

FALL 2012

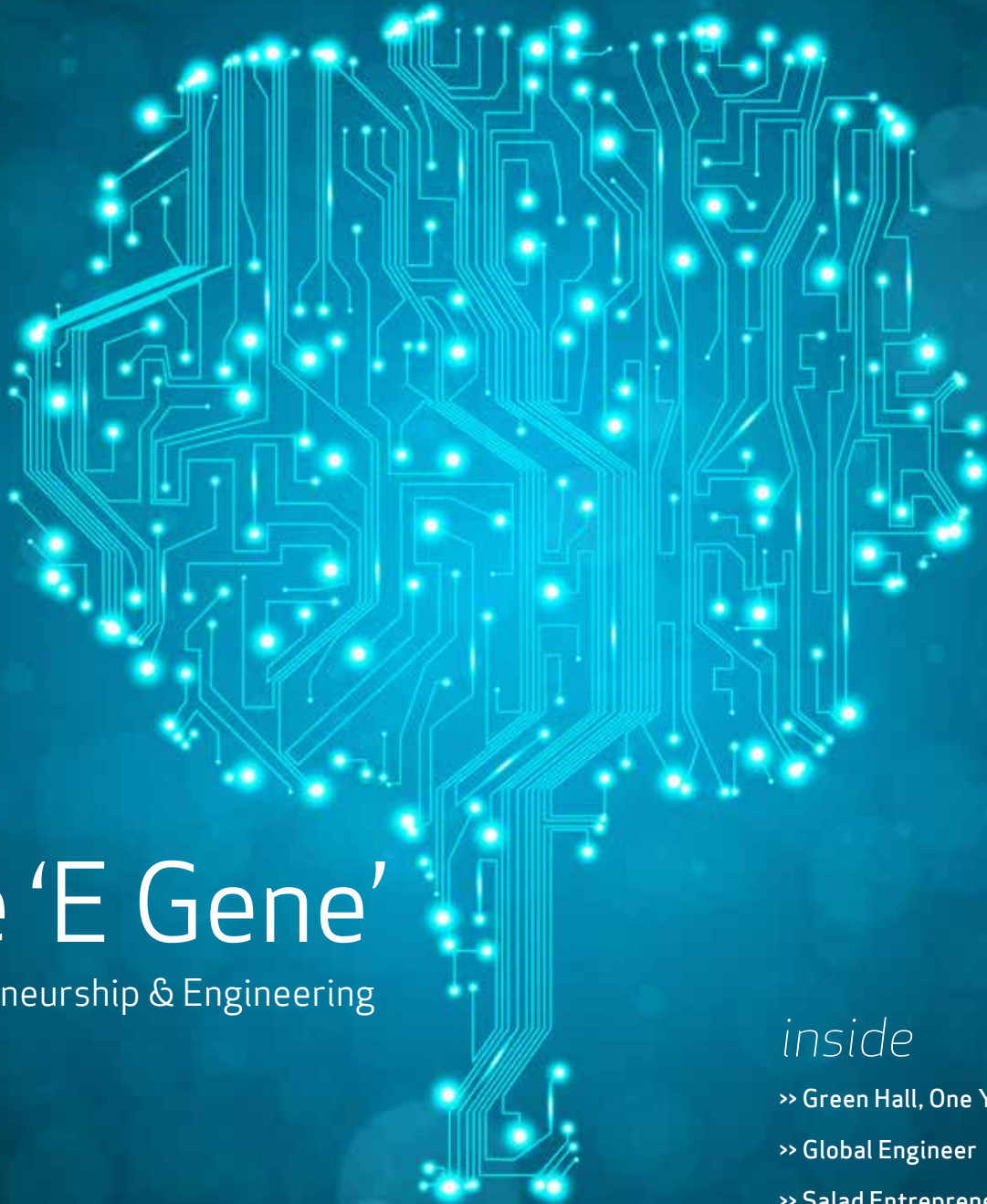
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Engineering Momentum

ACROSS DISCIPLINES. ACROSS THE WORLD.™

 Washington University in St. Louis

Engineering



The 'E Gene'

Entrepreneurship & Engineering

inside

- >> Green Hall, One Year Later
- >> Global Engineer
- >> Salad Entrepreneur



ORIENTATION 2012
PHOTOS BY CHAD WILLIAMS



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FALL 2012

 Washington University in St. Louis

Engineering

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 Printed on recycled paper
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The problems facing our planet today have never been more challenging, and solutions for such massive global needs will depend upon and require major contributions from engineers. We recognize the paradigm shifts taking place in all disciplines due to the great technological advances that are moving at the fastest rate in human history, and engineering is no different. Fueled by boundary disappearances, researchers and educators realize that the greatest advancements are occurring at the interfaces between engineering and other disciplines. However, true interdisciplinary activity is more than just bringing different backgrounds together to collaborate on projects or exchange information. There is a **convergence** of disciplines, with methods from one discipline becoming part of and enabling others. Given this revolution, how are we making the most of the evolving convergence of disciplines in our education and research programs?

First and foremost, we are continuing to improve our research infrastructure and facilities, while attracting and increasing the most outstanding students and faculty.

- » Recent additions to our faculty, who chose us over other engineering schools because they see our strengths and their opportunities, have captured some of the most prestigious national awards.
- » We enrolled the largest, most diverse and academically talented undergraduate student population in the history of the school and now have one of the best and most selective undergraduate programs in the country.
- » We continue to improve and grow our graduate student cohort, an essential component for the research enterprise, with a goal of increasing their support through endowed fellowships and training grants.
- » State-of-the-art buildings, housing 350,000 square feet of high-quality teaching and research space, constitute more than a \$150 million investment that has transformed our ability to conduct cutting-edge research and innovative teaching.

Yet, even with this strong foundation, and given our school's size and resources, we must be strategic and focus our intellectual efforts, build on strengths and leverage the existing partnerships throughout Washington University and around the world.

During the past year, we asked ourselves:

- » **What are the major national and global challenges?**
- » **How can our school contribute toward developing the most effective and efficient solutions?**
- » **How should we prepare the next generation of engineers and leaders?**

After conducting assessments and establishing benchmarks, discussing opportunities and needs with internal and external partners, and creating ideas for research, curricular and programmatic initiatives, we answered the three questions and developed a new strategic vision.

As an engineering school, we aspire to discover the unknown, educate students and serve society. Our strategy focuses intellectual efforts through a new convergence paradigm and builds on strengths, particularly as applied to medicine and health, energy and environment, and security. Through innovative partnerships with academic and industry partners — across disciplines and across the world — we will contribute to solving the greatest global challenges of the 21st century.

I encourage you to visit engineering.wustl.edu/vision to read the details of the plan, and I hope you will write me with your feedback and ideas as our plan continues to evolve.

Join us as we turn our vision into reality!

Ralph Quatrano, PhD
Spencer T. Olin Professor & Dean
 rsq@wustl.edu

STRATEGIC PLAN HIGHLIGHTS



DISCOVER THE UNKNOWN

Solving global challenges in medicine and health, energy and environment, and security through:

- » Advanced Materials & Nanotechnology
- » Biological & Medical Engineering
- » Environmental Engineering & Sustainable Technologies
- » Imaging & Signal Processing
- » Networking & Communications

EDUCATE STUDENTS

Preparing the leaders of tomorrow through:

- » Novel interdisciplinary doctoral programs
- » New courses and delivery methods
- » Additional opportunities for undergraduate research, hands-on design projects, internships, international experiences and entrepreneurial endeavors
- » Innovative professional degree and nondegree programs

SERVE SOCIETY

- » Educating engineers for St. Louis through the University of Missouri-St. Louis/ Washington University Joint Undergraduate Engineering Program
- » Encouraging Science, Technology, Engineering and Mathematics (STEM) interest through outreach to the community
- » Supporting the business community
- » Inspiring entrepreneurship
- » Promoting civic engagement

Investing \$300 million over the next eight years to:

- » Expand the tenured/tenure-track faculty by 25 percent to approximately 100
- » Double research expenditures to approximately \$50 million annually
- » Increase the number of doctoral students by 50 percent to approximately 500
- » Increase the number of master's students, especially professional students, by 45 percent to approximately 500
- » Increase the number of undergraduate students by approximately 20 percent to 1,500
- » Implement undergraduate and graduate curricular and programmatic initiatives
- » Complete the engineering complex with an additional 350,000 square feet and improve supporting infrastructure, such as information technology



» engineering.wustl.edu/vision



LEADING *Together*

The Campaign for Washington University

Our vision for the School of Engineering & Applied Science is bold and unique, but we believe it is the right plan that will allow us to seize on the opportunity of converging disciplines and to build on the strengths within the school, across the university and with external partners. Together, we can turn our goals for improving quality of life and becoming one of the best engineering schools in the world into reality. On Oct. 6, Washington University in St. Louis announced a major, multi-year fundraising initiative to secure a minimum investment of \$2.2 billion, including at least \$110 million for the engineering school, with the following priorities:

Preparing the Leaders of Tomorrow

Together, with our great alumni, faculty, parents, staff and friends, we are committed to cultivating an educational environment that enables our students to grow academically and socially, while preparing them to serve as leaders in their chosen professions and in their communities.

Advancing Human Health

Together, we work to understand the origins of disease to better diagnose, treat and cure. Through our interdisciplinary approach to teaching, research and practice, we are discovering and applying solutions to conditions ranging from heart disease to cancer.

Inspiring Innovation & Entrepreneurship

Through our educational and programmatic initiatives, including mentoring, internships and recognition efforts, we will stimulate the entrepreneurial endeavors of our faculty, students and alumni.

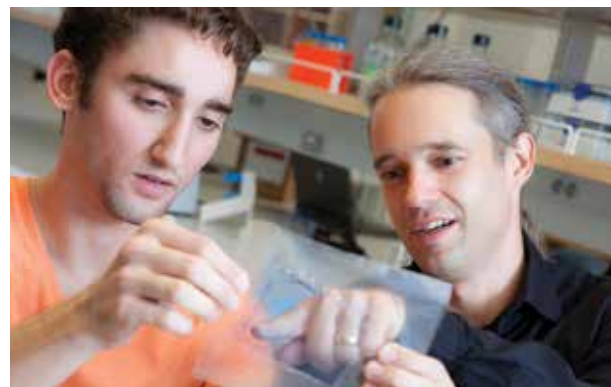
Enhancing the Quality of Life

The people of Washington University are committed to serving society, from striving to improve K-12 education, to reducing poverty and encouraging sustainable development.

