

SPRING 2009

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# Engineering Momentum

ACROSS DISCIPLINES. ACROSS THE WORLD.™

 Washington University in St. Louis

## Engineering

>> Breaking Ground: Stephen F. & Camilla T. Brauer Hall

> 4

>> A Quality Trip: Young Engineers Visit Beijing

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>> Finding Global Success

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Consortium  
for Clean Coal  
Utilization  
Shedding Light  
on Clean Coal  
Technologies



*In October 2008, ground was broken at the Danforth Campus's northeast corner for Stephen F. & Camilla T. Brauer Hall. The 150,875-square-foot building is expected to see completion in 2010. Read more on page 4.*

*Photo by GEOFF STORY*



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SPRING 2009

 Washington University in St. Louis

## Engineering

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Photo by GEOFF STORY



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# The Steady, Strong Leadership of Dean Sal Sutera

Written by **TONY FITZPATRICK**

*>> Salvatore P. Sutera, Ph.D., senior professor of biomedical engineering and esteemed member of the School of Engineering & Applied Science faculty for almost 40 years, was appointed interim dean in July 2008, an appointment applauded by faculty, alumni, administrators and students alike.*



**SALVATORE P. SUTERA**  
Dean, School of Engineering  
& Applied Science

Salvatore P. Sutera, Ph.D., Washington University senior professor of biomedical engineering and dean of the School of Engineering & Applied Science, began his long and distinguished career at Washington University as chair of mechanical engineering in August 1968. As Chicago raged with revolutionary fury that month, Sutera, sitting in the tranquility of his Bryan Hall office, could have had little inkling that, 40 years later, he would be heading the school that brought him here from Brown University to establish a research linkage between engineering and the WUSTL School of Medicine. In those 40 years, he did that and much more, serving the University and the School in a variety of capacities and making important contributions to engineering and medicine.

He gave up the chair duties in 1982, only to serve as acting chair again from July 1985 to January 1986. He again became permanent chair in February 1986 until 1996.

When the announcement was made of the formation of the new Department of Biomedical Engineering in 1996, Sutera served as acting chair of that department until the arrival in 1997 of current chair Frank C- P Yin, M.D., Ph.D., the Stephen F. & Camilla T. Brauer Distinguished Professor of Biomedical Engineering.

Sutera has long been recognized for his work in biomedical engineering, particularly with the application of fluid dynamics to problems of blood circulation. His research interests include the fluid mechanics of blood flow, drag reduction by boundary-layer control and the effects of turbulence on heat transfer, among other topics.

Prior to coming to Washington University, Sutera was a member of the Brown University engineering faculty from 1960 to 1968.

He earned his bachelor's degree in mechanical engineering in 1954 from Johns Hopkins University and a master's and doctorate in mechanical engineering from the California Institute of Technology in 1955 and 1960, respectively.

WUSTL PHOTO



**LEFT** Sutera studying the degradation of red cells in shear flow in 1968.

**BELOW** Sutera talks with Engineering Student Council President Lee Cordova.



Photo by DAVID KILPER/WUSTL PHOTO



*“As interim dean, I plan to be around for one or two years, but I am committed to the vision of the past two years, which we call the Plan for Excellence,” Sutera said. “We have the new building under construction. It will be shared by Energy, Environmental & Chemical Engineering and Biomedical Engineering. There are a lot of exciting things ahead of us here in alternative energy and sustainability research. It’s a major thrust of engineering at Washington University.”*

Sutera and his wife, Celia, met at Cal Tech and have three daughters, Marie-Anne, an attorney, Annette, first assistant director for the popular TV drama “Grey’s Anatomy,” and Michelle, a social worker. Their four grandchildren are all in St. Louis. All of the daughters are WUSTL alumnae.

Sutera eagerly anticipates the days when he can consult a little, attend research conferences and follow the work of his colleague Jin-Yu Shao, Ph.D., WUSTL associate professor of biomedical engineering, which he did for five years before serving WUSTL again this past year.

» For more information about Dean Sutera and the School’s strategic plan, visit the School’s Web site: [engineering.wustl.edu](http://engineering.wustl.edu).



**Send Us Your Comments**

We are excited to share our plans and initiatives with you, and we very much want to hear your ideas and reactions to them. Please write us at [magazine@seas.wustl.edu](mailto:magazine@seas.wustl.edu), and share your thoughts.

# BREAKING GROUND:

## Stephen F. & Camilla T. Brauer Hall

### BRAUER HALL

*Looking north from Brookings Drive, Brauer Hall is the newest addition to the School of Engineering.*

In fall 2008, the University received a major commitment from Stephen and Camilla Brauer to help implement the long-range strategic plan of its School of Engineering & Applied Science.

