbreaking effort to develop the computer software required to operate the next generation of military and space vehicles safely and reliably.

The Vanderbilt Institute for Software Integrated Systems (ISIS) is heading up a team that includes researchers from the University of California-Berkeley, Stanford University and Carnegie Mellon University, along with several industry partners. The five-year project is funded by the Air Force Office of Scientific Research.

"The military has developed exciting new aerospace technologies in recent years, but the increasing capability and complexity have also intensified the risks of failure in systems that absolutely require high levels of confidence and reliability," says Janos Sztipanovits, ISIS director and E. Bronson Ingram Distinguished Professor of Engineering.

"Everyone talks about 'smart systems' technology, but it's not safe enough yet to risk the equipment and, ultimately, the lives of people who will depend on it."

"Smart systems" technologies such as control systems in airplanes, in automobiles, in security systems and in cell phones are called "embedded systems" because the computing apparatus is integrated with physical equipment.

Before the advent of "smart systems," computer scientists did not have to consider the physical realities in software designs, other than such requirements as lighting a computer screen or running a printer. But with "smart systems," computer scientists literally have to think outside the box because the computer must control mechanical systems that obey the laws of physics, as well as the man-made, mathematical laws of computer science.

Systems That Work Together

The underlying challenge is the need to marry two complex disciplines that diverged years ago, says Sztipanovits. Physics, meet Computer Science.

But getting the right hand to know what the left hand is doing is profoundly more difficult to do than it is to imagine, says Sztipanovits. ISIS began tackling that challenge years ago by pioneering a variety of software systems that enable disparate computing systems to work together smoothly and to empower these computer systems to grapple successfully—and safely—with physical systems.

Along the way ISIS developed long-term collaborations with other university pioneers in embedded systems, and three of these partners are joining ISIS in this project.

The project includes four divisions of research. The first involves development of embedded systems theory, in which much of the integration of computer science and physical science will be achieved. The second involves development of a software design and verification approach that uses computer modeling to coordinate and control computer component software. The third emphasis works to eliminate ambiguity in the design process. The fourth part of the project creates experimental test beds to validate the research in the context of aerospace vehicles.

This research ultimately will benefit private-sector embedded systems development as well as military systems,

DANIEL DUBOIS

Janos Sztipanovits, the E. Bronson Ingram Professor of Engineering, left, and Professor of Electrical Engineering Gabor Karsai are leading a nationwide team in the development of new military and spacecraft smart-systems software.

concludes Sztipanovits. "Commercial computational tools now focus on only one aspect of the development cycle, and this piecemeal approach is not sufficient for systems that require high degrees of confidence." With the development of new software tools, commercial applications also will increase in reliability.

—Vivian F. Cooper

"Smart systems" technologies are called "embedded systems" because the computing apparatus is integrated with physical equipment.

$20 Million Imaging Center Opens

The university's premier imaging research center has a new home containing an array of powerful tools for biomedical research.

Dedication of the four-floor, $19.7 million Vanderbilt University Institute of Imaging Science (VUIIS) took place in November 2006. Dr. Harry Jacobson, vice chancellor for health affairs, calls the 46,000-square-foot, glass-and-steel building "the embodiment of what may be a world-changing place."

VUIIS is a leading international research center for imaging applied to medicine. In this shared resource for the whole university, researchers from traditionally separate disciplines of medicine, engineering, physics, chemistry, computing, biology and the social sciences are working together to better understand illnesses such as cancer, heart disease, brain disorders and many others.

The new facility, located adjacent to Medical Center North at the corner of Garland Avenue and 21st Avenue South, contains one of the world's most powerful magnetic resonance imaging (MRI) scanners. The $7 million, 7-Tesla scanner, built by Philips Medical Systems, can generate images down to the molecular level. (One Tesla is roughly 20,000 times the strength of the magnetic field of the earth.)

The scanner enables researchers to perform more advanced magnetic resonance spectroscopy, says VUIIS Director John Gore.

"MR spectroscopy produces biochemical information from small volumes within the body," says Gore, Chancellor's University Professor and professor of biomedical engineering. "For example, in the brain you can measure the levels of certain neurotransmitters." That's important for studying addiction and determining the effects of drugs in the brain.