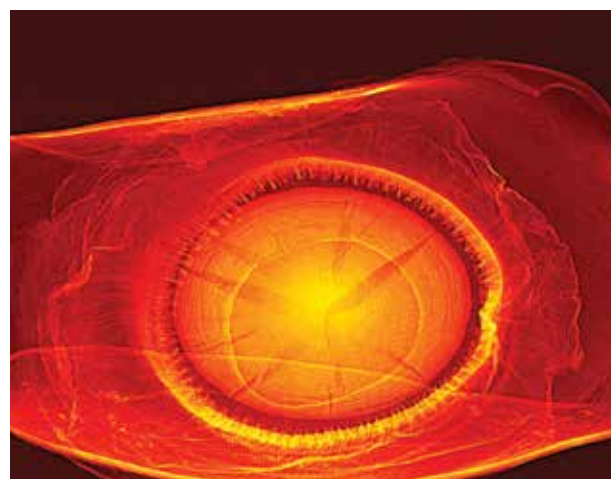
Learn more about The Campaign for Washington University:
together.wustl.edu



1,976 current engineering students



82 tenured and tenure-track faculty



\$25 million in annual research expenditures

everyday tips from our faculty



The most important habit is to keep software up to date. If you enable the "auto update" feature on all your devices and software, you will stay ahead of most would-be hackers. I also recommend passwords with nine or more characters.

Patrick Crowley, PhD, Associate Professor, Computer Science & Engineering



Do what your mother told you (or should have told you). Turn your computer off when you are not using it and have it automatically go to sleep during shorter periods of idleness. Plug all of your equipment into a power strip that you turn off as often as practical to prevent "dark" or "phantom" current that is consumed by devices when in standby mode.

Bob Morley, PhD, Associate Professor, Electrical & Systems Engineering



Once your laptop, cell phone, camera, etc., is charged, pull the plug. Your battery will thank you for it. Here's why: You can increase a laptop battery voltage up to 4.2V before negative reactions begin. If you keep your laptop plugged in too long, you force your battery to remain at 4.2V continuously, and these side reactions slowly kill the battery. If you unplug the device after charging it, the voltage drops and the battery life goes up.

Venkat Subramanian, PhD, Associate Professor, Energy, Environmental & Chemical Engineering

engineering.wustl.edu has a new look:



engineering.wustl.edu also features four new pages highlighting videos, news and industry updates on the school's strategic initiatives:

- Energy & Environment**
- Medicine & Health**
- Entrepreneurship**
- Security**

BIOMEDICAL ENGINEERING:

>> bme.wustl.edu

COMPUTER SCIENCE & ENGINEERING:

>> cse.wustl.edu

ELECTRICAL & SYSTEMS ENGINEERING:

>> ese.wustl.edu

ENERGY, ENVIRONMENTAL &

CHEMICAL ENGINEERING:

>> eece.wustl.edu

MECHANICAL ENGINEERING &

MATERIALS SCIENCE:

>> mems.wustl.edu

HENRY EDWIN SEVER INSTITUTE:

>> sever.wustl.edu

Green Hall

ONE YEAR LATER



A little more than a year after its dedication, Washington University's Preston M. Green Hall has not only become a new gateway to the campus but has become a hub for innovative, interdisciplinary research and education.



WUSTL PHOTO

Written by **BETH MILLER**

Walk through Washington University's Preston M. Green Hall on a typical Wednesday morning and you'll find students in a classroom learning Engineering Mechanics I, graduate students and faculty working in labs, and others brainstorming groundbreaking solutions to the world's most pressing needs in the inviting second-floor collaboration space.

While those activities may sound typical of any university building, Green Hall is different, as it was designed specifically to spark ideas, nurture creativity and be a hub for innovative, interdisciplinary research and education. More than a year after its dedication, Green Hall has not only met its goal, but has become a new gateway into Washington University's Danforth Campus.

"We feel very fortunate and privileged to have our new building, thanks to the generous donation of our late alumnus, Preston M. Green, and his widow, Nancy Green, and the commitment of Washington University to make their dream happen," says Arye Nehorai, PhD, the Eugene and Martha Lohman Professor and chair of the Preston M. Green Department of Electrical & Systems Engineering housed in Green Hall.

"The new building helps us recruit the best new faculty and students and accommodate the growth in our department," he says. "Students in our new building sense the commitment to do the best research projects, and they enjoy the work and collaborative environment."

Although the building is less than two years old, its Collegiate Gothic style built with red Missouri granite matches much older buildings on campus. But what's inside is modern and provides the latest technology to prepare leaders for a global, technology-driven world. Contemporary chairs and benches near entrances provide conversation or study space, while lighting on the lower level and first floor gives the appearance of a starry night sky.

GREEN HALL RIBBON CUTTING & DEDICATION

Left to right: Danielle Hoover, Professor Arye Nehorai, P.R. Kumar, Provost Ed Macias, Subra Suresh, Stephen Brauer, Scott Rudolph, Chancellor Mark Wrighton, Mrs. Preston Green, Dean Ralph Quatrano, Dorothy Green, Nicole Zellweger-Bass, Dennis Mullenburg, Charles Vest, Professor Pratim Biswas, Professor Himadri Pakrasi



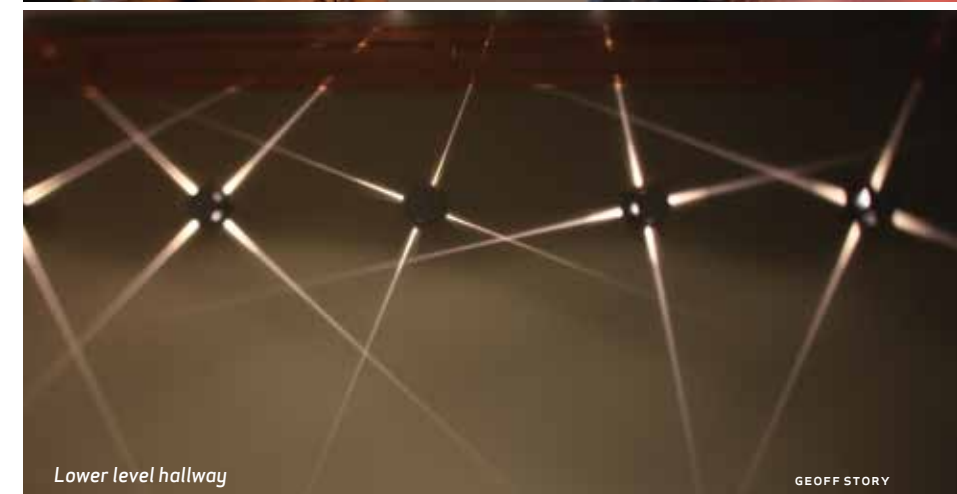
Collaboration Space

GEOFF STORY



Professor Joseph O'Sullivan with graduate students

DEVON HILL



Lower level hallway

GEOFF STORY

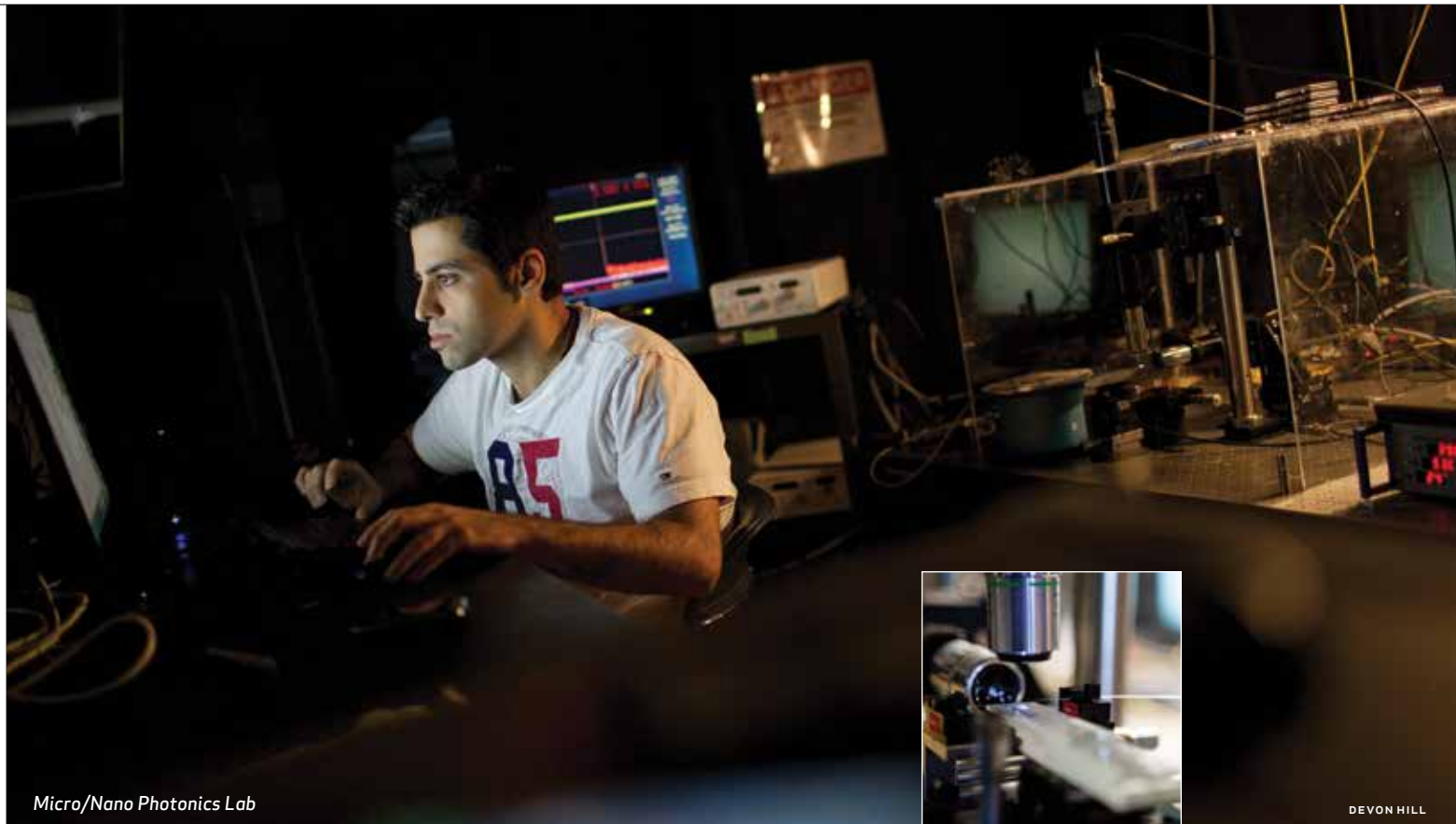


Born in 1915 and a native of St. Louis, Preston M. Green earned his Bachelor of Science degree in electrical engineering from Washington University in 1936. After graduation, Mr. Green worked in a local factory until he joined Southwest Steel Supply Co. in 1950 as vice president of purchasing and production. He became president in 1955 and chairman of the board in 1957. During his career at Southwest Steel, Mr. Green was responsible for adding a second manufacturing plant in Madison, Ill., and growing his company into the leading processor of steel throughout the Midwest.

Mr. Green designed most of the equipment used by Southwest Steel and was acknowledged for creating more efficient processing procedures. He was recognized nationally for his leadership and vision within the steel industry, including receiving the Steel Distributor of the Year award in 1986 from the Association of Steel Distributors.

In 1990, Mr. Green sold Southwest Steel to Hanwa American, a subsidiary of the Hanwa Corp. of Japan. Mr. Green died in 2003, but his legacy continues today through his many contributions, both professional and philanthropic.

Nancy Green, his widow, lives in St. Louis and serves on the advisory board for the Preston M. Green Charitable Foundation, which continues to support several charities within the St. Louis community.



