Gifts that last for life

Building the Bucky Wagon • Funding faculty • Supporting scholarships • Forging our future
The Wisconsin Collaboratory for Enhanced Learning (WisCEL) is a cross-college effort at UW-Madison to develop engaging, technology-rich environments in which all students can be successful learners. Spaces at College Library and at Wendt Commons (above) are designed to maximize student learning by enabling instructors to make the best possible use of the time they spend with students.

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We all have a stake in college excellence

As fellow alumni, I am sure you appreciate the privilege afforded to us who studied and graduated from the College of Engineering at UW-Madison, one of the world’s premier universities. The university and college represent a great asset to Wisconsin, an important contributor to U.S. economic competitiveness and, increasingly, a positive force for the future health of our planet.

But that premier position is not guaranteed in the changing world of higher education. Maintaining and enhancing the university will require continuing contributions from all of us. Under a campuswide initiative, Dean Paul Peercy and his team will be implementing new forms of educational innovation and resource stewardship to meet budget challenges. And those of us on the outside will need to do our own share through the power of engagement.

That includes volunteering our time, hiring talented graduates, establishing internships and—for most of us—providing direct financial support for scholarships, graduate fellowships, faculty chairs and a multitude of other needs.

The increasingly essential role of philanthropy in the future of the college became evident to the Industrial Advisory Board (IAB) in reviewing our updated strategic plan for the college. Two years ago, the board responded by establishing a development committee to help build a culture of giving consistent with the forecasted future needs of the college. Under the very able and enthusiastic leadership of committee chair Mark Henning, a college team is now working with student leaders and student organizations to instill an awareness of the importance of philanthropy in students before they leave campus (see p. 11). We believe this will be an important way to grow the percentage of alumni who give to the college annually, from the current 10 percent to a more sustainable 20 percent over the next five years.

Our message to current students—through a variety of programs and activities—is that every gift matters; no matter how small. And developing and maintaining that habit of giving, across many alumni and friends, will provide that collective base of support to ensure the College of Engineering remains vibrant in the 21st century.

Of course, those of us who have been fortunate enough to be financially successful can—and should—do more. I invite you to join the IAB and all other current donors who are recognized in this publication to contribute to the College of Engineering. You will help us maintain the margin of excellence in a changing world. The college was here for us when we needed it; let’s all help ensure that it will be here as an exceptional educational resource for future generations of engineers.
Normally, the student transition from high school senior to college freshman means adjusting to a faster pace, a deeper curriculum and ramped-up expectations. Not so much for Korey Jasper, who experienced all those things as a 2010 graduate of Rufus King International Baccalaureate High School in Milwaukee.

“They have high standards; they throw everything at you,” says Jasper, now a UW-Madison sophomore preparing to major in chemical and biological engineering. “Their main goal is to have you go to college and not be overwhelmed by the transition. They try to overwhelm you while you’re there.”

Jasper is one of five recipients of $5,000 annual scholarships from alumnus Rod Hassett, who created the program in 2007 to encourage more Milwaukee students to pursue engineering at UW-Madison. Rufus King, which adopted the rigorous international baccalaureate model in 1979, is recognized as one of the top high schools in the nation and routinely sends more than 95 percent of its graduates to college.

Jasper chose UW-Madison engineering over offers from Notre Dame, Minnesota, the Illinois Institute of Technology and others, thanks to the scholarship and the college’s reputation. He also became very familiar with UW-Madison as a PEOPLE scholar and a participant in the Engineering Summer Program.

“I was always about math and science and ‘put this problem in front of me and I’ll figure it out,’” he says. “Engineering allows me in a professional setting to solve problems with the things I learn in school.”

Jasper says he was excited beyond belief to receive the scholarship, noting that he has four siblings at or near college age. “It was a relief to know I could get some financial help and release some of the strain off me and my mom.”

Hassett is equally excited about his scholarship, both as a champion of diversity in engineering and as an alumnus of Rufus King. Hassett graduated from King in 1958, and jokes about whether he would have had the chops to get accepted to UW-Madison under today’s high standards. “As an alum, I felt I could be a natural conduit for this,” says Hassett, a retired vice president at Strand Associates in Madison and an adjunct civil engineering professor at UW-Madison since 2003.

“One of the things I’m proudest about is I now have five kids in the program. It’s a body of work we have developed now.”

In addition to Jasper, Hassett scholars include Cory Jackson (freshman), Nehemia Edwards (junior), Evan Lewis (senior) and Matt King (fifth-year senior). King will become the scholarship’s first engineering graduate in May 2012, with a dual bachelor’s and master’s degree in nuclear engineering.

Hassett says he was moved to work with the high school after several years of team-teaching the civil engineering capstone course and seeing few if any targeted minorities in his class. He was further concerned about how few King students were coming to UW-Madison, especially since most of the nation’s other premier universities successfully recruit there.

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He and other department leaders initially got a cold reception from King guidance counselors, who did not feel UW-Madison was as interested in or committed to their students as other schools were. But the relationship is very strong today, with the engineering Diversity Affairs Office (DAO) now having an active presence at King. “Now I tell my current scholars, ‘You are going to be the ambassadors moving forward. When you graduate from this program, you have a responsibility to go back to high school and talk about it,’” Hassett says.

The scholarship is built as a partnership between Hassett and the College of Engineering, with Hassett paying for the first two years and the college funding the second two years (and a fifth year if necessary). The program is designed not only to enroll African-American engineers, but to ensure they graduate.