The commitment was made in the form of a challenge grant, which will match all gifts and commitments from alumni, parents and friends – up to the maximum of the commitment by the Brauers – that are earmarked for support of the annual and long-term needs of the engineering school. These include scholarships and

fellowships, research, new and ongoing academic programs and initiatives, the annual fund and construction and renovation of physical facilities.

“Steve and Kimmy Brauer are two of St. Louis’s and America’s most distinguished citizens,” Chancellor Mark Wrighton said. “They have been steadfast friends of Washington University for many years, and through their leadership, generosity and service, they have left an indelible imprint both on the University and the School of Engineering.”



Image courtesy of RMJM HILLIER

Photo by CAMPUS IN FOCUS



FROM LEFT TO RIGHT *William Danforth, Camilla Brauer, Stephen Brauer, Chancellor Mark Wrighton, Risa Zwerling-Wrighton*

### Building on Tradition

On October 29, 2008, ground was broken for the second building in a new complex for the engineering school, located near the northeastern perimeter of the Danforth Campus. Wrighton announced that the building will be named Stephen F. & Camilla T. Brauer Hall in honor of the Brauers to recognize their longstanding devotion to and impact on the University.

Wrighton said that since Stephen Brauer joined the Board of Trustees in 1991, he has championed the goal of accelerating Washington University's ascent among the world's premier universities and building a leading engineering school.

"The University has benefited greatly from Steve's wisdom and experience," Wrighton said. "As vice chair and now chair-elect of the Board of Trustees and chair of the School of Engineering's National Council, he is helping guide the long-term strategic planning process that will set the direction for both the University and the School as we work to address the challenges facing society in our fast-changing world."

Stephen Brauer, former U.S. ambassador to Belgium, is chairman of Hunter Engineering Co., a leading manufacturer of computer-based automotive service equipment for the global market, headquartered in St. Louis. Camilla Brauer is a leading figure in local cultural and civic organizations and has been recognized nationally for her volunteer work as a fund-raiser.

### BRAUER HALL FACTS

>> SQUARE FEET

150,875

>> LEED® RATING

Gold

>> NUMBER OF NEW RESEARCH LABS

25

>> NUMBER OF DISTANCE LEARNING LAB SEATS

86

>> GROUNDBREAKING

10.29.08

>> EST. COMPLETION

2010



SPECIAL FEATURE

Visit [engineering.wustl.edu/brauerhall](http://engineering.wustl.edu/brauerhall) to view a Brauer Hall Web cam courtesy of Clayco.

*Brauer Hall is located on the northeast corner of the Danforth Campus, near the corner of Forest Park Parkway and Skinker Boulevard.*

*Photo by GEOFF STORY*





“Kimmy and I are proud to be so closely associated with Washington University,” Brauer said. “The University’s growth and its rise in reputation in the last 20 years have been truly remarkable. We believe the School of Engineering has terrific potential both for Washington University and for society; as well, it can be a catalyst for economic development in the St. Louis region. We are happy to add our support to its success.”

Photo by **CAMPUS IN FOCUS**



For a ceremonial photo, the Brauer family and Washington University leaders wore construction hard hats adorned with the School of Engineering & Applied Science logo.

*When Brauer Hall is completed in 2010, the 150,875-square-foot facility will serve as the home for the School of Engineering’s Department of Energy, Environmental & Chemical Engineering (EECE), provide space for the International Center for Advanced Renewable Energy & Sustainability (I-CARES) and share facilities with the University’s highly successful Department of Biomedical Engineering.*



## Energy & Environmental Initiatives

In addition to new EECE labs, Brauer Hall will serve as the home of I-CARES, a major initiative that encourages and coordinates University-wide and external collaborative research with other regional research institutions.

I-CARES is directed by Himradi Pakrasi, Ph.D., the George William and Irene Koechig Freiberg Professor of Biology in Arts & Sciences and professor of energy in the School of Engineering & Applied Science.

Led by Pratim Biswas, Ph.D., the Stifel & Quinette Jens Professor of Environmental Engineering Science, the EECE faculty will conduct research with industrial partners on environmental engineering science, energy systems and chemical engineering. They also plan to be international leaders in addressing global challenges in those areas and environmental public health.

## Bridge to a Bold Future

Brauer Hall will connect with Uncas A. Whitaker Hall, home of the Department of Biomedical Engineering, on all three levels of its east facade. It will present a seamless quality to those within the two structures to create an extraordinary physical presence on the northeast side of the Danforth Campus.

The Department of Biomedical Engineering, which was created in 1997, is chaired by Frank Yin, M.D., Ph.D., whose relationship with the Brauers extends back 10 years to the time when he was installed as the first Stephen F. & Camilla T. Brauer Distinguished Professor of Biomedical Engineering. The department now enrolls approximately 40 percent of undergraduate engineering students, and, in just one decade, it has become nationally recognized as one of the top biomedical engineering departments in the country.