Micro/Nano Photonics Lab

DEVON HILL



Rodin Auditorium

GEOFF STORY

Constructed with regionally sourced and recycled materials, thermal windows, high-efficiency HVAC systems and finishes that promote good indoor air quality, the building is a model for sustainability. It achieved LEED Gold certification in February 2012, making it the second in the three-building engineering complex at the corner of Skinker Boulevard and Forest Park Parkway to achieve that designation, after Stephen F. & Camilla T. Brauer Hall. High-efficiency plumbing fixtures reduce overall water use by more than 30 percent. The windows were placed to allow natural light within offices and labs, and interior lighting is motion-sensitive. One hundred percent of irrigation is provided by captured rainwater stored in a turn-of-the 20th century brick sewer converted to a cistern. And the building is adjacent to the Skinker Metrolink station and MetroBus lines that provide a direct link with the School of Medicine.

In addition to 17 research labs and 150 classroom seats, there are a variety of conference and meeting rooms with high-tech equipment. On the lower level, the Rodin Auditorium, named for Ervin Y. Rodin, PhD, senior professor of applied

math and systems science, is used by various university groups for special seminars and meetings.

“Having a state-of-the-art lab is not only helpful for my research, but it is helpful when applying for grants because I can show that I have the cutting-edge facility to do the research.”

Lan Yang, PhD

Associate Professor, Electrical & Systems Engineering

In its first full academic year, Green Hall's three classrooms held 67 courses, ranging from Properties of Materials to Thermodynamics.

Joseph O'Sullivan, PhD, the Samuel C. Sachs Professor and dean of the UMSL/WUSTL Joint Undergraduate Engineering Program, has taught two classes and two seminars in Green Hall.

“We're fortunate at Washington University to have a lot of very nice classrooms, and it's nice to have these elite classrooms in our new engineering building,” he says.

Green Hall also is home to O'Sullivan's research lab.

“The labs are state-of-the-art, beautiful places,” he says. “It's great for the students, and it helps communicate to them that a lot is expected of them.”

Lan Yang, PhD, associate professor in electrical & systems engineering, has 10 students working in her Micro/Nano Photonics Lab in Green Hall.

“When we learned we were going to move here, I consulted with the designers about what I needed for my lab,” says Yang, who has earned both a Presidential Early Career Award for Scientists and Engineers from President Barack Obama and a National Science Foundation CAREER Award. “I got to design my ‘dream lab.’ Having a state-of-the-art lab is not only helpful for my research, but it is helpful when applying for

grants because I can show that I have the cutting-edge facility to do the research.”

Another thing Yang appreciates about Green Hall is that her office space and lab are close to each other, making it easier for her to work with students. Her Applied Optics classroom also is in Green Hall.

Hamadri Pakrasi, PhD, the George Williams and Irene Koechig Frieberg Professor of Biology in Arts & Sciences, director of I-CARES and professor of energy in the School of Engineering & Applied Science, said being in Green Hall is very beneficial to the International Center for Advanced Renewable Energy and Sustainability (I-CARES), created in June 2007 to foster research on energy, environment and sustainability that cannot be done by single investigators or by single disciplines alone.

“This is our optimal space for the way we operate,” Pakrasi says. “I-CARES is all about bringing people together from various places. Green Hall is the perfect place to have different groups from different places come to meet.”

» View photos of Green Hall: engineering.wustl.edu/GreenGallery



Designed for a LEED Gold rating from the U.S. Green Building Council, Green Hall includes the following features:

- » The building is adjacent to four bus lines and the St. Louis Metrolink station at Skinker Boulevard, in addition to bike paths and storage.
- » One hundred percent of irrigation is provided by captured rainwater stored in a turn-of-the-century brick sewer converted to a cistern.
- » High-efficiency plumbing fixtures reduce overall water use by more than 30 percent.
- » High-efficiency systems increase overall energy cost savings at more than 25 percent. Building energy use is regularly measured and verified to maintain peak performance.
- » The building incorporates high percentages of recycled-content and locally sourced materials.
- » More than 50 percent of the building's wood products came from sustainably managed forests.
- » More than 90 percent of the construction waste was diverted from landfill.
- » Low-VOC construction components and finishes were used throughout to promote good indoor air quality. HVAC components were protected during construction to safeguard good indoor air quality.
- » Lighting and thermal comfort controls are available for building occupant use.



GEOFF STORY

Green Dedication Keynote Speaker

Charles M. Vest, PhD, president of the National Academy of Engineering and president emeritus of the Massachusetts Institute of Technology, listed important innovations of our time that have come primarily, and in some cases exclusively, from our research universities: computing, the laser, the Internet, numerically controlled machinery, the fundamentals of the GPS system, the deployment of the World Wide Web, the genomic revolution and most of modern medicine.

"My point," Vest said, "and the one point I'd like you to remember if you take nothing else away, is that this is serious business in which we are engaged. I don't think there's a job in America that is not based on utilizing one or more of these innovations that have stemmed from our research universities."

He went on to list challenges engineering faces in a changing world, including the precipitous decline of American students taking engineering degrees, but went on to say that "this is without question the most exciting era in human history to be engaged in science and engineering" and that if "you really want to make the world a better place, there's no better pathway through which to do it."

Watch the keynote address:
www.youtube.com/WUSTLEngineering, search "Green Dedication"

GREEN HALL DEDICATION 9.23.11



Student group Stereotypes, WUSTL's all-male a cappella singing group, performed at the Dedication dinner.

GEOFF STORY



WUSTL PHOTO

Danielle Hoover, a Systems Science & Engineering student



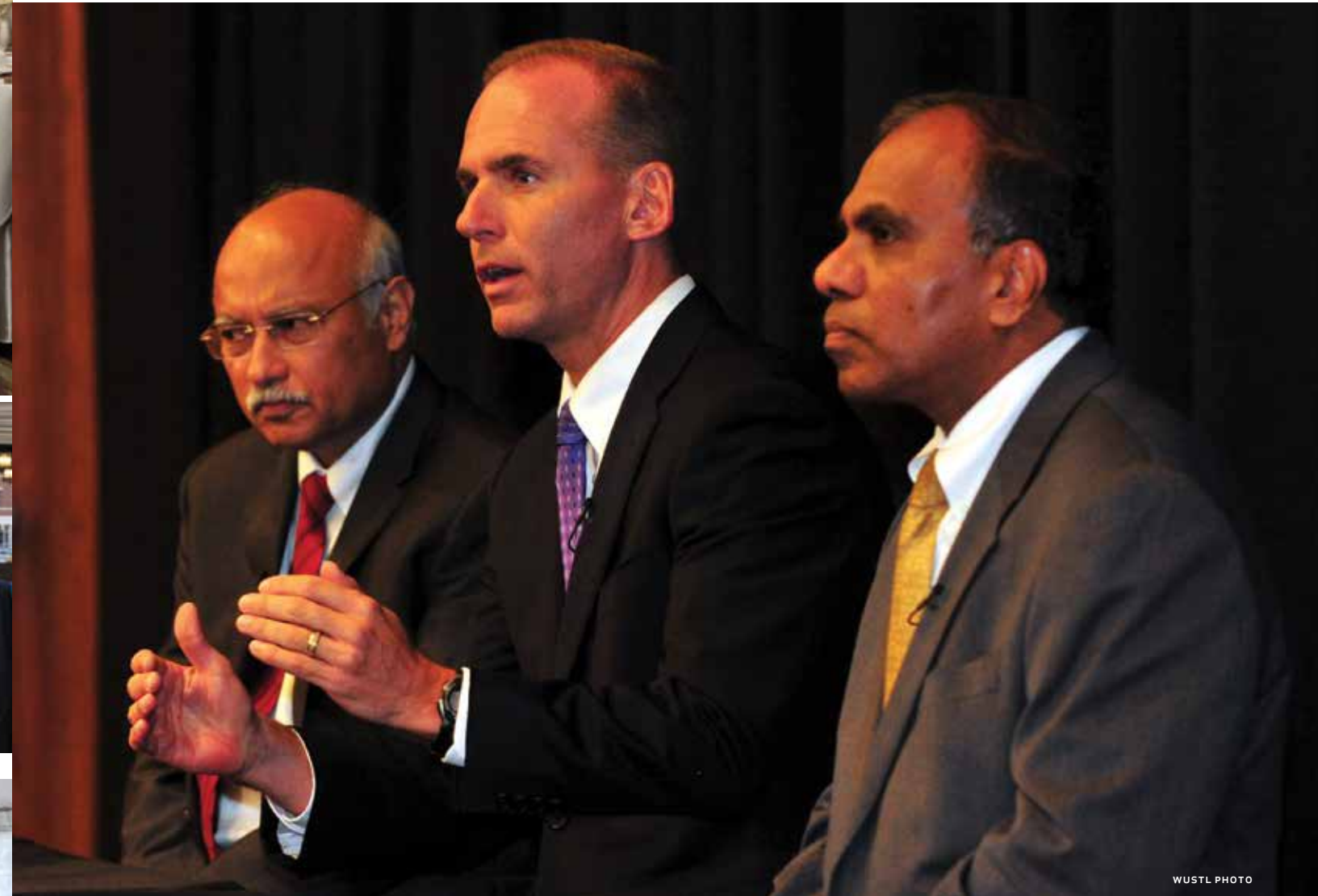
Dean Ralph Quatrano, Nancy Green and Chancellor Mark Wrighton



Dedication

ENGINEERING SYMPOSIUM

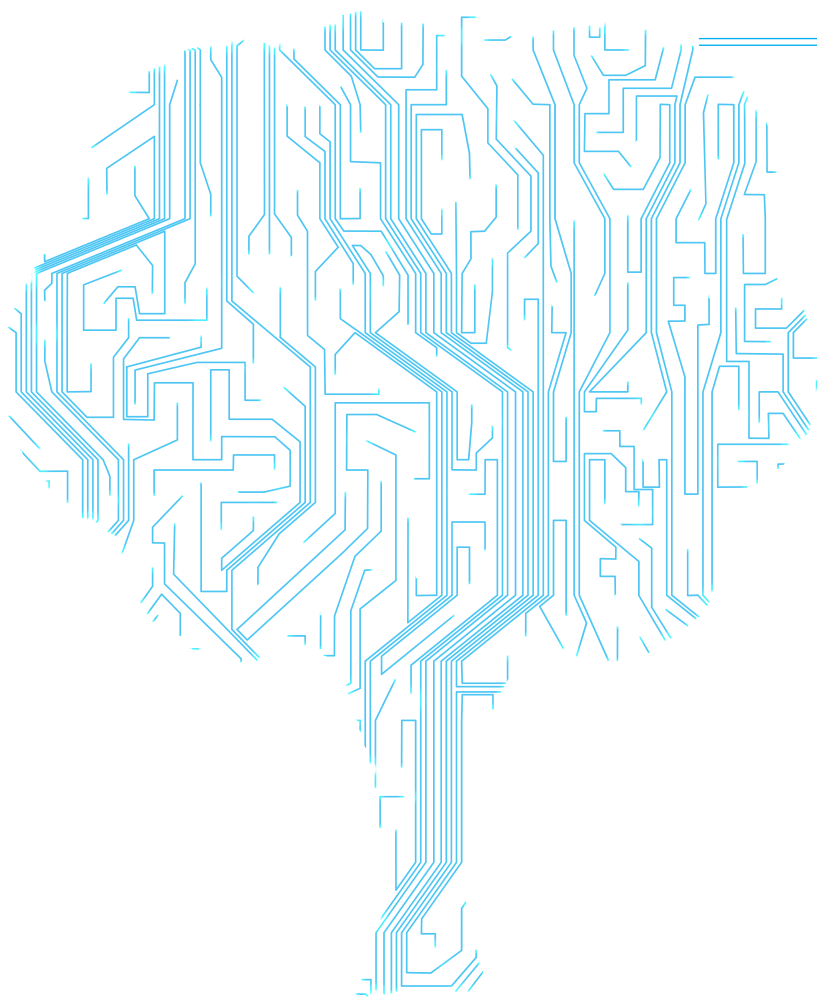
The future of engineering education & research



WUSTL PHOTO

Held in conjunction with the dedication of Green Hall, Washington University hosted a symposium, "Opportunities & Challenges in Engineering Education & Research," which featured National Science Foundation Director Subra Suresh, DSc (right); Dennis Muilenburg (center), president and chief executive officer of Boeing Defense, Space & Security and a member of WUSTL's Board of Trustees; and P.R. Kumar, DSc (left), professor and College of Engineering chair in computer engineering at Texas A&M University and a WUSTL alumnus.