The institute also employs other advanced imaging devices, including a 3-T whole body scanner, X-ray, ultrasound, PET and multi-slice CT. The small animal center contains a two-story scanner for the noninvasive study of brain activity in live monkeys.

Several biomedical and electrical engineering professors are among the 85 people working at VUIIS. More than half the institute's 32 graduate students and several of its post-doctoral students are biomedical or electrical engineers.

"Imaging is one of the fastest-growing areas in biomedical engineering," says Gore. Three other biomedical engineering professors are also primary VUIIS faculty members: Associate Professor Mark Does, director of the institute's Center for Small Animal Imaging; Associate Professor Adam Anderson, who focuses on magnetic resonance imaging of the brain; and Associate Professor Cynthia B. Paschal, who conducts cardiovascular research.

"VUIIS gives engineering faculty the opportunity to work with other leading researchers in a variety of disciplines to make significant advances in medical imaging technology," says School of Engineering Dean Kenneth F. Galloway. "The new building and equipment will unquestionably expedite the world-class research and development already taking place in the institute."

A graduate of the University of London, Gore came to Vanderbilt in 2002 from Yale University, bringing a core group of more than a dozen scientists with him. In 2004 the International Society for Magnetic Resonance in Medicine awarded him its highest honor—the Gold Medal—for his pioneering work in developing MRI technologies.

Gore says the new center will help keep Vanderbilt at the forefront of imaging science.

"By every measure we are already in the top handful of centers in the world for imaging research," he says. "We intend to become world leaders in imaging science and molecular imaging and new applications of imaging in medicine."

—Joanne L. Beckham

DANIEL DUBOIS

Once scattered around campus, researchers for the Vanderbilt Institute of Imaging Science are now housed together in a new, 46,000-square-foot facility. The Institute is directed by John Gore, Chancellor's University Professor and professor of biomedical engineering.

Behind-the-Scenes Banker

Charles Plosser has discovered the intersection of good business practices and engineering skill.

FEDERAL RESERVE BANK OF PHILADELPHIA

Charles Plosser, BE'70, president of the Federal Reserve Bank of Philadelphia, hopes to help the public understand what the Fed can and can't do: "Monetary policy is a very blunt instrument," he says. "It's not a magic elixir."

"Career paths are hard to predict, as they sometimes take unexpected turns," says Charles I. Plosser, BE'70. In August 2006, Plosser's career path shifted from university dean and college professor to president of the Federal Reserve Bank of Philadelphia.

The work of the 12 Fed banks nationwide is diverse, esoteric and often transparent to most Americans, says Plosser. Yet, it touches even mundane aspects of personal finance. For instance, the Fed clears billions of electronic and paper checks consumers write daily. Says Plosser, "When consumers withdraw money from ATMs, the Fed works behind the scenes to ensure transactions go smoothly.

"In times of financial crisis, we work to ensure stability in the financial markets through oversight of the banking industry and its ability to be a 'lender of last resort' during periods of financial distress," explains Plosser. "Case in point: The Fed provided liquidity in the markets after the Sept. 11 terrorist attacks."

When not directing the Philadelphia Fed's 1,100 employees, Plosser is a policymaker who, like other Fed presidents, sits on the Federal Open Markets Committee. During slivers of personal time, he and his wife of 30 years, Joann, travel. The couple has three grown children.

Econ 101

"Economics, in general, and monetary policy, in particular, are mysterious to many people," says Plosser, who earned his M.B.A. at the University of Chicago. His interest in business was born of working summer jobs with engineering firms where the intersection of good business practices and engineering skill was evident. After a brief stint with Citicorp, he returned to Chicago for a doctorate and spent the past 30 years teaching and researching, most recently at the University of Rochester.

"I taught economics, statistics and finance to M.B.A. students. Teaching in the business school kept me in touch with people and ideas outside academia," says Plosser, who was dean at Rochester for 10 years. "The combination of my training and research in macro- and monetary economics and the management experience acquired as a dean provided me with the skills that made my appointment at the Federal Reserve possible." He also credits the unstructured problem analysis that was part of his Vanderbilt engineering education with giving him the tools to solve problems and analyze data on behalf of the Fed.