Molly Reinhard, assistant director for engineering pre-college and outreach programs in DAO, says the scholarship has helped the college build a strong relationship with King students and staff.

“One can immediately sense Rod’s commitment to student success and passion for enhancing access to higher education,” she says. “The Rod Hassett Engineering Scholarship provides much more than financial assistance. Rod serves as an advocate and mentor throughout students’ undergraduate years.”

“As an alum, I felt I could be a natural conduit for this.”
—Rod Hassett

Conduit from Rufus King to Madison: Scholarship attracts top students
Two weeks before the 2011 UW-Madison homecoming celebrations began, Bill Proft (BSME ’83), Pierce Manufacturing’s senior chief engineer and marketing manager for rescue products, led the way into a secret project hangar apart from the Appleton, Wisconsin, company’s main buildings. He paused briefly. “Hmmm . . . we should probably have you blindfolded,” he said.

Relenting, he pointed to a garage stall beside two intimidating military vehicles, where the diminutive frame of a 1932 American LaFrance fire engine fitted with a new electric drive train sat as Pierce engineers and the UW-Madison vehicle team advisor readied freshly painted Badger-red body pieces.

The new and improved Bucky Wagon was nearly ready for its big debut. “It’s taken two years, but we wanted to do it right,” says Glenn Bower, a mechanical engineering faculty associate and the engineering
student vehicle team advisor. Bower was instrumental in getting the Bucky Wagon back in action. A cracked transmission and rare replacement parts had threatened to banish the wagon to the scrap heap, so the Wisconsin Alumni Association (WAA) approached Bower in 2009 for advice on restoring the wagon to working order.

His answer? A complete overhaul … but one that also would bring the Bucky Wagon into the 21st century as an all-electric vehicle.

Safety First

Operated by the WAA, this third iteration of the Bucky Wagon has brought Badger spirit across campus and into Wisconsin communities since 1973. But those decades of school spirit had taken their toll, relegating the once-great campus tradition to an out-of-order antique hidden under a tarp somewhere on campus. “At first, we only had one option, and that was to sell it for parts,” says Mark Blakeslee, the WAA senior director of business operations. “If the College of Engineering hadn’t stepped in, the Bucky Wagon today would just be a memory.”

Even before it broke down, the UW Athletic Department deemed the wagon unsafe in 2001 because of its aging controls. The original cable brakes and unresponsive steering had made running over a UW Spirit Squad member a frightening possibility, so adding power steering and hydraulic brakes became part of the renovated design as well.

Bower determined that adding an electric powertrain and safer steering and braking systems were well within his and his students’ capabilities. “We looked at it and decided that it’s something that would fit into what we normally do,” says Bower. (Continued on next page)
Donors with Badger spirit

Bower and his team needed major design modifications to make modern components functional in the old fire engine. But without the generosity of numerous companies, obtaining all of those components would have proven impossible. “We had guidance from alumni and others on which parts would work best together,” says Bower.

He says the key was a slow but steady process of attracting companies with university ties to the project. “They understand the value of being connected to the university, since the higher education that occurs here is helpful to them,” he says.

Enthusiastic alumni like Mark Polster (BSME ‘00) got the wheels turning. President of the Wisconsin Alumni Association Motor City Badgers chapter and an environmental engineer at Ford Motor Company, Polster helped to convince his employer to pay for a Dana rear axle with a special gear reduction for the Bucky Wagon. Making a case for Ford’s involvement didn’t prove all that difficult, since the company values student experience with green technology. “We have a fairly extensive electrification strategy, so to have students working on this sort of project is very important to us,” says Polster.

Remy International provided an electric motor, A123 Systems donated a lithium-ion battery system, and Phoenix International donated a controller that converts electric energy to propel the vehicle. ZF Transmissions donated a remanufactured manual transmission for a heavy-duty truck, which provides the necessary gear reduction for the electric motor. “Most of the mechanicals are now stock parts,” says Bower. “So, repairs won’t require ordering or manufacturing anything custom-made.”

Restoring the exterior of the 80-year-old wagon, which had seen a fair amount of abuse at the hands of Spirit Squad members in its time, required some outsourcing. Since the UW-Madison automotive projects predominantly focus on powertrains, automotive body repair students at the Truax campus of Madison College helped restore the exterior by painstakingly disassembling the Bucky Wagon panel by panel. Eau Claire-based powder-coating specialist Envirotech worked its magic to make the frame of the wagon look like new.

At that point, Bower had a dismembered fire truck on his hands. The Bucky Wagon needed the steady hand of an expert to put it back together, and thankfully, the largest producer of fire engines in the country—Pierce Manufacturing—sat just two hours away in Appleton. And, its engineers couldn’t wait to put their stamp on Badger history.

It started to look like Swiss cheese

In some ways, the body of the Bucky Wagon had taken more damage over the years than anything else—the sheet-metal running boards arrived in Pierce’s hangar workspace twisted and bent, and the back half of the truck looked like it barely escaped a firing range. “People drilled a lot of holes to mount various things over the years, and nobody fixed any of them,” says Bower. “It started to look like Swiss cheese.”

Ryan Rowe (BSME ’01), another UW vehicle team alumnus, jumped to work on the restoration project alongside Bower in Pierce’s project hangar. As a senior project engineer for Pierce’s parent company, the Oshkosh Corporation, Rowe works on designs for several specialized vehicles, including the type of imposing military transport visible just beyond the Bucky Wagon frame in the garage. Yet Rowe still learned a lot from studying the wagon. “There were lots of pieces of old technology. The shift mechanism—everything was levers and linkages,” says Rowe.