## Preserving History

To continue the architectural style of the Danforth Campus, RMJM (formerly RMJM Hillier) was chosen because it has extensive experience in laboratory design and historic preservation.

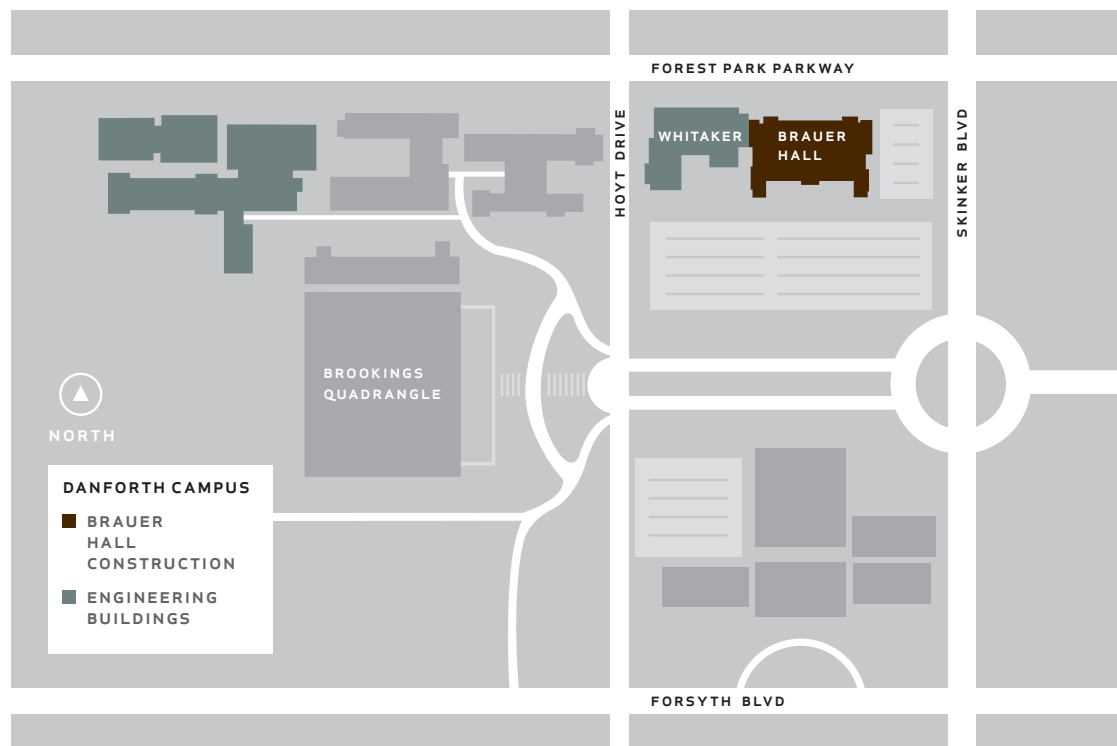
The new building will embrace the Collegiate Gothic style so characteristic of the campus, and which harkens back to the original buildings that form the Brookings Quadrangle – an architecturally rich blend of academic, ecclesiastical and palatial design spanning five centuries. In addition to state-of-the-art research and instructional laboratories, classrooms and specialized teaching areas, several conference rooms, faculty offices

and numerous student work spaces, Brauer Hall will house office suites for the dean of the School of Engineering and for the EECE department and its chairman.

An innovative feature of the new facility will be an 86-seat distance-learning classroom – the first of its kind at the University – that will be available for use by all academic departments and schools.

Facing south, the main entrance to Brauer Hall will lead into a sunlit lobby that can double as a reception area, much like the atrium entrance in Whitaker Hall.

*“We recognized that to be successful in attracting leading, research-active faculty and superb students to the School of Engineering & Applied Science, people who can help us realize our vision to establish Washington University as a hub for environmental and energy research, education, innovation and action, we must have the physical facilities supportive of and commensurate with this ambition,” said Dean Salvatore Sutura.*





Chancellor Mark S. Wrighton (right) and Salvatore P. Sutura, dean of the School of Engineering & Applied Science, presented Camilla and Stephen Brauer (from left) with a special gift to commemorate the Stephen F. & Camilla T. Brauer Hall groundbreaking ceremony.

All of WUSTL's recent construction projects have been built with environmental sustainability in mind, and this building also is being designed as a green structure according to LEED specifications for a gold rating. LEED, the acronym for Leadership in Energy and Environmental Design, is a nationally accepted rating system for the design, construction and operation of buildings that use its specifications for achieving environmental sustainability.

### Stephen F. & Camilla T. Brauer

The company Stephen Brauer heads, Hunter Engineering, was founded by his stepfather, Lee Hunter, an automotive engineer famous for his inventions, which revolutionized the automotive service industry. A native St. Louisan, Lee Hunter attended Washington University, served on the School of Engineering Task Force in the 1980s and was a member of the Board of Trustees from 1982 until his death in 1987.