At heart, Plosser, a Birmingham, Ala., native, is an educator. These days his classroom is the nation, and helping people understand what the Fed can and can't do is his passion. "It's … believed that Federal Reserve policy can be used to address all manner of economic ills," says Plosser, "from Hurricane Katrina to trade balances with China. Yet, monetary policy is a very blunt instrument. It's not a magic elixir.

"Economics is essentially the study of how people use scarce resources to satisfy unlimited wants," he says. "We do not have all the resources we want, so we must make choices and, therefore, give up something. Economists call this opportunity cost. Understanding opportunity costs is essential to making good everyday decisions."

—Mardy Fones

Driving Ambition

From cup holders to safe handling, it's Mark Reuss' job to create vehicles you'll love.

For some people, cars are just a way to get from point A to point B—large radios on wheels. But to others, they are endlessly fascinating machines that are constantly evolving with each new make and model. Mark Reuss, BE'86, definitely falls into this category.

Reuss joined General Motors' Flint Automotive Division in 1986 as an associate car development engineer for powertrain calibration. He went on to serve as total vehicle engineer for several models before being appointed executive director for North American vehicle systems and architecture. In April 2006, Reuss was named executive director for global vehicle integration, safety and virtual vehicle development. It's a complicated title befitting a complicated job.

"We engineer the parts and pieces that go together to create what is really the soul of a vehicle. How it sounds. How it rides and handles. How it steers and brakes," explains Reuss. "All those things are what's called 'vehicle integration.'" He also has responsibility for the safety performance of the vehicles. And, ultimately, Reuss' department sets the requirements for the people who actually fabricate the parts and pieces. The goal, of course, is to produce a product that customers enjoy and will want to buy again.

But pleasing the car-buying public becomes more complicated with each passing year. These days customers not only have more vehicles to choose from, but they also have more options. And something as seemingly insignificant as a cup holder can actually carry quite a bit of weight. It's what the experts call the "human-vehicle interface."

"How the machine interfaces with the human being is very important," says Reuss. "We've had a rapid shift in the marketplace over the last 10 years. The competition is extremely intense, and we have to earn the right for people to buy our vehicles. The interface is where all those parts and pieces come together to create something unique and special."

On the Fast Track

For a guy who loves cars, Reuss also must spend a lot of time on airplanes. He regularly travels to GM facilities in Korea, Australia, India, Brazil and China.

"I really enjoy learning about different cultures, different car markets, and the different capabilities of people in GM worldwide," he says. "It wears you out, but it's fascinating."

It only stands to reason that a person who is into cars this much would also be an excellent driver. Reuss is a certified industry pool test driver for the famed Nürburgring Nordschleife (North Course) in northeast Germany, a feat very few Americans have accomplished.

"Nürburgring is called the most difficult and challenging race course ever manufactured—13 miles with about 125 turns. It was once home to Formula 1 races, but it was decided that it was too dangerous," says Reuss.

The fortunes of the automotive industry rise and fall with regularity, and now GM is enjoying some hard-earned success. Reuss, for one, is enjoying the ride.

"No other industry has the same intense competition and dynamic environment—and it changes faster than any other industry around, except for software. It's challenging, rewarding and very engaging."

—Cindy Thomsen

GENERAL MOTORS

Mark Reuss, BE'86, began his career with General Motors 14 years ago as a student intern. Today he's a top executive in the company, with customer satisfaction as his priority: "We have to earn the right for people to buy our vehicles," he says.

Faculty Notes

Peter T. Cummings, the John R. Hall Professor of Chemical Engineering, has been appointed principal scientist for Oak Ridge National Laboratory's Center for Nanophase Materials Sciences (CNMS), which is designing and developing next-generation nanoscale materials. He will also continue to oversee the CNMS Nanomaterials Theory Institute, which he has led since 2002. One of five U.S. Department of Energy nanoscale-science research centers, the CNMS allows scientists and engineers to collaborate to more quickly make nanoscience discoveries and to develop ways to create new materials to be used in medicine, electronics, and a wide variety of industrial applications. Cummings has served as a joint faculty member of Oak Ridge National Laboratory since 1994.