» View remarks and Q&A at engineering.wustl.edu/symposium



The 'E Gene'

If you need something to be made
if you need things that work
you need **engineers**

— Patrick Crowley, PhD

Associate Professor, Computer Science & Engineering

Entrepreneurship & Engineering

Written by **BETH MILLER**

Study successful businesses and you'll find similarities in how they got started. Someone identified a need, found a solution and took a risk. While those are characteristics of people in business, they also describe engineers.

This vibrant culture of entrepreneurship within the School of Engineering & Applied Science is an extension of the rich history of innovation at Washington University in St. Louis, which was recently ranked among the top schools in the nation for entrepreneurship by *Entrepreneur* magazine. The university ranked No. 5 in undergraduate programs and No. 6 in graduate programs. Among the university-wide initiatives that led to the high ranking include the Olin Cup competition, IdeaBounce, the Skandalaris Center for Entrepreneurial Studies, The Hatchery, the BioEntrepreneurship Core and the Student Entrepreneurship Program (StEP). (See sidebar on page 15.)

In fact, one of the pillars of *Leading Together: The Campaign for Washington University*, launched in October, is to further inspire innovation and entrepreneurship, across disciplines and around the world.

And there's something special about Washington University's entrepreneurs and innovators — they have a focus on prompting positive social change and a greater goal to create solutions to the world's biggest problems, such as clean water and air for those who don't have it, reducing or eliminating disease and making the world a better place in which to live. Engineers are at the heart of the process, from concept to startup to established business.

"If you need something to be made, if you need things that work, you need engineers," says Patrick Crowley, PhD, associate professor of engineering in computer science and engineering. "You can bet engineering is required, whatever the startup is."

Through its progressive curriculum that allows students to explore other academic interests, Engineering continues to promote learning and its application while cultivating a spirit of entrepreneurship and innovation, says Ralph S. Quatrano, PhD, dean and the Spencer T. Olin Professor.

"It's a very high priority for me to promote entrepreneurship and innovative activities with undergraduate and graduate students, postdoctoral fellows, faculty and alumni, who are excellent mentors to our students," he says. "We're actively encouraging and supporting a culture within the school to drive this."

Quatrano, a biologist with an academic and corporate life sciences background, is spearheading the school's entrepreneurial charge backed by his own experience as a partner in launching Nidus Partners LP, a collaboration between experienced entrepreneurs and corporations to identify and bring innovative technologies into the marketplace, and MOgene, a DNA service company. He also worked in research and development with DuPont and directed a 10-year research project with Monsanto Co.

"Certain engineers have the 'E gene,' or the entrepreneurial gene," Quatrano says. "I've seen the direct relevance of applied science and engineering to the marketplace in how we take basic science to that next level. Engineers are the ones who are going to make that happen."

Creating an Entrepreneurship Ecosystem

Starting a successful company takes time, talent and good luck, says Skandalaris Center for Entrepreneurial Studies Director Ken Harrington.



1 Networking.

"First and most important," Harrington says, "is how energized and collaborative the social networks are. What sort of mentoring do you have, what sort of events, what sort of connections do you have back to universities? In San Jose everyone was working 18 hours a day, going to cocktail parties and lunches, talking and swapping ideas."



2 Funding.

"Funding for proof of concept, experiments and for the venture, as well as a continuum of funding that supports the ecosystem," are all vital, Harrington says.



3 Facilities.

"This is much more important for biotech or energy than for IT, but there are a lot of expensive toys and you have to have special facilities," he says, which are often found at large research institutions such as Washington U.



4 Institutions.

These includes the local means and knowledge to get technology support, agreements, intellectual property protection and suitable financing structures.

School spirit

National surveys show that more engineering students plan to become entrepreneurs after earning their degrees. In response, Engineering has established a core curriculum and co-curricular activities to prepare students for a successful entrepreneurship career.

This fall the school launched the Discovery Competition, an opportunity for undergraduate students to compete for \$25,000 to develop prototypes and start companies. (See sidebar on page 15.) The competition received more than 40 entries for the prize — evidence that the “E gene” is abundant among Engineering undergraduate students.

Within the curriculum, the Department of Computer Science & Engineering offers a Technology Entrepreneurship course for students who plan to be or to work with entrepreneurs. Crowley, who leads the course, also helped start Washington University Technology Entrepreneurs (WUTE), a student club designed to bring together diverse people who share a common interest in technology and entrepreneurship to inspire its members to create or join new technology ventures.

Beyond the lemonade stand

The “E gene” is evident among Engineering students who have taken the knowledge and skills they are learning, both in the classroom and in co-curricular activities, and have already started successful businesses while taking a full course load.

Matthew MacEwan, an MD/PhD student in the schools of engineering and of medicine, and Nalin Katta, a doctoral student in biomedical engineering, started what is now Retectix, which develops advanced surgical products using nanotechnology, such as a mesh used to repair injuries to the brain and spinal cord. The pair won \$50,000 in the 2011 Olin Cup competition to help start the company, which recently moved into Innovative Technology Enterprises, a University of Missouri–St. Louis incubator.

“Our story proves how fertile Washington University is for new ventures,” MacEwan says. “The pairing of students from the medical, business and engineering schools and the hospitals leads to great collaborations.”

Another collaboration can be found in the startup Aerosol Control Technologies (ACT), started by Michael Gidding and Daniel Garcia, both chemical engineering students. ACT is building on a technology initially invented by Pratim Biswas, PhD, that cleans the air with extremely high efficiency. Gidding and Garcia are developing the technology to be applied to the coal industry. In particular, they will be making a prototype to be tested as a diesel particulate filter substitute for mining environments. The two originally founded Saturnis, which in May received a \$50,000 Arch Grant to help launch and grow the business.

In addition to Saturnis, 10 other WUSTL-affiliated entrepreneurs were among the winners of \$750,000 in inaugural grants from Arch Grants, a St. Louis–based global business plan competition providing \$50,000 grants to startups and taking no equity in return. The 11 WUSTL-affiliated winners, out of 15 total winners, comprised five alumni, four faculty members and two students.

Crowley’s Observable Networks startup, which offers a new approach to enterprise network security and management, was one of the faculty who won an Arch Grant. His company, as well as Arch Grants and several others with ties to Washington University, recently moved into a new incubator in the TEC@ Railroad Exchange Building in Downtown St. Louis. The incubator, known as T-REx, provides low-cost space to startups in the space that formerly housed corporate offices of The May Department Stores Co. and Macy’s Inc. to support and encourage startup businesses in the St. Louis area. Engineering and the Olin Business School are renting space in T-REx for students to gain hands-on experience.

As with students, Crowley also credits the university for encouraging his “E gene.”



Entrepreneurship @ WUSTL

Bear Cub Fund Grants

The program awards \$20,000 to \$75,000 to University researchers seeking to move their inventions from their laboratories toward commercialization.

Bio-Entrepreneurship Core

The group consists of university students, postdoctoral fellows and staff working to foment local biotech-industry collaborations.

The Hatchery

(Business Planning for New Enterprises) The university’s capstone entrepreneurship course. Students form teams around a commercial or social venture idea and present ideas and business plans to a panel of judges.

IdeaBounce®

The Skandalaris Center’s flagship program. Anyone — on campus or off, anywhere in the world — can post ideas on the IdeaBounce® website and get feedback from a network of creators, inventors, businesspeople, mentors and others. Special events bring together mentors, judges and pre-selected “idea bouncers” with two-minute pitches.

Olin Cup Competition

Seed investment awards of \$20,000 to \$50,000 are made to winners of the business plan competition. Student cash prizes of \$5,000 are also offered. Participants get feedback during the competition from a panel of investors and judges.

Social Entrepreneurship

The Brown School offers a Social Entrepreneurship course for students who want to learn to be social innovators.

Washington University Tech Entrepreneurs (WUTE)

WUTE is a club established to bring together people from all backgrounds who share a common interest in technology and entrepreneurship. The club’s purpose is to promote interest in and to develop skills relating to all aspects of science and technology business creation.

YouthBridge Social Enterprise and Innovation Competition (SEIC)

Launched in 2005 as a partnership between the university and YouthBridge Community Foundation, it has awarded more than \$600,000 to students to develop innovative approaches to social programs.

Discovery Competition offers \$25,000 prize for innovative ideas



Washington University undergraduate students with great solutions to problems can win \$25,000 to take their innovative ideas from concept to their own businesses.

The School of Engineering & Applied Science has launched the Discovery Competition to promote new and innovative discoveries to solve challenges or needs. The competition provides engineering undergraduate students with a forum to explore their entrepreneurial interests with support from mentors, to use their creativity to develop solutions for real-world problems and to compete for financial resources that could help turn their ideas into businesses.

To be held annually beginning this fall, the competition includes multiple rounds during the fall and spring semesters. Students will interact with mentors, advisers, judges and other students through several events during the academic year. Each spring, the winning team or teams will win at least \$25,000, provided by alumni donors, to continue developing prototypes leading to new ventures.

Finalists will be selected in December and the winner(s) will be announced in late April.

Teams must be composed of currently enrolled WUSTL undergraduate students, with at least one engineering student and at least one non-engineering student. Teams must produce original work.



engineering.wustl.edu/discovery

“Answers and the Washington University interns we’ve hired contribute to the St. Louis region, as do the increasing number of technology startups springing up as this city continues to be established as an entrepreneurial hub.”

— David Karandish



Chris Sims &
David Karandish



“I find Washington University to be a very supportive place for entrepreneurship,” Crowley says. “Students these days have an understanding of the pace and consequence of innovation, particularly computer science and engineering students. They recognize if they can become entrepreneurs, that gives them a better shot at doing what they want to do in the world – rather than working for some big company that is going to be acquired or put out of business by someone else’s startup.”