Brauer started with Hunter Engineering in 1971 after serving three years in the U.S. Army Corps of Engineers. He became chief operating officer in 1978 and chief executive officer in 1980.

In the past 20 years, Hunter has achieved remarkable growth through research and new product development. In the area of machine

vision technology, in particular, Hunter has collaborated with Joseph O'Sullivan, Ph.D., the Samuel C. Sachs Professor of Electrical Engineering and dean of the UMSL/WUSTL Joint Undergraduate Engineering Program, among others, to bring that technology to the field of measuring vehicle suspension and alignment.

He is past president of the Missouri Botanical Garden Board of Trustees, a partner in The St. Louis Cardinals Baseball LP, a member of St. Louis Civic Progress, and a director of Ameren. His long association with the University began in 1987 when he joined the National Council for the School of Engineering.

Camilla Brauer is a cultural and civic leader in the St. Louis region and is vice chair of the United Way of Greater St. Louis. At WUSTL, she serves as a member of The Danforth Circle Committee of the William Greenleaf Eliot Society. In 1996, the National Society of Fund Raising Executives named her the Outstanding Fund Raising Volunteer in the United States.

Additionally, the Brauers have provided significant support for scholarships for students in the School of Engineering and in the John M. Olin School of Business.

*"We must continue to invest and strive for excellence. This magnificent new building will give us the opportunity to expand into several cutting-edge areas of biomedical engineering. These areas offer the challenges as well as the opportunity for engineering to have a huge impact on the well-being and health of humankind."*

**FRANK YIN,**  
M.D., Ph.D., the Stephen F. & Camilla T. Brauer Distinguished Professor of Biomedical Engineering and chair of the Department of Biomedical Engineering

## Consortium for Clean Coal Utilization

# SHEDDING LIGHT ON CLEAN COAL TECHNOLOGIES

Illustration by ALICIA REED

**O**n December 2, 2008, Washington University in St. Louis Chancellor Mark S. Wrighton announced the establishment of the Consortium for Clean Coal Utilization.

The University has dedicated more than \$60 million in financial resources during the past year to advance education and research related to energy, environment and sustainability. The new consortium will receive additional support in the form of research partnership commitments of \$5 million each from Arch Coal and Peabody Energy and \$2 million from Ameren, to be paid over five years.

*The consortium's goal is to bring University researchers, industries, foundations and government organizations together to research clean coal technology, making St. Louis the nation's center for clean coal research.*

"Despite these difficult financial times, the University and these lead corporate sponsors

realize that investment in such research will benefit the region and the world in the long run," Wrighton said. "The knowledge and technology we will be able to create together will over time mean lower costs to customers and global environmental improvement."