Still, there was an air of reverence for the old wagon among those working on it. “It was archaic, but at the same time, it was kind of neat to see the amount of design work that went in to these components 80 years ago,” he says.

The fire engine’s “green” makeover challenged Rowe and Pierce engineers to maintain the vehicle’s old look while designing a vehicle that will last for generations of new Badgers. “We build all the unique trucks—mobile command centers, SWAT trucks, canine units, all kinds of things;” says Proft. “Our rescue products crew is very good at taking unique concepts and turning them into reality. They’re not afraid to tackle something like this.”

With Pierce’s complete production resources at their disposal, Pierce engineers had the capacity to discard body pieces that were beyond saving. “If something wasn’t in good shape, Pierce had the machinery to remake the part correctly,” says Bower.

In the end, Pierce engineers refabricated about half of the Bucky Wagon body. This also meant they could reinforce replacement parts to better suit the rigors of a typical game day. Now, the driver needn’t worry about
Spirit Squad members falling from bent running boards as the wagon rounds tight corners. Pierce’s fresh coat of Badger-red paint and new aluminum rims from Alcoa put the finishing touches on a vehicle that at this point can only be described as a Wisconsin original.

A bridge between education and industry

Corporate donations made the restoration a reality, but Pierce’s contribution went above and beyond: 30 employees put in 1,000 man-hours to rebuild the Bucky Wagon exterior. But Tom Quigley (BSME ’94), vice president of engineering in the Oshkosh Fire and Emergency Segment that includes Pierce Manufacturing, says its involvement represents the company’s commitment to an ongoing relationship with the College of Engineering. “Our initiative is to get the university involved, to get young students understanding who Pierce is,” says Quigley. “We’re relatively close to the university, but I don’t think there are a lot of students at the university who really understand what Oshkosh and Pierce are and what we do.”

It also helped that Pierce is packed with UW-Madison alumni and Badger fans. “There have been a lot of people on the Pierce side that have been very excited to work on this. I see a lot of smiles when I talk to the people that have worked on this. It allowed us to take our everyday creativity from the fire truck side and apply it to a great project for a lot of Wisconsin Badger fans,” says Quigley.

Those fans showed Bower and his students the fruits of their labor at the 2011 UW-Madison homecoming parade: Fans snapped photos and held up excited kids while murmuring about all the hard work they’d heard had gone into the brand-new Bucky Wagon. Bower smiled as he sat at the wheel, driving with all of his students as they waved to the cheering fans along State Street.

“It was invigorating. I was awestruck at how well it was received,” says Bower, humbly recalling the experience from the driver’s seat in the homecoming parade. “I didn’t realize it would have that much appeal.”

For a more detailed history of the Bucky Wagon renovation, check out the UW-Madison Bucky Wagon project blog: buckywagon.wordpress.com/.
Through bequest, Professor Obert remains a champion for undergrads

He was passionate about his students—yet known as a severe taskmaster. He had a unique teaching style, but had no qualms about flunking students who didn’t pass muster. He was a prolific author. He was unwaveringly ethical. He did not suffer fools. He thought highly of UW-Madison. And he had an excellent relationship with chipmunks—all of which he named Hildegard.

Although Mechanical Engineering Professor Edward Obert retired in 1976 and died in 1993, his dedication to engineering education—and in particular, to engineering undergraduate students—lives on through bequests from his and his late wife’s estate that total approximately $2.2 million.

A child of the Depression, Obert earned his first degree from a two-year college. Ultimately, he earned advanced degrees in mechanical engineering from Northwestern University and the University of Michigan, but not without struggling financially to do so. “It’s my view that those struggles set the stage for him making sure he would do what he could to help students,” says Fred Elder.

Now an adjunct professor of mechanical engineering and engineering physics, Elder earned his PhD under Obert in 1974 and developed a close friendship with Obert and his wife, Helen Whitman-Obert.

The couple’s gifts have facilitated not one, but two, renovations of the Mechanical Engineering Building lobby, a popular student study area and lounge. The bequest also funds such undergraduate student activities as travel to professional conferences and materials for student competitions. Recently, it contributed a $50,000 matching gift to kick off an ongoing initiative to endow the engineering student study area and lounge. The bequest also funds such undergraduate student activities as travel to professional conferences and materials for student competitions. Recently, it contributed a $50,000 matching gift to kick off an ongoing initiative to endow the engineering student study area and lounge.

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Entrepreneur rolls profits into higher ed

Dan van der Weide knows all about risks. Understanding the risk profile of the products sold by each of his start-up companies has been a key component of the electrical and computer engineering professor’s success in the private sector. But knowing the risks isn’t something that’s limited to the business world.

“One of my goals is to provide students with some of the risk of the business world, especially in fields like engineering, and to show them that it is possible to make a difference,” says van der Weide.

That’s why van der Weide and his wife, Elizabeth, started the van der Weide Family Fund, an initial gift of $50,000 that will be used to support electrical and computer engineering graduate students working in his research group. Funding for the initial gift comes in part from the sale of Optametra, a developer of instrumentation for long-haul fiber-optic communications van der Weide and his partner Robert Marsland founded in 2007. The company was acquired by Tektronix in 2011, and the van der Weide family elected to use some of the profits to give back to the university, in part in thanks for its support of start-up companies.