Douglas Fisher, associate professor of computer science and associate professor of computer engineering, was presented the 2006 Chancellor's Cup last October by Vanderbilt Chancellor Gordon Gee during a surprise ceremony in Fisher's classroom. The award is presented annually during Homecoming week to one faculty member in recognition of his or her extraordinary contributions outside the classroom to foster relationships between undergraduate students and faculty. Fisher, whose research area is artificial intelligence, received an engraved pewter cup along with the sterling Tiffany bowl engraved with the names of all Chancellor's Cup recipients since 1963, which he will keep for a year. He also was presented a check for $2,500 by Nashville Vanderbilt Club President Rod Freeman.

NEIL BRAKE

Doug Fisher receives the 2006 Chancellor's Cup in a surprise ceremony.

Duco Jansen and **Anita Mahadevan-Jansen,** both associate professors of biomedical engineering, received a Chancellor's Research Award at the Fall Faculty Assembly for their paper "Optical Stimulation of Neural Tissue *in Vivo*," published in *Optics Letters.*

G. Kane Jennings, associate professor of chemical engineering, received a Chancellor's Research Award at the Fall Faculty Assembly for his article "pH-Responsive Copolymer Films by Surface-Catalyzed Growth," published in the *Journal of the American Chemical Society.*

K. Arthur Overholser, senior associate dean of engineering and professor of biomedical and chemical engineering, was presented the Thomas Jefferson Award during the Vanderbilt Fall Faculty Assembly. The award recognized his "distinguished service to Vanderbilt through extraordinary contributions as a member of the faculty in the councils and government of the university," according to the inscription on the goblet presented to him by Chancellor Gordon Gee. Gee praised Overholser for his wisdom, skills of leadership, and service to the entire university.

Karl B. Schnelle Jr., professor of chemical and environmental engineering, received the 2006 Lyman A. Ripperton Environmental Educator Award in recognition of inspirational teaching at the annual meeting of the Air and Waste Management Association in New Orleans.

M. Roger Webb, emeritus professor of civil engineering and a Vanderbilt engineering faculty member for nearly 30 years, died Dec. 6, 2006, in Vero Beach, Fla. He joined the faculty in 1958 and went on to serve as registrar and associate dean of the School of Engineering. He retired as acting dean of engineering in 1987. Although not an engineer by training, Webb was bestowed Eminent Engineer status by the Tennessee chapter of Tau Beta Pi, the engineering honor society, for his outstanding work as an administrator and service to the School of Engineering. A native Nashvillian, Webb earned a bachelor of arts degree from Peabody College in 1948. He served three years in the U.S. Navy's Construction Battalion in the Pacific during World War II before returning to Peabody to earn his master's degree in 1956. Survivors include his wife, Dorothy McGee Webb; two sons; a daughter-in-law; and three grandchildren.

Images of War

Slogging through snow and mud, eating K-rations in the dark, and being shot at (albeit with blanks) isn't everyone's idea of a good time. But for engineering professor Joel Barnett and his fellow World War II reenactors, it's a passion.

Barnett is one of several hundred World War II reenactors in Middle Tennessee. His unit, which includes both civilians and active-duty and retired soldiers, is affiliated with the 101st Airborne Division's museum in Clarksville, Tenn.

Each day as more and more veterans of the "good war" pass away, memories of the conflict die with them. World War II reenactors seek to preserve the war's history, educate themselves and others, and have fun doing it.

"Reenactors take it seriously," Barnett says.

A lifelong student of history (he teaches a course on the history of technology to engineering freshmen each year) and a 30-year photography enthusiast, Barnett portrays a combat photographer during reenactments. He uses three vintage cameras that he bought on eBay: a large Speed Graphic flash camera, a small Signal Corps WWII issue Kodak, and a German Leica made in 1936. And he bears an uncanny physical resemblance to famed Iwo Jima photographer Joe Rosenthal.

"Reenacting has taught me how difficult it was for those photographers to get the pictures we see in history books," Barnett says. "The cameras were not automatic in any respect. They had to manually set the focus, the shutter speed and everything else, and then get the picture while someone was shooting at them."

Unfriendly Fire

Barnett's unit stages several different types of reenactments: tactical events in which they practice military skills, spectator battles for the public, and historical displays and demonstrations of artifacts and equipment from the WWII era.

His most exciting experience came during a tactical event when his unit was trying to slip through the woods around a group of "German soldiers."