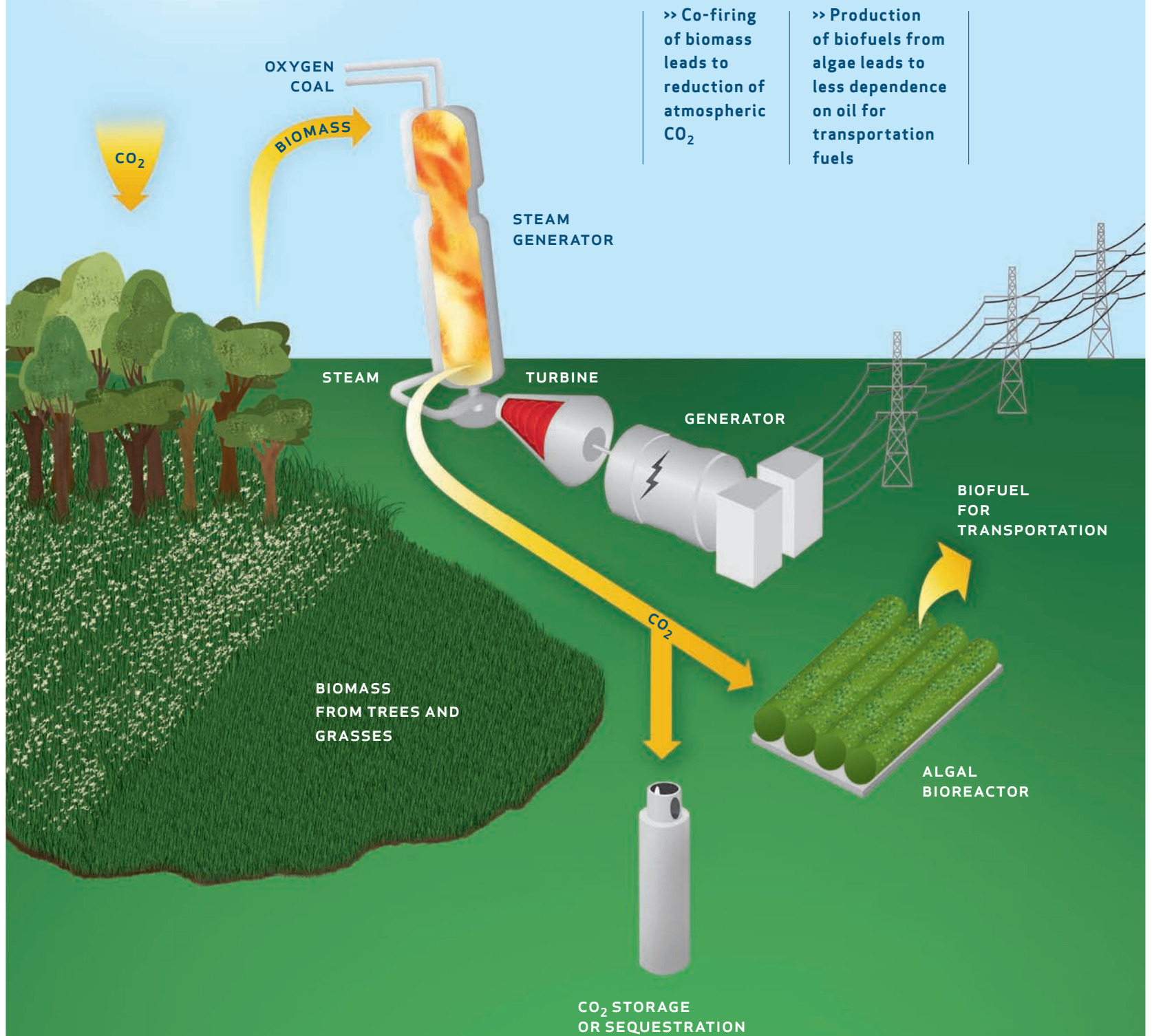
The consortium will foster work to explore co-combustion of coal with biomass or combustion of coal in pure oxygen, both of which can lead to reductions in carbon emissions. Other studies of approaches to carbon capture and storage will also be a part of the consortium's work.

Biomass is a renewable source of energy, and the research of the consortium will help to address Missouri's mandate that renewables comprise a portion of the electricity generated in the state.

The consortium will operate under the umbrella of the International Center for Advanced Renewable Energy & Sustainability (I-CARES), which the University established in June 2007.

The financial commitment to establish I-CARES includes creating six endowed professorships, funding \$3 million for seed research and constructing a new 150,875-square-foot building

## CLEAN COAL POWER PLANT OF THE FUTURE



Washington University leaders traveled to Hong Kong to announce the formation of the Consortium for Clean Coal Utilization. From left to right: A.K. Suresh, IIT Bombay; Pratim Biswas, Washington University; Jiming Hao, Tsinghua University; Richard Axelbaum, Washington University; Chancellor Mark Wrighton, Washington University; Fred Palmer, Peabody Energy; and Steve Leer, Arch Coal.



WUSTL PHOTO

***“From a university perspective, this is an exciting way to take coal – one of the nation’s most abundant energy resources – and put it to work for the public good. The University will also work to build public understanding of the energy options for the future. The Consortium for Clean Coal Utilization will place St. Louis at the center for clean coal research.”***

**— MARK WRIGHTON, CHANCELLOR**

to house the University’s Department of Energy, Environmental & Chemical Engineering and I-CARES programs.

The new building – called Stephen F. & Camilla T. Brauer Hall – will be completed in 2010. So far, the University’s total commitment to new facilities, new professorships and programmatic support for I-CARES exceeds \$60 million.

“In this consortium dedicated to clean coal utilization, we are forming an international partnership between universities, industries, foundations and government organizations to foster improved efficiency, lower emissions and develop ways to address climate change,” Wrighton said.

The University also announced the establishment of the Consortium for Clean Coal Utilization at a news conference December 8, 2008, in Hong Kong at the Second International Symposium on Energy & Environment, organized by Washington University’s McDonnell International Scholars Academy.

Twenty-four premier research universities from around the world are partnered with Washington University through the McDonnell Academy. As they work together to address issues related to energy, environment and sustainability, the Consortium for Clean Coal Utilization will encourage collaborative research involving these university partners, including partners in China and India with major energy needs being met by coal.

“Peabody is the global leader in clean coal solutions, advancing signature projects around the world to commercialize near-zero-emission technologies, including GreenGen in China, the COAL21 Fund in Australia and Vision 21 and FutureGen in the United States,” said Peabody Energy Chairman and Chief Executive Officer Gregory H. Boyce. “Greater use of clean coal is the ultimate solution for re-energizing the world economy, creating tens of thousands of green jobs and building energy security. We applaud Washington University for its leadership in

establishing this global consortium, which will drive energy security, economic growth and environmental solutions that contribute to quality of life around the world.”