Van der Weide hopes funds like this can become a regular source of support for grad education with the aid of contributions from like-minded donors. “Many students, especially in fields like engineering, are taking time out of what could be a high-paying career to advance their understanding,” says van der Weide. “I want to reward students who are aiming for excellence.”
A new program is helping spark a conversation with students about how private giving is transforming the UW-Madison College of Engineering

"Connect for Life," launched in fall 2011 by Engineering External Relations, is providing a variety of ways to illustrate how alumni and friends directly contribute to student success inside and outside the classroom. Connect for Life is coordinated by Avery Wine, a junior in industrial and systems engineering and vice president of external relations for the Society of Women Engineers.

The ultimate goal of Connect for Life is to raise awareness of how graduates can become lifelong contributors to the success of the college, through volunteering, mentoring and philanthropy. It also intends to show how all gifts, big or small, have a measurable impact on the college. "It is important for students to know how much giving truly impacts their college experience," Wine says. "Engineering revenue and gifts from alumni and friends are helping support more resources that students rely on every day."

Examples include a supplemental instruction program that provides free drop-in tutoring for engineering majors, Wine says. Paid for by private gifts, the program is used by more than 1,200 students per year and is making an impact on engineering graduation rates.

Virtually all of the 58 engineering student organizations rely on some kind of private support for their programs, says Wine. Donors provide assistance for everything from textbooks to international travel.

Connect for Life grew out of multiple years of discussions with the College of Engineering Industrial Advisory Board (IAB), a group of 16 influential alumni who advise the college on strategic directions. The board recognized that in order to maintain quality, the college must increase the overall percentage of alumni who give annually—from the current 10 percent to at least 20 percent. After a number of fruitful planning sessions with the IAB development committee, Connect for Life was born.

This fall, Connect for Life sponsored an essay contest encouraging students to tell personal stories about how gifts helped them. The program received a remarkable 63 entries. Winners were announced at a November 16 student-alumni reception that drew more than 120 people to Union South.

Also announced on November 16 was one of the centerpieces of Connect for Life—a new gift-matching opportunity created by the IAB. Through generous contributions from IAB members, Connect for Life will match, two-to-one, any gift given by an engineering alumnus who graduated in the past three years. The IAB made a three-year commitment to the match, which is designed to be an exciting way for young alumni to join the family of donors.

An engineering degree from UW-Madison greatly enhances a graduate’s job prospects, increases lifetime earning potential and provides ways to create a better world. Nine of the nation’s top-10 highest starting salaries for college graduates are in engineering, and the vast majority of graduates today will have starting salaries above $55,000 per year.

“When students graduate,” Wine says, “they will realize the impact of giving on their learning experience and hopefully return the gift to future students.”

Give to Connect for Life:
www.engr.wisc.edu/support/connect-for-life.html
We support the College of Engineering for two reasons. The first is philanthropic leverage. Unlike donating to a particular cause to solve a specific problem, donations to the college’s innovative faculty and clever students have the potential to positively impact a variety of problems, many of which we are not even aware of. In order for great ideas and technologies to positively affect lives, they have to be commercially developed and distributed. For this reason, we also support the UW School of Business.

The second reason is personal indebtedness. The Wisconsin taxpayer, through the College of Engineering, provided me an education that served as a strong foundation from which to build a career. The engineering curriculum teaches logic and creative problem-solving skills, and we want to do our part to make sure that future generations receive the same benefits. We support the Engineering Fund for Excellence and the Mechanical and Industrial Engineering Building Fund because the college identified student access and facilities as areas in particular need of funding. Our view is that the college and the UW are managed by highly competent and committed professionals. They know (much better than we know) where resources are needed. When the college embarks on a specific fund-raising effort, we assume it is because there is a high-priority need that requires funding. While we enjoy reading about new facilities, interesting students, and all the innovations they foster, we believe the decision to allocate scarce resources is best made by the university’s administrators.

Our universities are one of our country’s most valuable assets, and the University of Wisconsin-Madison is one of our country’s premier universities. The social and economic benefits that it provides are immense. In order to provide these benefits, the university needs funding to attract and retain top faculty, to attract motivated students, and to have state-of-the-art facilities both for research and teaching. Especially today, when traditional revenue sources are contracting, it is important that alumni across the university make an effort to ensure that the university remains a world-class academic institution.

Why we give

Todd Pulvino, BSM ’84, Principal, CNH Partners

Kathleen Pulvino, BBA Business ’84 CFO/emergency medical technician, MP Hospitality
Many College of Engineering students complete internships during their tenure at the college, hoping to gain work experience that will make them better equipped to find jobs in their fields.

But, sometimes the benefits are more direct. Take Anshuman Sharma, a materials science graduate student who worked under Materials Science and Engineering and Engineering Physics Associate Professor Dane Morgan. Sharma leaped almost directly from intern to employee.

Morgan was working on a team with other faculty to help Wisconsin-based A.O. Smith Corporation, a major manufacturer of water heaters for homes, to create more advanced anodes for its water heater equipment. Sharma's master's research under Morgan included a modeling project on aluminum anodes and was precisely what A.O. Smith needed help with. So, starting in summer 2009, Sharma interned for six months at A.O. Smith and within a year and a half, he was a full-time employee at the company.