"We were sure we had out-flanked them," he says. "But we had miscalculated and exited the woods right in front of them. They opened fire and we were doomed. That experience taught me that a soldier's fate depended both on skill and a little bit of luck."

The most poignant moment for this son of a WWII veteran came during a historical presentation where he met a former soldier from his father's old unit.

"My dad died in the late 1970s, and there were a lot of things that I never got around to asking," he says. "Hearing some of the fine details that I didn't know, like the name of the ship they sailed on and a city-by-city itinerary as they went across Europe, was a great experience."

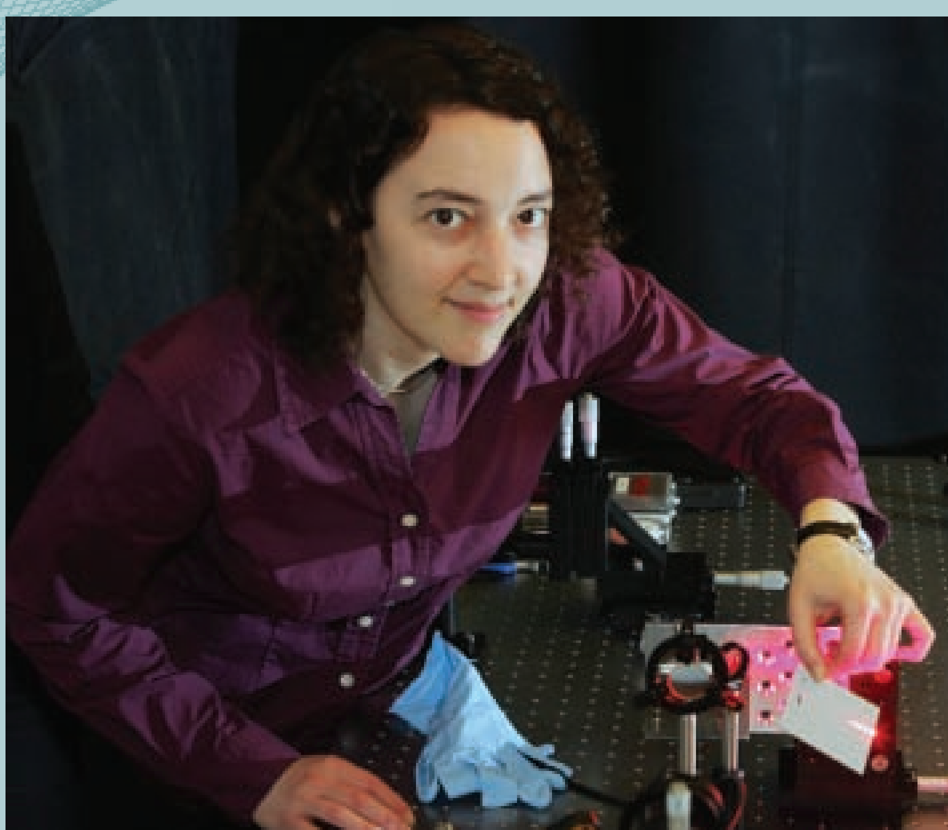
By day, Barnett, a 1993 Vanderbilt engineering Ph.D. graduate, is associate professor of the practice of engineering in the mechanical engineering department. He leads the senior design program, in which students work on "real-world" design projects in cross-departmental teams.

Before joining the faculty in 1997, Barnett served as president of Mid-South Engineering Inc. and was involved in research collaborations with NASA and the Defense Advanced Research Projects Agency (DARPA). His research interests include weld pool dynamics, welding automation, and nano-particle behavior in fluid environments.

—Joanne L. Beckham

Professor Joel Barnett portrays a combat photographer during World War II reenactments. A 30-year photography enthusiast, Barnett owns several vintage cameras from the war era.

INNOVATIONS



DANIEL DUBOIS

The Energy of Light

Replacing inefficient fluorescent, halogen and incandescent lighting with solid-state lighting by the use of light-emitting diodes would significantly reduce the amount of energy needed for lighting and thereby reduce carbon emissions. Sharon Weiss, assistant professor of electrical engineering, and her associates are taking a new approach to developing light-emitting diodes based on the introduction of light-emitting colloidal nanocrystals into a porous silicon matrix. Silicon-based light-emitting diodes could be produced using conventional silicon processing techniques, potentially at low cost and high throughput. Here Professor Weiss is performing photoluminescence measurements to characterize the performance of the hybrid porous silicon/light-emitting nanocrystal devices.