Faculty, alumni create startups

Along with Crowley, several other Engineering faculty have taken their ideas to market with the help of venture capital, modeling the entrepreneurial process for their students.

Igor Efimov, PhD, the Lucy & Stanley Lopata Distinguished Professor and a world leader in cardiac arrhythmia research, started CardiaLen, which is developing implantable, low-energy (low-voltage), pain-free atrial cardioverters to help address the major unmet needs of atrial fibrillation, the most common cardiac arrhythmia worldwide.

Richard Axelbaum, PhD, the Stifel & Quinette Jens Professor, started X-tend Energy, which produces high-performance electrochemical materials for lithium-ion batteries to address the limiting issues of cost and performance for electric vehicle batteries. In 1998, Axelbaum founded the startup AP Materials Inc., which specialized in flame synthesis of nanopowders. Cabot Corp. acquired the company in August 2007.

Jerome Cox Jr., ScD, senior professor, and Jonathan Turner, PhD, the Barbara J. and Jerome R. Cox, Jr. Professor, both in the Department of Computer Science & Engineering, co-founded the start-up company Growth Networks, which developed high-performance switching components for Internet routers. Growth Networks was acquired by Cisco Systems in 2000. In recognition

of their work, the team received the 2011 Chancellor’s Award for Innovation and Entrepreneurship. Now in his 80s, Cox recently started another company.

Alumni have found success with startups as well. Alumnus James McKelvey Jr. co-founded Square Inc., the largest mobile payment platform in the nation. More than 2 million vendors now use the two-year-old startup’s technology. Valued at \$3.25 billion at its last funding round, the company recently signed Starbucks Corp. as a merchant location, bringing with it a \$25 million investment.

Six years ago, two Engineering alumni, David Karandish and Christopher Sims, started AnnounceMedia with the goal of better organizing the online consumer’s retail experience. AnnounceMedia blossomed into Answers.com, a plain-language search engine and information source used by more than one-third of all Internet users. The company has more than 160 million registered users through Facebook alone. Profitable since its first year, the company has grown into a global enterprise with offices in the technology hotbeds of Silicon Valley, New York and Beijing.

Karandish and Sims, both of whom earned computer science degrees with honors from WUSTL in 2005, started working together while in high school. With their degrees from Washington University, Karandish and Sims know what its students have to offer. That’s why the St. Louis-based company has 18 paid graduate and undergraduate student interns, hand-picked through a special partnership with the university to be “mini CEOs.”

“Answers and the Washington University interns we’ve hired contribute to the St. Louis region, as do the increasing number of technology startups springing up as this city continues to be established as an entrepreneurial hub,” Karandish says.

*Rick Skwiot and Judy H. Watts
contributed to this story.*

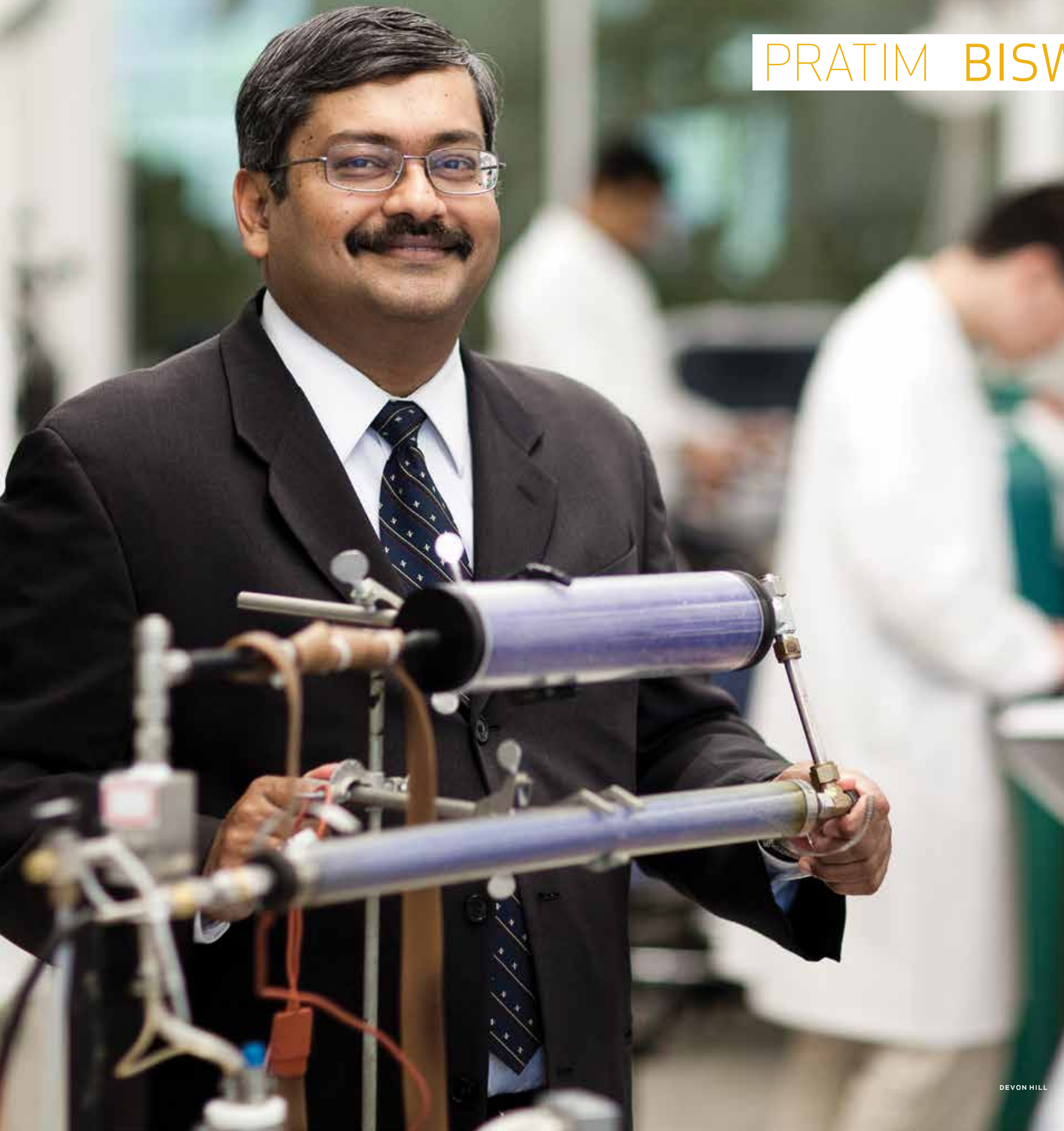


Select faculty, student & alumni companies:

- » **825 Basics**
- » **A1 Entertainment Service**
- » **Answers™ (Announce Media)**
- » **Appistry**
- » **Cardialen**
- » **Ettus Research**
- » **Exegy**
- » **Gateway EDI**
- » **GeoVerify**
- » **Global Velocity**
- » **Green Bean Restaurant**
- » **Kwame Building Group**
- » **Retectix**
- » **Salesforce.com**
- » **Sanergy**
- » **Saturnis**
- » **Say**
- » **Square Inc.**
- » **Third Rock Ventures**
- » **Venrock Capital Ventures**
- » **Whoshore**
- » **Willow Garage**
- » **Xtend Energy**
- » **Yerdle**

Have a startup or small business? Let us know at magazine@seas.wustl.edu

Want to see more about our engineers in entrepreneurship? Visit engineering.wustl.edu/entrepreneur



PRATIM BISWAS:

the global ENGINEER

Written by **BETH MILLER**

It's Biswas' charismatic personality, sunny disposition and endless energy that have helped to propel the department's reputation internationally and cemented Biswas' involvement in numerous projects at the university, around the country and throughout the world.

Pratim Biswas, PhD, loves his books. So much that when he came to the United States from India in 1980 as a graduate student, his two suitcases contained more books than clothes. A friend had told him books were very expensive in the United States, and Biswas didn't want to be without them, so he brought as many as he could carry.

Today, Biswas has books lining the shelves of his office in Brauer Hall at Washington University's School of Engineering & Applied Science, where he is chair of the Department of Energy, Environmental & Chemical Engineering and the Lucy and Stanley Lopata Professor.

Biswas joined the university in 2000 to rebuild the environmental engineering science program that had been eliminated 30 years earlier. He began with an interdisciplinary graduate program of one doctoral student. Just 12 years later, Biswas has redefined the approach to addressing global energy needs while preserving the environment and preventing negative consequences for public health. The Department of Energy, Environmental & Chemical Engineering, the first such program of its kind, today has 18 tenured and tenure-track faculty, more than 200 undergraduate and 80

doctoral students and about \$9 million in annual research funding. With its graduate program ranked among the top 10 in the nation, the department is recognized as a leader for its teaching, research and collaborations that reach around the globe and tackle some of the world's most pressing issues related to energy, the environment and public health.

It's Biswas' charismatic personality, sunny disposition and endless energy that have helped to propel the department's reputation internationally and cemented Biswas' involvement in numerous projects at the university, around the country and throughout the world.

"Pratim's such a good organizer of collaborations, wonderful at bringing people together," says James Wertsch, PhD, vice chancellor for international affairs.

And he cares deeply about the common good. In investigating scientific questions, Wertsch says, Biswas always "wants to know what difference it makes to the larger social good, especially in developing countries."

Perhaps his experience growing up at the prestigious and highly competitive Indian Institute of Technology (IIT) Bombay sparked his interest in making a difference. His father was a chemistry

professor there, and faculty lived on campus with their families, so Biswas grew up among India's best and brightest students — IIT's five campuses accept about 5,000 students total from 1 million applicants.

"We learned a lot outside of the classroom with such brilliant people around us," he says. "We thought we knew a lot about things, but we learned from other people."

Biswas earned a bachelor's degree in technology from IIT Bombay and traveled to California for a master's degree from the University of California, Los Angeles, and a doctorate from California Institute of Technology, setting the stage for his career as one of the world's leading experts in aerosols, a science applied in nanoparticle technology, pharmaceuticals and medicine, electronics, air pollution control, global climate, energy and environmental technologies. He has helped to assemble, with five of his faculty colleagues, what he calls "the world's best aerosol group" on the third floor of Brauer Hall.

"It's really a powerhouse of activity in aerosol science and technology," he says.

While energy and the environment are compelling issues on every campus today, Wertsch says, "Pratim has been very successful in convincing people that they are interested in it. He's very generous and endlessly enthusiastic."

That enthusiasm has apparently carried over to faculty and students. Since he became chair, he has recruited nine new faculty members and 11 of the current 18 tenure-track faculty in the department; added new programs, such as an undergraduate minor in energy engineering and nanotechnology, a Master's of Engineering in Energy, Environmental & Chemical Engineering and a joint MBA program with the Olin Business School. He also provided the initial vision behind

a highly successful International Experience in Energy and Environment Program for undergraduate students.