“Arch Coal is pleased to partner with Washington University in St. Louis and some of our region’s leading energy companies on this important new initiative,” said Arch’s chairman and chief executive officer, Steven F. Leer. “Global coal consumption has increased 35 percent in the past six years, and China, India and the rest of emerging Asia are building new coal-based power stations at a rapid pace. Arch is committed to supporting the development of new technologies that will allow this essential fuel to be used in cleaner and more climate-friendly ways. We are confident that the Consortium for Clean Coal Utilization can and will play a vital role in helping the world chart a successful course to a cleaner and more secure energy future.”

“With 65 percent of Missouri’s electricity generated by coal and the increasing likelihood of greenhouse gas reduction requirements, we must continue to invest in technologies that will allow us to meet our customers’ energy needs at a reasonable price – this is especially important given today’s challenging economic conditions,”



Photo by GEOFF STORY

**PROFESSOR RICHARD AXELBAUM**  
*Director of the Consortium  
for Clean Coal Utilization*

said Ameren’s chairman, president and chief executive officer, Gary Rainwater. “To meet that goal, coal must be a part of our fuel mix. The work of the consortium is critical to the continued use of coal in a cost-effective and environmentally safe manner. In addition, this initiative will help utility companies respond to the mandates both in Illinois and Missouri to generate double-digit percentages of our power from renewable sources. For all these reasons, we are pleased to support the consortium in this effort.”

The consortium partners will help establish the key priorities and laboratory facilities for clean coal research on Washington University’s campus. These may include pilot-scale facilities where scientists can perform fundamental research and develop new technology related to more efficient, cleaner combustion of coal and approaches to carbon capture and storage.

Some of the anticipated studies include the use of oxy-coal combustion with carbon capture and storage combined with the use of biomass to generate steam and electricity. Oxy-coal combustion is a new technology that replaces air with pure oxygen, enabling more cost-effective capture of carbon dioxide from the exhaust stream.

“The consortium has a tremendous educational value for our students and the public at large to demonstrate the potential of clean coal combustion as an enabler of new green technologies,” said Richard L. Axelbaum, Ph.D., WUSTL professor of energy, environmental and chemical engineering and director of the consortium. “Another key feature of the proposed research facility will be its unique scale, being larger than a typical university research lab but smaller than an industrial one, so it will bridge the gap between the two and allow the University to offer novel capabilities.”

Axelbaum noted that “Utilization” in the consortium title is important to the organization’s efforts.

## Steven Chu

*U.S. Secretary  
of Energy*



WUSTL PHOTO

Dr. Steven Chu, former director of the Lawrence Berkeley National Laboratory and recipient of the 1997 Nobel Prize in Physics, was the keynote speaker at the McDonnell International Scholars Academy Second International Symposium on Energy & Environment in December 2008. The same month, President-Elect Barack Obama nominated Dr. Chu to serve as United States Secretary of Energy. He was unanimously confirmed by the U.S. Senate on January 20, 2009.

Dr. Chu has a special connection to Washington University, beyond the McDonnell International Scholars Academy. Dr. Chu was born in St. Louis because his father, Ju Chin Chu, taught chemical engineering at Washington University’s School of Engineering.



## Consortium for Clean Coal Utilization

*A consortium at Washington University in St. Louis that supports research and technology for clean utilization of coal*

### THE CONSORTIUM IS A RESOURCE FOR INDUSTRY:

- > Advancing technologies for clean coal utilization
- > Partnering internationally with universities, governments, foundations and corporations
- > Addressing carbon dioxide mitigation
- > Improving public understanding of the role of coal as an energy resource and a source of chemical feedstock
- > Training a motivated and skilled workforce

### EXAMPLES OF ONGOING RESEARCH PROJECTS:

- > Oxy-coal combustion
- > Mercury and fine particle emissions control
- > Geological carbon dioxide sequestration
- > Algal systems for carbon dioxide capture
- > Co-firing biomass with coal
- > Distributed power generation in China and India

### CONSORTIUM MEMBERS:

- > Play an active role in identifying the research direction of the consortium and in the selection of research projects
- > Are kept informed of the latest advances in clean coal technology
- > Participate in the development of new coal technologies
- > Attend annual meetings, workshops and short courses

“Clean coal utilization could be for power generation, but it could also be to produce petrochemical products, synthetic natural gas or liquid fuels to reduce our dependence on foreign oil and natural gas,” he said. “Another aspect of the consortium would be to research the use of clean coal power plants as enablers of green technologies. For example, the burning of biomass, such as wood or switchgrass, with coal, and the capture and storage of the carbon dioxide in the exhaust can actually reduce greenhouse gases in the atmosphere. And the use of carbon dioxide in the exhaust stream to grow algae can lead to a source of liquid fuels while simultaneously removing carbon dioxide from the atmosphere.”