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A Reason to Celebrate

In the first event of its kind, more than 300 alumni, parents and friends turned out for the 2006 Engineering Celebration Dinner in October at the Loews Vanderbilt Hotel.

Hosted by Dean Kenneth Galloway and the Engineering Alumni Council, the event was held in conjunction with Reunion Weekend and was a celebration of engineering alumni and members of the Vanderbilt School of Engineering Academy of Distinguished Alumni. The gala represented a record turnout for a School of Engineering event.

Highlighting the evening was Dean Galloway's presentation of the Distinguished Alumnus Award to two accomplished friends of the School of Engineering: William B. Akers, BE'47, and Fred J. Cassetty Jr., BE'60. As distinguished alumni, both gentlemen became members of the School of Engineering Academy of Distinguished Alumni. Earlier in the spring, James A. Johnson, BE'63, PhD'72, was inducted into the Academy, marking the first time the honor has been bestowed upon three individuals in the same year.

Two students provided musical entertainment during the cocktail hour of the Celebration Dinner, including Matt Belsante, who is a senior engineering science and economics major. The evening closed with remarks from biomedical engineering senior Dani Shuck, who thanked alumni for the examples they have set for current students.

Our Highest Honor

In 2006, three outstanding individuals were inducted into the School of Engineering Academy of Distinguished Alumni. Members of the Academy represent the School of Engineering's most accomplished alumni. The honor recognizes distinguished achievement, significant service, excellent character, and a reputation that reflects well on the engineering school. Selections are made by a committee comprising representatives from the Executive Committee of the Engineering Alumni Council, faculty of the School of Engineering, and the Office of Development and Alumni Relations.

William B. Akers, BE'47

A lifelong Nashvillian, Bill Akers graduated from the School of Engineering in 1947 with a degree in civil engineering. It was his second bachelor's degree. Although he began his undergraduate studies at Vanderbilt, World War II interrupted his education and he entered the U.S. Navy. The navy sent him to the University of Oklahoma, where he earned a bachelor's degree in civil engineering, then to Cornell University Midshipmen's School, and finally to the Pacific, where Akers was a member of the Task Force for Operation Crossroads at Bikini for the atom-bomb test in June 1946.

DAVID CRENSHAW

Bill Akers accepts the Distinguished Alumnus Award from Dean Kenneth Galloway. In the mid-1970s Akers chaired the fundraising campaign that essentially saved the School of Engineering from financial collapse.

Upon separation from the navy, Akers returned to Vanderbilt to complete the degree he had started. He then went to the Massachusetts Institute of Technology to earn his master's degree in civil engineering.

After a brief stint as an engineer for the U.S. Army Corps of Engineers, Akers founded Asphalt Products Co., a paving materials manufacturer. He and his brother, Clark Akers, founded the Globe Co., a highway contractor, in 1956. They later founded the Parent Co. Inc., a general contractor. Akers retired in 1981.

In addition to his professional achievements, Akers has served the School of Engineering in numerous ways. In the mid-1970s, he was asked to organize the engineering alumni and to chair a national fundraising campaign for the school. The campaign, in essence, saved the School of Engineering, which was in dire financial straits at the time. He also has participated in building campaigns and efforts to create scholarships for undergraduate students.

Fred J. Cassetty Jr., BE'60

Also a lifelong Nashvillian, Fred Cassetty graduated from Vanderbilt in 1960 with a degree in electrical engineering. His father's unexpected death just before Cassetty's graduation forced him into the coal business that had been in his family for three generations. He led the Cassetty Coal Co. through mergers, acquisitions and new marketing strategies during the ensuing years. Today the Alley Cassetty Coal Co. mines and sells coal domestically, and exports coal all over the world.

DAVID CRENSHAW

"The engineering curriculum gave me the discipline and experience I needed to recognize, focus on, and solve the problems that occur in every business," said Fred Cassetty as he accepted the Distinguished Alumnus Award. "This education has proven invaluable to me."