He also is the driving force behind major research initiatives, including the \$12 million, externally funded Consortium for Clean Coal Utilization and the \$20 million Photosynthetic Antenna Research Center (PARC), funded by the U.S. Department of Energy. In August 2012 alone, the department learned it will receive nearly \$9 million in new funds to study solar energy through the Solar Energy Research Institute in India and the United States (SERIUS), to design a battery management system for lithium-ion batteries, and to develop innovative ways to burn coal cleanly for energy.

"Professor Biswas expects high standards from his postdocs and students, and in return dedicates a lot of time and energy into their research and successes; most importantly, everybody knows he truly cares."

— Anna Leavey, postdoctoral research associate

In addition, he has established collaborative relationships with scientists worldwide as the university's ambassador to IIT, with which the university has about 30 active projects, several of which Biswas leads. He also is director of the McDonnell Academy Global Energy and Environmental Partnership (MAGEEP), a consortium of 28 leading universities on five continents whose scholars collaborate on research and focus on new initiatives. Since its 2006 launch, it has had three high-profile, global

symposia, with a fourth planned this December in Mumbai. Its focus will be on abundant, clean, cost-effective energy systems for sustainability.

As tirelessly as Biswas has worked to bring MAGEEP into the spotlight, he has worked just as hard to bring new faculty to the School of Engineering & Applied Science.

"Washington University is a great place that's not as well known as some other places, but it's such a fabulous university that it's easy to sell," he says.

Even with all of his projects around the globe, there's one aspect of his job that he would never give up: his students.

"I wouldn't give them up for anything," he says. "The undergraduates keep me young, and the PhD students are like my family."

Many of his doctoral students have gone on to prestigious positions in the industry or academia, including Virendra Sethi, PhD, head of the Center for Environmental Sciences and Engineering at IIT Bombay, and Derong Zhou, PhD, general manager of Air Liquide in China.

Anna Leavey, PhD, a postdoctoral research associate, joined Biswas' Aerosol & Air Quality Research Laboratory lab more than a year ago.

"Not only has Professor Biswas created a laboratory environment that produces strong research on a variety of topical and important energy issues, but he has also created one of camaraderie," she says. "Professor Biswas is a great mentor: he expects high standards from his postdocs and students, and in return dedicates a lot of time and energy into their research and successes; most importantly, everybody knows he truly cares."

Biswas also has high standards for his son, Vivek, who is a sophomore at Washington University majoring in chemical engineering and political science.

Betsy Rogers contributed to this story.



Above: Pratim Biswas and Chancellor Mark Wrighton at the Lucy & Stanley Lopata Professor installation in fall 2011.

» engineering.wustl.edu/faculty/biswas

» eece.wustl.edu

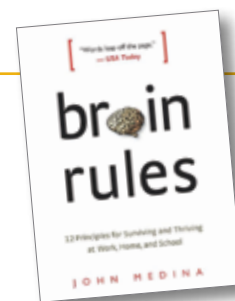
BISWAS FACTS



Biswas family: Wife, Sujata, a teacher at Mary Institute Country Day School (MICDS); son Vivek; son Vikram, a senior at MICDS.

Average number of hours of sleep a night

5



Books currently reading: *The Unthinkable*, by Amanda Ripley and *Brain Rules* by John Medina

Number of miles traveled in the last year: 150,000 ("Mainly in the air, but some catching up on missed sleep!")

150,000



Education:

- » Bachelor's degree in technology, Indian Institute of Technology, 1980
- » Master's degree in science, University of California, Los Angeles, 1981
- » PhD, California Institute of Technology, 1985



Hobbies

Reading, traveling, watching sports

Honors & Awards:

- » 2012 Distinguished Faculty Award, Washington University
- » Distinguished Alumni Award, IIT Bombay, 2011
- » Fellow, Academy of Science St. Louis
- » Kenneth Whitby Award from the American Association for Aerosol Research
- » Fellow, American Association for Aerosol Research
- » President, American Association for Aerosol Research



Biswas lab:
www.aerosols.wustl.edu/~pbiswas

salad entrepreneur

Written by **BETH MILLER**

Walk into the Green Bean restaurant in St. Louis' Central West End neighborhood and you'll see lots of color — from the green leaves painted on the walls to the chopped red peppers, orange carrots, purple onions and other fresh vegetables and meats stored neatly in gleaming stainless-steel containers.

Once a customer places an order for a salad or wrap, the process from preparation to presentation is an efficient system seemingly designed by an engineer with a penchant for the environment, since all materials used for the restaurant are sustainable, and utensils, cups and containers are compostable.

It seems that it was designed by an engineer because it was.

Sarah Haselkorn, a senior Engineering student, opened Green Bean in November 2011 with her friend, Nick Guzman, both Washington, D.C., natives, as a solution to a problem: finding healthy food off campus that was quick and tasted good.

They determined that there was a need in the St. Louis area for sustainable salad shops similar to those prevalent in the Washington, D.C., area. What they developed is a fresh-food-lover's paradise, with the option to choose from a chef-designed menu, create a large, custom salad or have the salad stuffed

into a large wrap. As much as possible, ingredients are locally sourced.

Already Haselkorn is getting national attention for Green Bean. In September, she won the Entrepreneurs' Organization's Global Student Entrepreneur Awards regional competition and competed in the finals in November for a \$10,000 cash prize.

Haselkorn planted the seed for Green Bean while in her second year at Washington University, where she is majoring in systems science & engineering with a minor in entrepreneurship through the Olin Business School. Although taking classes, working two part-time jobs and shy of 20 years old, she took on the challenge of starting the restaurant.

During the first semester, she and Guzman, a 2011 graduate of Amherst College, wrote a business plan. Between semesters, they took their business plan, along with some market research they did themselves, to family and friends, as well as a Washington, D.C.-based chef and restaurateur who is a Guzman family friend.

"We told him he didn't have to put anything into it besides his time, and he said yes," Haselkorn says. "He did first try to talk us out of it, as any chef or restaurant owner would."

Not to be deterred, Haselkorn and Guzman now had a business plan, seed funding and a menu — now they needed space.

Although Haselkorn spent the spring semester of her second year in Boston working for a startup company, she managed to oversee hiring a designer for the 900-square-foot space they had chosen at 232 N. Euclid Ave. Since money was tight, Haselkorn and Guzman oversaw the remodeling work themselves.

"We realized we were designing a small space, so we hired a plumber, electrician, HVAC technician and a carpenter," she says. "We reused a lot of materials from the business that was in the space before, including 100 percent of the wood, so we had a one-for-one exchange of materials."

Less than a year after they began the plan, Green Bean opened its doors in a modern yet simply decorated space on a November day.

"We opened on a Saturday, and the first day was a blur," she says. "We had thought of everything — we had enough lettuce,



mermaid

baby spinach, green beans, mushrooms, cucumber, tofu, seaweed, tofu-honey dressing.....\$7

turducken

mixed greens, arugula, cucumbers, cherry tomatoes, spicy chickpeas, dried apricots, pita chips, feta, duck confit, lemon-tahini dressing.....\$10

>> greenbeansalads.com

bowls, a store and cash registers, but when I had to fold the wrap for my first customer, I realized I hadn't thought to learn how to do that."

Haselkorn says Washington University has nurtured her entrepreneurial spirit through her classes as well as her relationships with faculty.

"Washington University provides different opportunities to explore different subjects if you take that opportunity," she says. "My favorite classes here have been interdisciplinary — social entrepreneurship and service learning. They helped me figure out what I was interested in and to think to the maximum, to explore my passions and to go for whatever I want to go for.

"I can pick up every skill here that I need," she says. "Washington University has everything you need to craft yourself into whatever you need to be able to reach your goals."

Her Engineering classes also have played a big role in the process.

"My engineering classes helped me the most with problem solving," she says. "I definitely used, and continue to use, those

critical-thinking skills when we hit roadblocks."

Haselkorn also credits the relationships she's developed with faculty, students and in particular, her mentor, Gay Lorberbaum, senior lecturer in the Sam Fox School of Design & Visual Arts.

"There are amazing resources here if you take advantage of them, and you should, because you're only here for four years," she says. "It's important to find the right people to reach out to who can help you."

Clifford Holekamp, senior lecturer in entrepreneurship and director of the Entrepreneurship Platform at the Olin Business School, has had Haselkorn as a student in several courses.

"I am absolutely amazed by how Sarah has managed to juggle being a full-time student while also being the full-time owner of a demanding retail business," Holekamp says. "Maybe her secret is that she seems to be having a lot of fun with the success she enjoys with both."

This fall, Haselkorn is in The Hatchery, the university's capstone entrepreneurship course taught by Holekamp, with a partner from a previous business class. Together they are developing an idea that they hope will get funding so they can launch after they graduate next spring.

As for Green Bean, Haselkorn and Guzman are evaluating options for the restaurant's growth in the area.

BRINGING ENGINEERING to life

Written by **TERRI MCCLAIN**



COURTESY PHOTO



DEVON HILL



DEVON HILL



When people first encounter vivacious Washington University alumna Deanne Bell, they're not surprised to learn she's a television host. But they're often shocked that she's an engineer.

Bell, who earned her bachelor's in mechanical engineering in 2002, credits Washington University with nurturing the diverse talents and traits that led to a career of hosting science-based television shows for National Geographic, The Discovery Channel, ESPN and other networks.

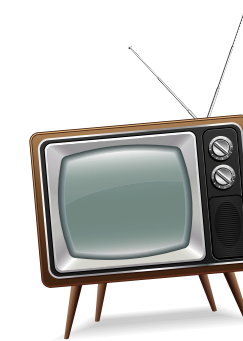
"I used to think my outgoing personality made me less of an engineer, less professional, but my professors encouraged me in every way to combine my interests and be my kind of engineer," Bell says.

"As an undergrad, Deanne was consistently a creative problem-solver and a clear thinker," says Guy Genin, PhD, associate professor of mechanical engineering and materials science. "She identified and addressed the problems that were most important to our community at Washington University and introduced engineering-centered social programming that continues to help make Washington University the best undergraduate engineering program that can be found anywhere. We knew from the start that Deanne was on a path to make a bang in engineering, but could never have predicted that this bang would involve exploding passenger jets."

Bell's outside-the-box activities include co-founding the annual Vertigo dance party and minoring in architecture. She also mined her classes for skills she would ultimately use in her TV career.

A required technical communication course helped Bell learn to explain scientific concepts to the lay person. A marketing class prepared her for promoting her freelance TV hosting and public speaking businesses. And

"My degree taught me to ask the right questions, find the right experts and find the right answers — and I can do that in pretty much any challenge I'm handed."



Canada History TV
"War Junk Pilot"
January 2012

ESPN
"Rise Up"
June 2011 – December 2011

National Geographic Channel
"The Egyptian Job"
July 2010 – July 2011

DIY Network
"Money Hunters"
June 2009 – October 2011

Discovery Channel
"Smash Lab"
September 2007 – August 2008

WGBH /PBS
"Design Squad"
June 2006 – April 2007

her overall WUSTL experience showed her how to bone up on myriad TV-show subjects, ranging from Egyptian pyramid robberies to gymnasium renovation to Chinese war artifacts.

That Bell would enjoy an unconventional engineering career does not surprise Phil Bayly, PhD, the Lilyan and E. Lisle Hughes Professor of Mechanical Engineering.