For his internship, Sharma (pictured at left with A.O. Smith prototype specialist Matthew Critchley) worked with company principal engineer Ray Knoeppel and vice president Bob Heideman, spending four months on spot welding and another two months experimenting with the same aluminum anode project he was modeling at the university. "I was most interested in figuring out the relation between modeling and real experimental results," Sharma says. "I would go through some modeling at UW-Madison and then try to correlate the results of that with what we were seeing in the experiments at the A.O. Smith lab. This was the part that attracted my interest the most."

The company not only provided Sharma the internship, it also helped him receive funding for his master's research. Thanks to a grant from A.O. Smith and a matching grant from the university Innovation & Economic Development Research (IEDR) program, which supports research collaborations between UW-Madison researchers and Wisconsin businesses, Morgan's lab could offer Sharma full support for his master's degree. "Because the two programs existed, we could tie together a focused project with two years of funding," Morgan says. "It was really a great fit for Anshuman."

During Sharma's internship, he became interested in working for the company in the long run. But there was one catch: He wanted to work in India, where he grew up and had family. "I was fully focused on A.O. Smith and was determined to get employment with them," Sharma says. "Had I not got the job with them, I would have come back to India and searched for a job here."

His determination paid off, and he initially was offered a part-time position. He'd drive to Milwaukee, where he worked 20 hours a week while completing his thesis in Madison. But within six months, he was a full-time employee at the company's new India plant.

Now Sharma is a materials design engineer in the company's Bangalore office. He helps choose materials for new products, and works with quality control and manufacturing to ensure staff are using the correct steel, plastics and other materials in their existing products. He's also a liaison between the company's design facilities in the United States and India.

Sharma says that though the work he's now doing is different from his previous work, it's exciting. A new plant is fertile ground for someone with engineering expertise. "There are millions of things to work on and improve," he says. "This is the time to establish things and mold the plant's workings in the best possible way—and that makes the work exciting."
That was 2005, and Noguera, an award-winning researcher focusing on drinking-water quality and biological approaches to wastewater treatment, was tempted to say ‘yes’ to the Arizona State University professorship. “It was a beautiful offer and a great research environment,” he says. “The topics I could investigate were cutting-edge.”

But Noguera wasn’t ready to leave Madison. He had just started two new research efforts, for one thing. And, he wanted to stay. He was attached to his university department and to the city of Madison. “Madison is a great place to raise a family, thinking about the quality of the school systems,” he says. “That made it very difficult to pack and go.”

And then-Chair Jeffrey Russell, now dean of the UW-Madison Division of Continuing Studies, didn’t want to see Noguera leave, either. “He’s an outstanding scholar and teacher,” Russell says. “He’s just exceptional. His idea of pushing water and wastewater treatment to a much higher, more scientific kind of pursuit is really what he’s about.
He’s really pushing the boundaries of scientific tools and how those are applied to wastewater treatment.”

Noguera also is a vital member of the university community, playing roles in the shared governance of the college, and providing thoughtful insights during hiring processes. “He’s exceptional. He’s very smart,” says Russell. “He’ll listen to arguments; he’s always contributing to whatever we’re doing. I think our colleagues really appreciate that about him.”

Private giving provides much-desired flexibility

Russell knew additional funds would be one critical piece of giving Noguera something equivalent to his Arizona offer. In addition to offering Noguera new opportunities, Russell also sent out an SOS to civil and environmental engineering donors for help in securing discretionary funding for Noguera’s research. More than just a salary boost, discretionary funding is money a professor can spend on essentially any research-related activity.

Russell says it’s not uncommon for widely published professors to look elsewhere in search of pay commensurate with that of their peer group. “Leading scholars and researchers will get opportunities elsewhere,” he says. “One of the things to keep them here is if we can provide discretionary funding to assist them.”

In that endeavor, outside assistance is necessary because the university’s baseline budget from the state doesn’t have room for extras that often are key to retaining quality faculty. “Relative to our peers in the Big Ten, we’re easily underpaying by 10 to 13 percent,” Russell says. “And the private schools can usually outmatch us in terms of salary and discretionary funding.”

Discretionary funding can make a difference for faculty, Noguera says, because unlike grants, it’s not tied to specific projects. In other words, faculty can use it for other investments, such as replacing equipment—
now we know they are there. “Even organisms that were unknown five years ago—there are very specific types of organisms that grow in the pipes, previously identified in water-treatment systems. “We have seen that process, he says, his research team found many new organisms not growing in water-treatment systems and distribution pipes. In the way for more harmful bacteria to grow. Ultimately, says Noguera, a group of nitrifying bacteria that can degrade the disinfectant, paving the way for more harmful bacteria to grow. Ultimately, says Noguera, his research allows scientists to better identify which bacteria are involved in photosynthesis and all the other metabolic processes, then identifies the possible pathways of hydrogen production, and how much hydrogen could be harvested during specific scenarios. “Industries create hydrogen from fossil fuels, so if you can have a renewable source and sunlight, you can produce this hydrogen directly at the site where it’s going to be used,” says Noguera.

That research is now coming to an end, but its result is several publications and a solid framework for other researchers to build upon. And in the meantime, Noguera and Donohue have begun looking at other processes involving photosynthesis that could be used to produce fatty acids and other precursor ingredients for making organic biofuels from renewable resources.