In 1971 Cassetty purchased the Capitol Building Supply Co., which he grew from a local company to a regional firm with 12 offices throughout the southeastern United States. He founded the Alley Cassetty Trucking Co. in 1972 to help meet his own trucking needs and eventually expanded its services to haul for other companies. In 1980 he purchased a truck repair service that developed into the Alley Cassetty Truck Center, which sells and services Western Star, Mitsubishi and Ottawa trucks. These companies were merged into the Alley Cassetty Co. Inc., of which Cassetty serves as chairman and chief executive officer.

Cassetty also has served the Vanderbilt School of Engineering in a variety of ways, from participating in the Engineering Alumni Council and the Featheringill Hall building campaign to establishing a scholarship fund.

James A. Johnson, BE'63, PhD'72

Jim Johnson, originally of Huntsville, Ala., earned his bachelor's and doctor of philosophy degrees in civil engineering at Vanderbilt in 1963 and 1972, respectively. He started his professional engineering career with Turner Collie & Braden in Houston, where he still lives, in 1970. His experience includes the planning and design of airports and aviation facilities, highways and bridges, and community development projects in the United States, Kuwait and Saudi Arabia. In 1989 he moved to Kellogg Brown & Root, where he has helped develop the firm's civil engineering business. He is currently director of program management for the firm's government and infrastructure unit.

DAVID LUND

At a ceremony last spring in his home city of Houston, Jim Johnson accepted the Distinguished Alumnus Award from Dean Kenneth Galloway.

Johnson served in the U.S. Army in Panama, Paraguay, Ecuador, Bolivia and Vietnam. For his service he was awarded the Bronze Star Medal with two oak leaf clusters, Air Medal, Army Commendation Medal, Presidential Unit Citation, and Vietnamese Cross of Gallantry Unit Citation.

He also has served the School of Engineering in various capacities. He is past president of the Engineering Alumni Council and has served on the Committee of Visitors and on the External Advisory Committee of the Department of Civil and Environmental Engineering. Johnson represents the School of Engineering on the Vanderbilt Alumni Association Board of Directors.

THE ACADEMY OF DISTINGUISHED ALUMNI

1969	Vaughn Mansfield, BE'33, ME'45 †	1992	Robert E. Smith Jr., BE'51
1974	John H. DeWitt Jr., E'28 †	1993	George O. Trabue Jr., BE'55
1975	H. Fort Flowers, BE'12, ME'15 †	1994	Lawrence A. Wilson, BE'57
1976	William H. Armistead, BE'37, MS'38, PhD'41 †	1995	Bailey P. Robinson III, BE'66
		1996	H. Roy Slaymaker, BE'50
1978	Bruce D. Henderson, BE'37 †	1998	H. Lee Buchanan III, BE'71, MS'72
1979	Frank K. Pittman, BE'36, MS'37 †	1999	Dennis C. Bottorff, BE'66
1980	Wilbur F. Creighton Jr., BE'29 †	2000	William W. Featheringill, BE'64
1981	Daniel B. Barge Jr., BE'43 †	2001	Monroe J. Carell Jr., BE'59
1982	George W. Hardigg, BE'43 †	2002	L. Hall Hardaway Jr., BE'57
1983	John R. Hall, BE'55	2003	Howell E. Adams Jr., BE'53
1984	Jere S. Cave Jr., BE'36 †	2004	Gerry G. Hull, BE'64
1985	Eugene E. Pentecost, BE'50	2005	David F. Dyer, BE'71
1986	Thomas L. Yount Jr., BE'52	2006	William B. Akers, BE'47
1987	H. Eugene McBrayer, BE'54	2006	Fred J. Cassetty Jr., BE'60
1988	J. Lawrence Wilson, BE'58	2006	James A. Johnson, BE'63, PhD'72
1989	Robert L. Bibb Jr., BE'43 †		
1990	John A. Warren, BE'48		† Deceased
1991	Lester H. Smith Jr., BE'54		

DAVID CRENSHAW

Thirteen members of the School of Engineering's Academy of Distinguished Alumni attended the 2006 Engineering Celebration Dinner: (left to right) Howell Adams, Bailey Robinson, Fred Cassetty, Jim Johnson, Tom Yount, Gene Pentecost, Bill Akers, Roy Slaymaker, Monroe Carell, Hall Hardaway, Bob Smith, David Dyer and Lester Smith.