"TV host is a couple of standard deviations outside the mean path, but Washington University makes an effort to bring in engineers who also want to nurture other interests," Bayly says.

Landing her first job in the media-rich city of Los Angeles kickstarted Bell's career. While working in L.A. as a Raytheon aerospace systems designer, she auditioned for a science-focused TV show. Although the program never materialized, the producers' amazement over a camera-ready female engineer in their presence and their numerous call-backs validated her emerging goal of television hosting.

"They were so excited that I existed," Bell says. "That's when I realized there was a really big need for women in science to get out there and be seen."

Bell's first television role in 2006 resulted from an opportunity she learned about while in the Philippines during a six-month solo tour of the globe. Her decision to book a quick flight to the Boston audition has led to five years of steady work promoting a new brand of geek chic.

"Being a nerd is cool right now, so I'm rockin' that," Bell says.

At WUSTL in February for an Engineering Week presentation, Bell contemplated a long-term goal of producing and hosting her own TV show. Her dream's not about being a celebrity but ramping up what she calls her engineering evangelism.

"A lot of people just want the fame," Bell says. "But I just love the fact that being on TV gives me the opportunity to promote science and engineering, which I'm passionate about."

2012 >>

ALUMNI ACHIEVEMENT AWARD

Dr. Larry Chiang
Senior Advisor, Former President, Siemens
Telecommunication Systems

Mr. Richard Janis
President, William Tao & Associates

Dr. Deepak Kantawala
Consultant, Mahindra Consulting Engineers

Dr. Janice Karty
Technical Fellow, The Boeing Co.

Dr. Milind Kulkarni
Chief Technology Officer,
Solar Materials Business Unit, MEMC
Electronic Materials

Mr. James McKelvey Jr.
Co-Founder, Square, Inc. Co-Founder/
Owner, Third Degree Glass Factory,
Founder/President, Mira Digital Publishing

2012 YOUNG ALUMNI AWARD

Dr. Jennifer Dionne
Assistant Professor, Department of Materials
Science & Engineering, Stanford University

2012 DEAN'S AWARD

Dr. Salvatore Sutera
Senior Professor, Former Dean,
School of Engineering & Applied Science,
Washington University

Watch a short video of each
awardee highlighting how
Washington University had an
impact on their careers and
why they were nominated for
these prestigious awards:
[engineering.wustl.edu/
alumniawards](http://engineering.wustl.edu/alumniawards)



Left to right: Deepak Kantawala, Milind Kulkarni,
Larry Chiang, James McKelvey Jr., Dean Ralph Quatrano,
Richard Janis, Jennifer Dionne, Janice Karty
(Not pictured: Salvatore Sutera)

Engineering Alumni Achievement Awardees

Engineering welcomes new faculty members

“Since last year, we recruited 14 of the most promising young and distinguished senior researchers and educators. These remarkable new faculty members chose Washington University over any other engineering school because they recognize our vision for excellence, and they realize the many opportunities and connections available throughout our university and community,” says Dean Ralph Quatrano.



PARAG BANERJEE

- » Joined WUSTL in July 2011
- » Assistant Professor in the Department of Mechanical Engineering & Materials Science
- » PhD, University of Maryland, College Park
- » Spent six years at Micron Technology working on D-RAM, S-RAM and FLASH dielectric and device reliability issues
- » Research areas: synthesis of nanomaterials, integration of materials into “performance enhancing” nano-architectures



JAN BIESCHKE

- » Joined WUSTL in January 2012
- » Assistant Professor in the Department of Biomedical Engineering
- » PhD, Max Planck Institute for Biophysical Chemistry
- » Postdoctoral fellow at the Scripps Research Institute in La Jolla, Calif.
- » Research areas: processes of protein folding and misfolding and how these processes can lead to widespread aging-related diseases such as Alzheimer’s and Parkinson’s



SHINUNG CHING

- » Will join WUSTL in May 2013
- » Assistant Professor in the Department of Electrical & Systems Engineering
- » PhD, University of Michigan–Ann Arbor
- » Postdoctoral research fellow at Harvard Medical School and Massachusetts Institute of Technology
- » Research areas: systems and control engineering and neural medicine, use of control theory and dynamical systems to elucidate brain network dynamics



JOHN CUNNINGHAM

- » Joined WUSTL in March 2012
- » Assistant Professor in the Department of Biomedical Engineering
- » PhD, Stanford University
- » Postdoctoral fellowship in machine learning at the University of Cambridge
- » Research areas: advance understanding of learning and pattern generation in computational and biological systems



TAE SEOK MOON

- » Joined WUSTL in July 2012
- » Assistant Professor in the Department of Energy, Environmental & Chemical Engineering
- » PhD, Massachusetts Institute of Technology
- » Postdoctoral fellowship at Massachusetts Institute of Technology and University of California–San Francisco
- » Research areas: creating programmable cells that process multiple input signals and produce desirable outputs for real-world applications



KRISTEN NAEGLER

- » Joined WUSTL in March 2012
- » Assistant Professor in the Department of Biomedical Engineering
- » PhD, Massachusetts Institute of Technology
- » Postdoctoral associate at the Koch Institute, Massachusetts Institute of Technology
- » Research areas: computational molecular systems biology, post-translational modifications, signal transduction and proteomics



AMIT PATHAK

- » Will join WUSTL in January 2013
- » Assistant Professor in the Department of Mechanical Engineering & Materials Science
- » PhD, University of California–Santa Barbara
- » Postdoctoral fellowship at the University of California–Berkeley
- » Research areas: biomechanics, biomaterials, cellular mechanics, mechanobiology of the cell, and interactions between cells and extracellular matrices



JONATHAN SILVA

- » Joined WUSTL in July 2012
- » Assistant Professor in the Department of Biomedical Engineering
- » PhD, Washington University in St. Louis
- » Postdoctoral research at Washington University in St. Louis and the University of Chicago
- » Research areas: how perturbations to molecular motions propagate across time and spatial scales to affect the heart rhythm



KATHY FLORES

- » Joined WUSTL in July 2012
- » Professor in the Department of Mechanical Engineering & Materials Science and Associate Chair for Materials Science
- » Co-director of the Institute of Materials Science & Engineering
- » PhD, Stanford University
- » Research areas: mechanical behavior of structural materials, with particular emphasis on understanding structure-processing-property relationships in bulk metallic glasses and their composites



MARCUS FOSTON

- » Joined WUSTL in July 2012
- » Assistant Professor in the Department of Energy, Environmental & Chemical Engineering
- » PhD, Georgia Institute of Technology
- » Postdoctoral fellowship at the Georgia Institute of Technology
- » Research areas: renewable synthetic polymers derived from biomass feedstocks, inspired by existing polymer systems



HUMBERTO GONZALEZ

- » Joined WUSTL in September 2012
- » Assistant Professor in the Department of Electrical & Systems Engineering
- » PhD, University of California–Berkeley
- » Research areas: broad area of dynamical systems, with an emphasis on computational tools for cyber-physical systems



SPENCER LAKE

- » Joined WUSTL in July 2012
- » Assistant Professor in the Department of Mechanical Engineering & Materials Science
- » PhD, University of Pennsylvania
- » Postdoctoral fellow at the University of Minnesota
- » Research areas: soft tissue biomechanics, with an emphasis on orthopaedic tissues, such as tendon and ligament



FUZHONG ZHANG

- » Joined WUSTL in August 2012
- » Assistant Professor in the Department of Energy, Environmental & Chemical Engineering
- » PhD, University of Toronto
- » Postdoctoral fellowship at the University of California–Berkeley
- » Research areas: engineering microbes for the production of advanced biofuels

Guérin named chair of Computer Science & Engineering



Roch Guérin, PhD, has been named chair of the Computer Science & Engineering department at Washington University in St. Louis effective July 1, 2013.

Guérin is the Alfred Fidler Moore Professor of Telecommunications Networks and professor of electrical and systems engineering and computer and information science at the University of Pennsylvania, where he has been on the faculty since 1998.

“I am delighted to welcome Roch Guérin to the School of Engineering & Applied Science,” says Ralph Quatrano, PhD, dean

and the Spencer T. Olin Professor. “His research will complement and enhance research already under way in the department, and he will be a strong leader for the growing department.”

Guérin will succeed Jeremy Buhler, PhD, who has been interim chair since July 1, 2011, when former chair Gruiá-Catalin Roman, PhD, became dean of engineering at the University of New Mexico. Guérin also will be named the Harold B. and Adelaide G. Welge Professor of Computer Science at Washington University.

From 2001 to 2004, Guérin was on leave from Penn to start Ipsum Networks, which pioneered the concept of route analytics for managing IP networks. Prior to joining Penn, he held various positions at the IBM T.J. Watson Research Center.

A Paris native, Guérin earned master’s and doctoral degrees in electrical engineering from California Institute of Technology and a bachelor’s degree from ENST Paris.

Faculty receive prestigious awards



Lan Yang received a 2011 Presidential Early Career Award for Scientists & Engineers (PECASE)

President Barack Obama awarded Associate Professor Lan Yang, PhD, a 2011 PECASE for innovative research in microlasers on a silicon wafer and development of photonic devices with applications from optical communications to ultra-sensitive biochemical sensing; and for pioneering studies of real-time, in-situ detection and sizing of nanoparticles using low-power on-chip devices.

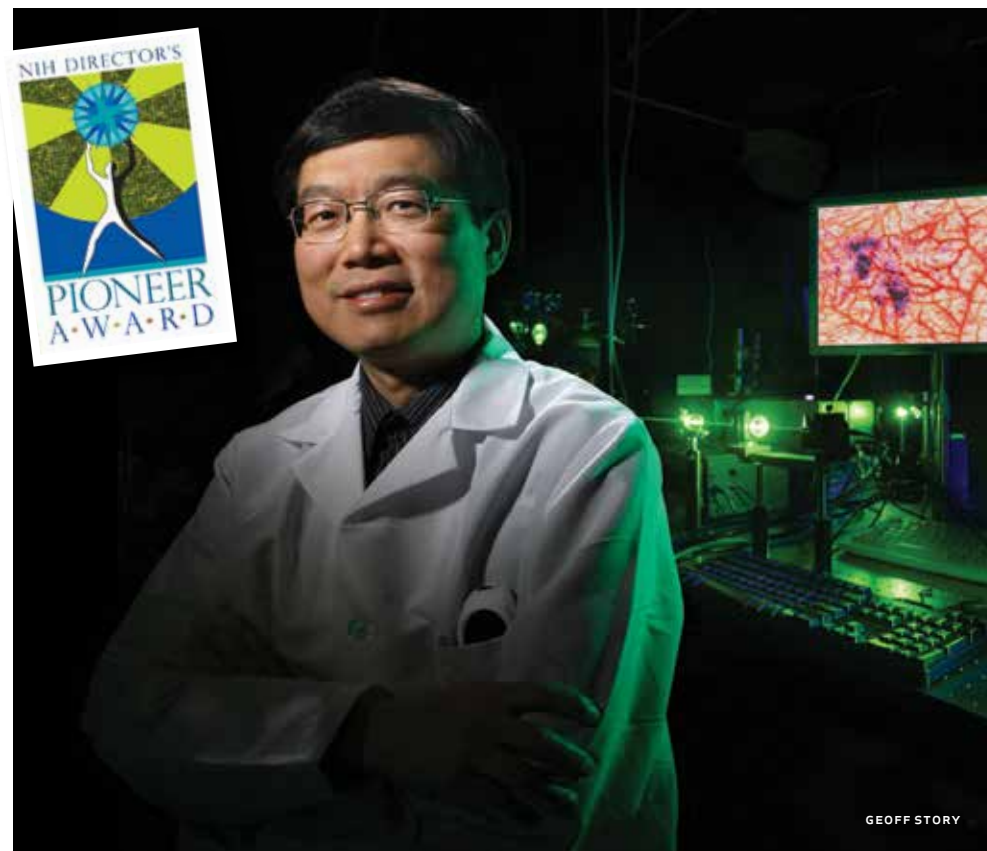
PECASE is the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers.