The consortium draws upon the strengths of the University’s Department of Energy, Environmental & Chemical Engineering, I-CARES and the McDonnell Academy Global Energy & Environment Partnership (MAGEEP), as well as the St. Louis regional coal companies Arch Coal and Peabody Energy, and the utility company Ameren. It is anticipated that several additional corporations will join the consortium.

A key goal of I-CARES is to foster institutional, regional and international research on the development and production of biofuels from plant and microbial systems, solar energy, and the exploration of sustainable alternative energy and environmental systems and practices. Research in the consortium will focus on the region’s important coal resources and efforts to mitigate carbon dioxide accumulation, improve combustion processes and reduce emissions.

I-CARES operates under the direction of Himadri Pakrasi, Ph.D., the George William and Irene Koechig Freiberg Professor of Biology in Arts & Sciences and professor of energy in the School of Engineering & Applied Science. Earlier this year, I-CARES funded 12 pilot projects in the areas of bioenergy, solar energy and sustainability.



*The consortium draws upon the strengths of the University's Department of Energy, Environmental & Chemical Engineering, I-CARES and the McDonnell Academy Global Energy and Environment Partnership (MAGEEP), as well as the St. Louis regional coal companies Arch Coal and Peabody Energy, and the utility company Ameren. It is anticipated that several additional corporations will join the consortium.*



Organized in 2007, MAGEEP is a consortium of 25 international universities and corporate partners of the McDonnell International Scholars Academy, including Washington University, working together in energy, environmental and sustainability research, education and sustainable campus operations.

MAGEEP operates under the direction of Pratim Biswas, Ph.D., the Stifel & Quinette Jens Professor of Environmental Engineering Science and chair of the energy, environmental and chemical engineering department.

MAGEEP research focuses on energy, aerosols and air quality, and aquatic processes and water quality issues. There are 14 projects involving Washington University faculty and MAGEEP collaborators.



Peabody Energy (NYSE: BTU) is the world's largest private-sector coal company and a global leader in clean coal solutions. Its coal products fuel approximately 10 percent of all U.S. electricity generation and 2 percent of worldwide electricity.



St. Louis-based Arch Coal (NYSE: ACI) is the nation's second largest coal producer and supplies cleaner-burning, low-sulfur coal to 148 U.S. power plants in 33 states and customers in more than a dozen countries worldwide. Through its national network of mines, Arch Coal provides 6 percent of the electricity generated in the United States.



With assets of approximately \$21 billion, Ameren (NYSE:

AEE) serves approximately 2.4 million electric customers and almost one million natural gas customers in a 64,000-square-mile area of Missouri and Illinois. Ameren owns a diverse mix of electric generating plants strategically located in its Midwest market with a generating capacity of more than 16,400 megawatts.

Washington University is counted among the world's leaders in teaching and research, and it draws students and faculty to St. Louis from all 50 states and more than 125 nations.

» For more information, visit: [cleancoal.wustl.edu](http://cleancoal.wustl.edu) or [eece.wustl.edu](http://eece.wustl.edu)

If you would like to join the consortium or seek additional information, contact the consortium director:

**Professor Richard Axelbaum**  
Department of Energy, Environmental & Chemical Engineering

**E-mail:**  
[axelbaum@wustl.edu](mailto:axelbaum@wustl.edu)

*The consortium is under the umbrella of the International Center for Advanced Renewable Energy & Sustainability, I-CARES.*