Noguera’s work in water treatment, in partnership with Civil and Environmental Engineering Professor Greg Harrington, was also a meaningful collaboration at the time of Noguera’s offer. In 1997, the pair began investigating what types of bacteria survive the disinfectant chlorine, which is added to water during treatment. Large cities, such as Milwaukee, the Twin Cities and some in the San Francisco Bay Area use chloramine, a combined form of chlorine and ammonia. But this molecule breaks down into chloride and ammonia, a food source for a group of nitrifying bacteria that can degrade the disinfectant, paving the way for more harmful bacteria to grow. Ultimately, says Noguera, his research allows scientists to better identify which bacteria are growing in water-treatment systems and distribution pipes. In the process, he says, his research team found many new organisms not previously identified in water-treatment systems. “We have seen that there are very specific types of organisms that grow in the pipes,” Noguera says. “Even organisms that were unknown five years ago—now we know they are there.”

Still ahead, he says, is researching how to eliminate these organisms from the water and prevent them from growing in the pipes. He and Harrington have developed a microarray, a tool for detecting specific genes that allow them to identify the nitrifying bacteria. They use custom-designed DNA that attaches only to certain types of bacteria and then can test water for that piece of DNA. Their next goal is to detect any microorganism that could be present in water.

“Technology has grown so fast that you can put millions of pieces of DNA in a microarray,” Noguera says. A third Noguera research project helps the Madison Metropolitan Sewerage District. It’s a continuation of a partnership the Department of Civil and Environmental Engineering has maintained for decades. When the wastewater-treatment plant undergoes significant upgrades or has a major problem, Noguera steps in to consult. In the past two years, he has tested phosphorus removal as a means of reducing solid precipitates that clog the plant reactors’ pipes, motors and turbines. If the plant recovers phosphorus and ammonia from other parts of the treatment process, it not only minimizes the clogging problem, but also helps the district produce a marketable fertilizer.

In 2010, in recognition of the contributions he has made to the state economy in the water and wastewater industries, Noguera was named a Wisconsin Distinguished Professor, a UW System-wide honor for professors whose work interplays heavily with and contributes to the growth of Wisconsin industry.

Noguera says his drinking water research is one of the most exciting parts of his job. But even more, he enjoys his role as teacher and mentor. “What I’m most proud about is working with my students, seeing them develop while they are here, and then go on to be really good professionals,” he says.

At a recent conference of graduate alumni, he was pleased to see that several of his more-than 30 former master’s and PhD students have professorships in the United States and in other countries such as Korea, Turkey and Chile. And many others now are in leadership positions in the water and wastewater treatment industry.

**Building on solid research ground**

At the time of his offer, Noguera had just received a significant grant from the U.S. Department of Energy to work on methods for recovering hydrogen from photosynthetic organisms, working with Bacteriology Professor Tim Donohue. The pair were investigating ways to manipulate genes to encourage the organisms to produce more hydrogen as a byproduct of photosynthesis. The recovered hydrogen gas could be used for fuel cells or other industrial hydrogen uses.

While Donohue does the actual gene manipulation, Noguera’s expertise is on the modeling side; he maps out the thousands of reactions involved in photosynthesis and all the other metabolic processes, then identifies the possible pathways of hydrogen production, and how much hydrogen could be harvested during specific scenarios. “Industries create hydrogen from fossil fuels, so if you can have a renewable source and sunlight, you can produce this hydrogen directly at the site where it’s going to be used,” says Noguera.

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**Seeking and securing the margin of excellence**

A large number of civil and environmental engineering alumni work for local firms, including Mortenson Construction, which donated considerably to the CEE departmental retention fund. Tom Gunkel, chief executive officer and president of the company, says he was happy to help out when he got the phone call from Russell. “He called and said, ‘I need your help in retaining Dan and I need your help advocating others to do the same,’” Gunkel says. “It was an easy decision. Jeff made it clear how important it was to the civil engineering program and for the program’s long-term success.”
Gunkel was one of a half-dozen industry and alumni donors who contributed thousands to the Department of Civil and Environmental Engineering faculty retention fund, which provided Noguera with the five years of discretionary funding that has enabled him to continue his work in Madison—rather than in Arizona.

Gunkel's company hires dozens of civil engineering graduates every year. Gunkel says UW-Madison is a major contributor of those employees. Sixty of the company's current engineers graduated from the Department of Civil and Environmental Engineering. "We've gotten so many great graduates out of it," he says. "Madison is always at the top of our list for key talent. When we're hiring people, we're thrilled with the way they've been prepared and the impact they have on our business."

Gunkel also believes faculty continuity is vital to keeping engineering graduates excellent. "It's the combination of faculty together producing this environment and creating high-impact engineers," he says. "From the business point of view, it's very important that key faculty are retained. They're impacting these young men and women in a way that impacts us."

Gunkel also is a UW-Madison alum, having graduated with a degree in construction administration. And as an alumnus, he values that faculty continuity in even other ways. "Students talk to each other," he says. "When you have a key faculty member who's a part of that culture, that often attracts new students and helps to retain students."

He says alumni need to step up and help. "We were lucky coming up through our own programs to have excellent faculty," he says. "I didn't want to see that lost."

And, Russell says, retaining faculty not only maintains the department culture, it saves the department both the turmoil and monetary cost of replacing them—which isn't always possible, anyway. "Faculty are not being recruited away from us because they have potential—they're being recruited because they're major players in their field," he says. "So not only is it very expensive to hire new faculty and get them going—there's only one Dan. Our ability to retain Dan has been a very good department decision that we're excited about. His impact on the department, college and profession continues to grow. I hope we have many, many more years of his contributions."
For some professors working to teach industrial and systems engineering students the fundamental skills they’ll need for successful careers, something as simple as classroom furniture can have a huge impact on the success of their class.