Lihong Wang receives NIH Director's Pioneer Award

Lihong Wang, PhD, received an National Institutes of Health (NIH) Director's Pioneer Award to explore novel imaging techniques using light that promise significant improvements in biomedical imaging and light therapy.

One of only 10 recipients of the highly competitive award, Wang was selected from among 600 applicants. The award supports individual scientists of exceptional creativity who propose pioneering – and possibly transforming – approaches to major challenges in biomedical and behavioral research, according to the NIH.

The award will provide Wang with a total budget of \$3.8 million over five years. Wang, who invented functional photoacoustic tomography and 3D photoacoustic microscopy, has more than \$40 million in current and past research awards. His 39-member lab has 15 doctoral students and 20 postdoctoral researchers.



NSF grants CAREER Award to Young-Shin Jun, Kunal Agrawal and Kilian Weinberger



YOUNG-SHIN JUN

Young-Shin Jun, an assistant professor in the Department of Energy, Environmental & Chemical Engineering, received a 2011 NSF CAREER Award.

Her project is titled: "CAREER: Understanding CO₂-Fluid-Mineral Interfacial Reactions for Sustainable Geologic CO₂ Sequestration: An Integrated Research and Education Plan."



KILIAN WEINBERGER

Kilian Q. Weinberger, PhD, assistant professor of computer science & engineering, received a 2012 NSF CAREER Award.

Weinberger will use the award to perfect a type of machine learning that could be useful for a broad array of applications. Weinberger's CAREER project, "New Directions for Metric Learning," seeks to solve one of the fundamental problems of machine learning: how to compare individual texts, images or sounds. If an algorithm could perfectly determine whether two instances of a data type are similar or dissimilar, most subsequent machine learning and data analysis tasks would become trivial, he says.



KUNAL AGRAWAL

Kunal Agrawal, PhD, assistant professor of computer science & engineering, received a 2012 NSF CAREER Award.

The goal of Agrawal's project, titled "Provably Good Concurrency Platforms for Streaming Applications," is to design platforms that will allow programmers to easily write correct and efficient high-throughput

parallel programs. In particular, her platforms will be useful for data-intensive applications, such as audio, video and signal processing, allowing these applications to run on modern multicore machines.

New professorship announcements



PRATIM BISWAS

Pratim Biswas, PhD, is the new Lucy and Stanley Lopata Professor. Chancellor Mark S.

Wrighton installed him in a ceremony on Oct.

10, 2011. Biswas, chair of the Department of Energy, Environmental & Chemical Engineering

(EECE), is one of the world's leading experts in aerosol science.



RICHARD AXELBAUM

Richard Axelbaum, PhD, was installed as the new Stifel & Quinette Jens Professor of Environmental Engineering Science on Oct. 31, 2011.

Axelbaum is currently the Director of the Consortium for Clean Coal Utilization.

His present research efforts in synthesis are directed toward producing next-generation battery materials.

Faculty promotions:

- » Dennis Barbour promoted to associate professor
- » Jeremy Buhler promoted to professor
- » Daren Chen promoted to professor
- » Christopher Gill promoted to professor
- » Jr-Shin Li promoted to associate professor
- » Robert Pless promoted to professor
- » Shelly Sakiyama-Elbert promoted to professor
- » Lan Yang promoted to associate professor

Select Research Grants from FY12 & FY13

Michael Brent, PhD

\$1,370,000; 4 years (PI)

National Institutes of Health
Title: "Linking Gene Regulation to Metabolism"

Igor Efimov, PhD

\$2,065,048; 4 years (PI)

National Heart, Lung, and Blood Institute
Title: "Arrhythmogenic Remodeling in Human Heart Failure"

Guy M. Genin, PhD

\$2,000,000 (Co-PI)

National Institutes of Health
Objective: construct artificial tissue models that will allow the rapid testing of new drugs for heart failure

Vitaly Klyacko, PhD

\$1,690,595; 5 years (PI)

National Institutes of Neurological Disorders and Stroke
Title: "Multiple Roles of RMRP in Synaptic Function and Plasticity"

Dan Moran, PhD, Kilian Weinberger, PhD, and Eric Leuthardt, MD

\$2,000,000; 4 years

Title: "Development of New Algorithmic Models and Tools to Enhance Neural Adaptation in Brain Computer Interface Systems"

Arye Nehorai, PhD

\$800,000; 5 years (PI)

Air Force Office of Scientific Research
Title: "Radar Methods in Urban Environments"

Select Research Grants from FY12 & FY13

Jody O'Sullivan, PhD

\$611,070; 5 years (PI)

National Institute of Health
Title: "Quantitative Dual-Energy CT Imaging for Radiation Therapy Treatment Planning"

Baranidharan Raman, PhD

\$732,084; 3 years (PI)

Office of Naval Research
Title: "Neuromorphic Chemical Sensing Using Miniaturized Microsensor Arrays"

Yoram Rudy, PhD

\$1,520,000; 4 years (PI)

National Heart, Lung, and Blood Institute
Title: "Inverse and Forward Problems in Electrocardiography"

Shelly Sakiyama-Elbert, PhD

\$2,359,656; 5 years (Co-PI)

National Institutes of Health
Title: "The Effects of GDNF on Peripheral Nerve Regeneration"

Srikanth Singamaneni, PhD

\$455,000; 3 years (Co-PI)

U.S. Army
Title: "Label-Free, Point-of-Service Assay for Noninvasive Detection of Kidney Cancer"

Venkat Subramanian, PhD

\$2,000,000 (PI)

Department of Energy
Objective: Design a battery management system for lithium-ion batteries that will guarantee their longevity, safety and performance

Weixiong Zhang, PhD

\$1,185,600; 4 years (PI)

National Institutes of Health
Title: "A novel co-expression network approach that is robust to genetic heterogeneity and its applications"

\$9 million to advance energy research

Washington University continues to lead in developing advanced energy sources while preserving the environment. The U.S. Department of Energy awarded nearly \$9 million to faculty in the Department of Energy, Environmental & Chemical Engineering for work in solar energy, lithium-ion batteries and clean coal technology.

As part of the \$125 million U.S.-India Joint Clean Energy Research and Development Center, the department will receive about \$4.4 million from federal grants and a gift from MEMC Electronic Materials Inc.

WUSTL and its McDonnell International Scholars Academy partner, the Indian Institute of Technology, Bombay IIT together with corporate partners, will play key roles in the effort as part of a consortium to define and invent solar technologies that might make this leap possible. The consortium has launched the Solar Energy Research Institute in India and the United States (SERIUS) to coordinate its efforts.

In August, the Department of Energy (DOE) awarded \$2 million to a team of WUSTL engineers to design a battery management system for lithium-ion batteries that will guarantee their longevity, safety and performance. Coupled with \$1.2 million in matching funds, the total award is \$3.2 million. The project is one of 12 that won funding from the DOE's Advanced Research Projects Agency-Energy (ARPA-E) under the new AMPED program that focuses on innovations in battery management and storage to advance electric vehicle technologies and to help improve the efficiency and reliability of the electrical grid.

Also, Richard Axelbaum, PhD, and his team received two grants totaling more than \$1.3 million to develop innovative ways to burn coal for energy.

One of the grants, a one-year, \$836,000 grant from the U.S. Department of Energy, funds a project that will evaluate the technical feasibility and improved economics of a unique



pressurized system, which uses a staged combustion approach.

The second grant of nearly \$500,000 comes from the State of Wyoming's Advanced Conversion Technology Research Program, which was created to stimulate research and development in the area of low-emissions and advanced coal technologies. This three-year funding also will support staged oxy-combustion research, specifically atmospheric pressure experiments using Powder River Basin coal at the university's Advanced Coal and Energy Research Facility (ACERF).

As a leader in the scientific community with a mission of teaching, research and service to society, the School of Engineering & Applied Science is the anchor for a portfolio of initiatives addressing global climate change, including solar energy, clean coal technology, sustainability and clean water and air. Through the International Center for Advanced Renewable Energy and Sustainability (I-CARES), the McDonnell Academy Global Energy and Environmental Partnership (MAGEEP) and other efforts, our mission is to generate new knowledge to enhance human life and improve our planet.

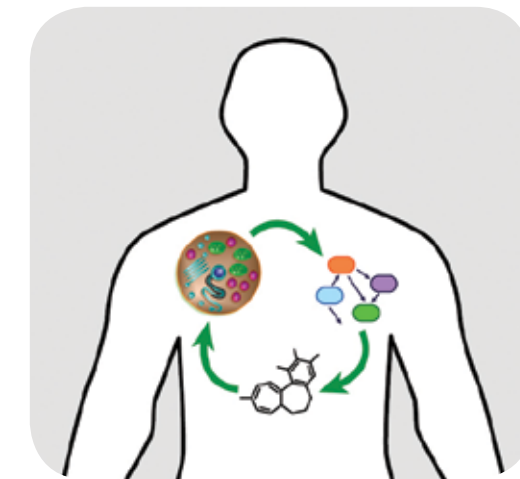
The Last Word: *System*

The word "system" brings to mind images of a vehicle's engine, circuit boards on a computer or the entrance and exit ramps that make up a highway. The individual parts in these systems must work together for a common purpose, whether it's to start the vehicle, type a document or drive across town. If one part doesn't do its job, the whole system goes awry.

The same applies to the human body. For example, if you touch a hot stove, nerves send messages through the spine to the brain that the surface is hot, and then the brain triggers a response.

Today, engineers and scientists at Washington University's Center for Biological Systems Engineering (CBSE) are using the systems approach to improve knowledge about complex diseases such as cancer, cardiovascular disorders and neurodegenerative diseases.

Although the CBSE researchers are from diverse areas of biomedical science and engineering, they share a common goal. By utilizing their collective expertise to better



understand complex diseases as a system, they expect to find new ways to diagnose, treat and prevent some of the greatest health challenges of the 21st century.

The CBSE launched in September with a daylong symposium, sponsored by Lockheed Martin, that included faculty speakers from the university's School of Engineering & Applied Science and School of Medicine, as well as world leaders in their fields from academia and industry.



cbse.wustl.edu

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& Systems Engineering, is the new entrance on the
northeast side of the Danforth Campus.*

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