One Good Turn Deserves Another

Like most Vanderbilt students, Bruce Evans, BE'81, needed some financial help to get the education required to make his way in the world. The university recognized that the School of Engineering freshman from Huntington, W.Va., showed great promise and awarded him the James W. Stewart Jr. Honor Scholarship, which enabled him to earn his degree in 1981 with a double major in mechanical engineering and economics.

"The Vanderbilt School of Engineering and the Stewart Scholarship gave me my start in life, and I'm grateful for that," says Evans. "You tend to look back at the people who were there and gave you your first chance, and think kindly of them for having given you that first chance."

After graduation Evans went to work in Louisville, Ky., as a mainframe computer salesman for IBM, an opportunity he also credits to Vanderbilt because of the engineering school's relationship with the company and its recruiters. Ironically, IBM introduced its personal computer on Evans' second day on the job, and mainframes became increasingly difficult to sell. In 1984 Evans left IBM and moved to Boston to enter Harvard Business School. There he earned his M.B.A. in 1986 and met his future wife, Bridgitt, whom he married in 1987.

In 1986 he joined the Boston office of Summit Partners, which today is a leading private equity and venture capital firm with 150 employees and offices in Boston, London and Palo Alto, Calif. Evans is now a managing partner of the firm.

Evans has always maintained active connections with Vanderbilt. He's a former member of the Engineering Alumni Council and has been a Lewis Society member since 1995. He has Lifetime Sustaining Membership in the Vanderbilt Alumni Association and has been a non-trustee member of the Vanderbilt Board of Trust's Investment Committee since 1998.

It was last year, however, that Evans' philosophy of leadership by example came through when he served as fundraising chair for the Class of 1981's 25th Reunion. With a class fundraising goal of $2 million, the Evanses ensured half the victory with a $1 million gift from their family's foundation to endow the Bruce and Bridgitt Evans, Class of 1981, Honor Scholarship in Engineering.

Bruce Evans, BE'81, and Bridgitt Evans endowed an honor scholarship in engineering through their family's foundation in 2006. As fundraising chair for his 25th Reunion last year, Bruce helped his class reach record levels in giving.

"Merit-based honor scholarships help Vanderbilt and the School of Engineering recruit the best students with the highest potential," says Evans. "And over the long term, hopefully those scholarship recipients will go on to do great things and create their own resources so they can give back to Vanderbilt in return." (A timely example of such reciprocation is Bill Akers, BE'47, who was inducted into the School of Engineering Academy of Distinguished Alumni in 2006. He was influential in securing the gift from James W. Stewart, BE'49, that established the honor scholarship Evans received when he came to Vanderbilt. That scholarship transformed the School's ability to attract students and greatly affected its financial turnaround.)

With Evans at the helm, the Class of 1981 not only met its $2 million Reunion goal but surpassed it considerably, for a total raised of $3.45 million—an all-time record for any 25th Reunion class. In fact, it's the fifth highest amount ever raised by a Reunion class of any year.

Evans says he feels good about supporting the School of Engineering because of all the opportunities for success Vanderbilt provided him. "An engineering degree provides a very useful background for many things, including business endeavors. The thought processes and problem-solving skills I developed are two of the most important things I took from my mechanical engineering days.

"But the first opportunity I was given was the Stewart Honor Scholarship—and I wanted to help provide that same opportunity for someone else."

—Phillip B. Tucker

A New Tax-Saving Opportunity—but act soon. It's only for a limited time!

Make a gift to Vanderbilt from your IRA. Under the new Pension Protection Act of 2006, you'll avoid paying taxes on amounts transferred directly ("rolled over") from your IRA to Vanderbilt University. Under the old law, all withdrawals from an IRA were included in taxable income. But act soon—this opportunity expires at the end of 2007. You must be at least age 70 1/2 to take advantage of this opportunity, and the rule applies only for tax years 2006 and 2007. You may give up to $100,000 per year from your IRA, but the rollover may not be used for dues, tickets or dinners. The new rollovers satisfy your Required Minimum Distribution. To find out more, please contact Vanderbilt's Office of Planned Giving staff at 615/343-3113, 888/758-1999 or *plannedgiving@vanderbilt.edu.*