Thanks to one donation by Jane Mandula, who earned her bachelor’s degree in industrial engineering in 1987, new classrooms in the Mechanical Engineering Building are providing instructors a flexibility they never had before: Students now can collaborate in small groups.

Industrial and Systems Engineering Professor Emeritus Harry Steudel teaches Engineering Management of Continuous Process Improvement, ISyE 515, a capstone senior design class that focuses on process improvement. Acting in the capacity of full-fledged industrial engineers, students work to implement process improvements with outside organizations such as healthcare, manufacturing and service organizations, pitching projects of their own design with the help of tools they learn from Steudel. “They get to pick what area and they also have to set up their own projects,” he says. “They have to be able to go out and convince somebody they have skills and values that are worth taking the time to work with them.”

And, Steudel says, group work is a unique and important feature of the course, integral to the learning process. The students work in groups of four on their final projects. Also, as part of their classroom instruction time, they must work through different process improvement tools in small workshops of seven or eight.

In the real world, he says, process improvement is typically done in teams. “Not only do I teach the students problem-solving methods, I also teach them about teams and how to work in teams and what makes an effective team,” says Steudel.

He says such skills are essential to young industrial and systems engineers hoping to succeed in their careers. “Feedback from alumni and people who hire our students is that our people are very technically well trained,” he says.

But, he says, the same feedback suggests students must work more on teamwork and communication. “Good communication skills, knowing how to work in teams, and project management skills are the three most common things that employers say are important,” he says.

Before the Mechanical Engineering Building’s 2007 renovation, Steudel had to adapt, awkwardly, to rooms with nailed-down chairs and limited board space. Many of his student groups had to work, instead, in the tables in the lobby of the building. And to ensure the space would be available, the class met only at 8 a.m. “It was rough,” Steudel says.

Furthermore, the class took up a valuable study space that other students might have needed to use. “Other students were trying to study in the lobby,” he says. “If they came in before the class was done at 9:30, we were bothering them. Having class in the lobby was kind of the best of the bad options we had.”

Now, thanks to the creation of several flexible teaching labs in the renovation, Steudel easily can lead his students into team collaboration in the new teaching dynamics lab, which—including advanced projection capabilities, sports round tables that fit six students each, plus moveable white boards that students can use to draw diagrams and brainstorm solutions to problems.

Jane Mandula says she hopes the gift—$500,000 for the team dynamics lab and another teaching laboratory—will raise the department’s national reputation with industry and encourage more nontraditional, nonmanufacturing companies to tap into the college’s talent pool.

“I wanted to support and enhance UW’s reputation for having a great engineering program,” says Mandula. “I learned a tremendous amount from my IE professors, many of whom are still there, and I’d like the IE students of today to have better lab facilities than I had.”

Thanks to the added space, Steudel’s process improvement class can be taught at any time of day now. And that’s good thing, given that the class is so popular it was full by 11 a.m. of the first day of fall 2011 course registration, and Steudel has added a second section for the first time in the course’s 15-plus years.

“This is the only classroom in this building that has the round tables,” Steudel says. “It’s a great addition to our building and our abilities to help educate students.”
in some cases, hourly wages. “They’re not just helping the graduate students,” he says. “They are asking their own questions and pursuing the answers—designing and conducting experiments, and the complete process of scientific and engineering research.”

The experience, he says, helps the students focus their careers as students and later, as engineers. “Many, if not most of them, have started out not thinking about graduate school or additional studies,” Booske says. “And they end up saying ‘Oh, I like this and I’m good at it and I want to continue it.’”

While the two endeavors, WisCEL and undergraduate lab experiences, benefit different numbers of students at varying levels, Booske says each is critically important to creating students who are lifelong learners and contributing citizens.

The beauty of the professorship, Booske says, is that it’s difficult for professors to find funding from the general university budget to enhance their teaching. “That’s a shrinking pot, not a growing pot,” he says. “So to have that extra edge in doing new things, in getting 21st-century instruction, we are becoming more dependent on privately donated resources. I think private gifts like the Bluemkes’ are crucial to how UW-Madison maintains its excellence. Prioritizing the educational emphasis empowers me to invest it in that area.”
Cal Buelo

Collaborating on complex medical imaging technology and coaching children’s soccer don’t align for many people, but Cal Buelo discovered that working with kids on the field revealed skills that come in handy as a biomedical engineering student. “I like the teaching part of it, especially showing them something that I enjoy, and then seeing them enjoy it too,” he says.

Based on how often the sophomore finds himself helping classmates understand calculus problems, that realization applies as much to math and science as it does to teaching proper form for a free kick.

Finding joy in communicating ideas is a critical part of productive teamwork, something Buelo seems keenly aware of, especially after spending his summer helping measure regime shifts in northern Wisconsin lakes for the UW-Madison Center for Limnology and the Cascade Research Group. Limnology doesn’t exactly line up with biomedical engineering, but seeing the scientific process in action impressed on Buelo the importance of understanding one’s role in a larger project. “Talking to the principal investigators, you saw their big ideas and how they broke down into what we were actually working on every day in the field as we took daily measurements,” says Buelo. “It’s something you’re not exposed to unless you take part in their work. Seeing the process up close was really neat.”

The nuanced view of teamwork Buelo has developed in his off-campus experiences has prepped him for the cooperative design work in courses like Introduction to Engineering (InterEGR 160), in which the challenge isn’t mathematical or scientific, but instead lies in understanding and interpreting information effectively.

“It’s about process. I like the design of Intro to Engineering for that,” says Buelo. “They put you in a team to work on the engineering process. You start with a client giving you a problem, and then you have to define the problem yourself, then do the background research and design.”

Of course, all that group work takes up a fair amount of time outside of class, but Buelo seems to enjoy the prospect of group projects. Thankfully, outside donors help give him the extra time he needs. “Having a scholarship—along with financial aid and help from my family—makes it so that I don’t have to work during the semester. I work full time during the summer, but I don’t have to take a part-time job during the school year, which helps me focus more on my classes,” says Buelo.

Mostly, he spends that extra time on design classes, including his most recent project, designing part of a micro-T, micro-PET and micro-RT scanning machine for the Morgridge Institute for Research. But, says Buelo, the funding does allow him to take a break: “It gives me more time for other activities, including fishing occasionally,” he says.
**Drew Birrenkott**

Engineering students keep plenty busy just sticking close to Engineering Hall, but that didn’t deter junior Drew Birrenkott from delving into the underpinnings of law and government to pursue a major in political science with his biomedical engineering coursework. “Originally it was just something I was interested in doing, since I had an interest in both science and politics,” Birrenkott explains. “But as I’ve gone through my coursework, I’ve found that the two are more intertwined than most people would think.”

Birrenkott has seen the intersection of engineering and politics firsthand in his three years as a member of the UW-Madison student chapter of Engineers Without Borders. Working on one of its long term engineering projects in rural Orongo, Kenya, Birrenkott had a chance to be a part of solving engineering problems while working within the local economic and political constraints. “It gives undergraduates the opportunity to actually go to these places,” says Birrenkott. “We’re working on an irrigation project right now, and we’re trying to make sure that all of the pumps we use are available through local distributors in Kenya.”

He’s taken part in great engineering learning opportunities on other continents as well. He traveled to India this summer to help research the correlation between travelers’ diarrhea and decreased risk for colon cancer. Once-in-a-lifetime research opportunities like that wouldn’t be possible without the help of scholarships such as the Great People funding. “I got a stipend for the program, but it didn’t cover all of my costs,” says Birrenkott. “The scholarship allowed me to study at the Indian Institute of Science for two months.”

Since he hopes to attend medical school in a few short years, Birrenkott supplements his international medical research with local experiences in the lab of Professor Eugene Kaji in the UW-Madison Cardiovascular Research Center. Birrenkott helps research the role of the THG1 protein in the different causes of hypertrophy of the heart.

In his breathless listing of his humanitarian work and ambitious research experiences, it’s evident that Birrenkott has an exciting future ahead of him. But will he go on to make the next great medical breakthrough, or change the lives of entire communities in a foreign land? That remains to be seen. “It’s something I’m definitely thinking about right now,” he says.

**Jordan Swanson**

Biofuels or breakfast cereals. He casts a wide net when he talks about his career possibilities, but that’s only because chemical and biological engineering sophomore Jordan Swanson finds that he’s game for just about anything in which engineering fundamentals intersect with a design challenge. “I really like math, I really like chemistry, and I really like solving actual problems, so chemical engineering seemed like a good mix of the three,” Swanson says. “I haven’t had a whole lot of experience in industry, so I’m hoping to get an internship to see what that’s like, and just go from there.”

As is the case for many engineering undergrads, Swanson has had plenty of opportunities to collaborate on design projects through his engineering coursework, even if at first blush they don’t seem to relate to his interests. This fall, he participated in biomedical engineering faculty associate Amit Nimunkar’s Introduction to Engineering (IntroEGR 160) class project that tasked students with designing a set of parallel bars for the Hackett Hemwall Foundation. Now, the bars are used to rehabilitate patients in Honduras. “We had to make all of the designs and make all of the purchases necessary, all within our budget and time constraints,” says Swanson.

He says Intro to Engineering showed him that the most important thing for young engineers to learn is how to collaborate on good design, regardless of the track of engineering that it might occupy. “Engineering 160 is all about getting that design experience and working as a team,” he says. “That’s what engineering in general is all about.”

Swanson found other places on campus to apply his love of chemistry and math—he worked on the Clean Snowmobile Team to help optimize vehicle fuel consumption, and he did work on a biosand water filter for the Kenya project of Engineers Without Borders. But he got his first taste of chemical engineering in a lab setting thanks to Chemical and Biological Engineering Associate Professor Thatcher Root.

Root and his lab’s work on converting biomass into biofuel relied on high-performance liquid chromatography (HPLC), which became inefficient as demand for the process increased. As part of Chemistry 116, Swanson got to help out in the lab by devising a way to make the process more efficient. “I needed to find a way to get it done faster while still getting the resolution we needed,” says Swanson. “That was done by changing the solution we were using to an acetoneitrile solution, which brought it down from an hour to around 30 minutes.”

Since Swanson is paying his own way through school, scholarships allow him to minimize the amount of loan debt he will accrue while providing encouragement that his time in the classroom is well spent. “It’s a pat on the back that shows me that someone thinks I’m doing good work here,” Swanson says.
The Bucky Wagon's big debut!

Scenes from Homecoming weekend, October 14-15. Read more about the incredible transformation of this campus icon starting on page 6.