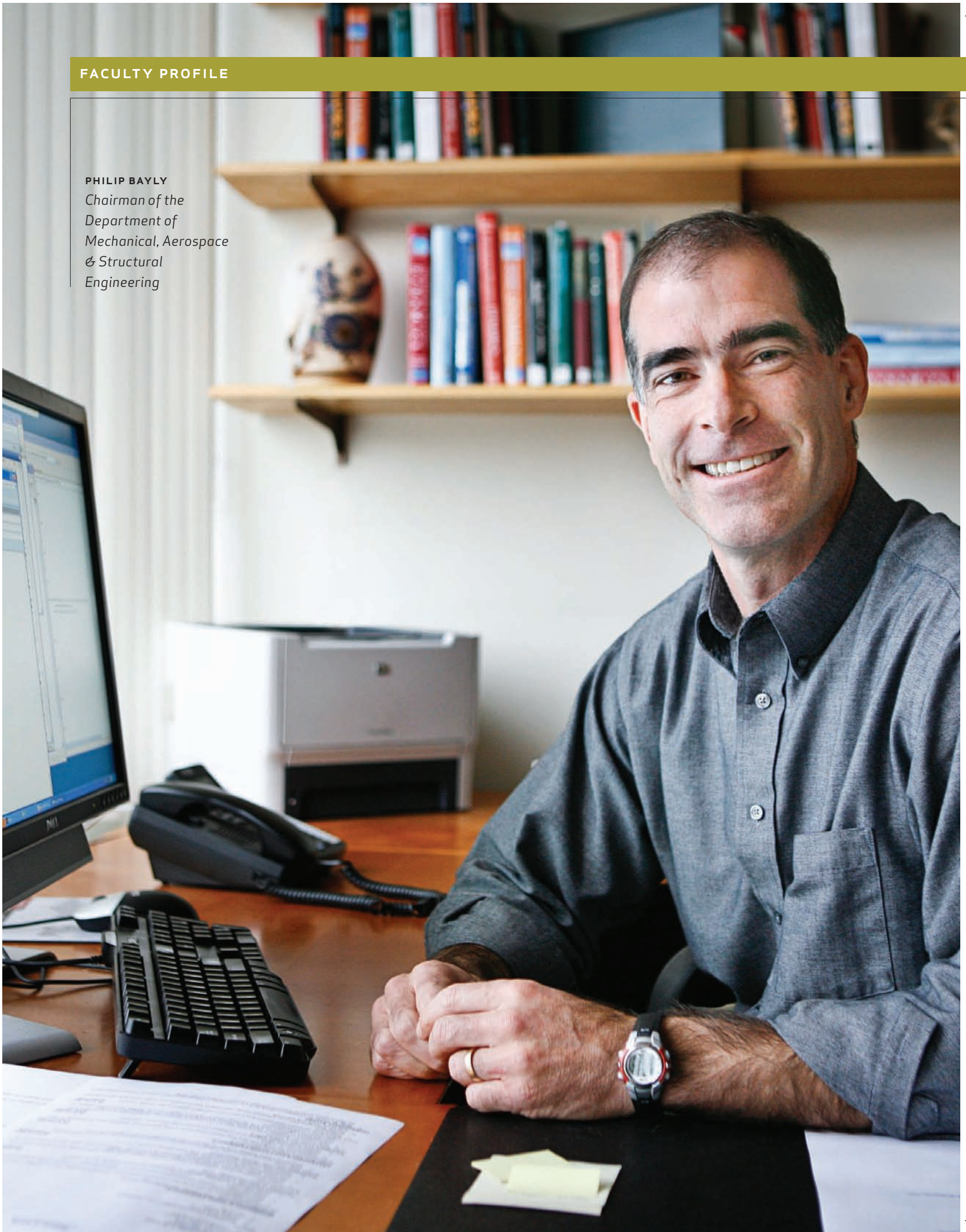
» [i-cares.wustl.edu](http://i-cares.wustl.edu)

*International collaborations are fostered through the McDonnell Academy Global Energy & Environment Partnership, MAGEEP.*

» [mageep.wustl.edu](http://mageep.wustl.edu)

FACULTY PROFILE

**PHILIP BAYLY**  
*Chairman of the  
Department of  
Mechanical, Aerospace  
& Structural  
Engineering*



# Bayly Welcomes Challenge:

NEW CHAIRMAN OF DEPARTMENT OF MECHANICAL, AEROSPACE & STRUCTURAL ENGINEERING

Written by **JAN NIEHAUS**

Photos by **GEOFF STORY**

*“Until you’re tenured, you’re holding your breath. When you get tenure, you can come up and look around,” says Philip V. Bayly, Ph.D., the Lilyan & E. Lisle Hughes Professor of Mechanical Engineering and, since August 1, 2008, chairman of the Department of Mechanical, Aerospace & Structural Engineering.*



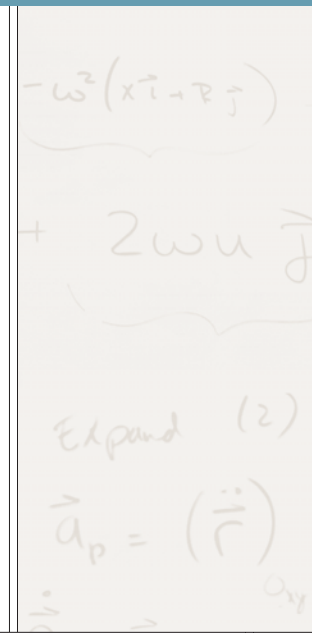
Bayly was tenured in 1999, and he promptly took a long, hard look around. “I asked myself,” he recalls, “Where do I want to spend the rest of my career?” “What do I want to work on?” I considered the professional impact of my career. Because of the medical school, there is a vast reservoir of challenges waiting for mechanical engineering insight and great people looking for collaboration. I considered the chance to work with people like Larry Taber, Ph.D., the Dennis & Barbara Kessler Professor of Biomedical Engineering, and David Van Essen, Ph.D., the Edison Professor of Neurobiology and head of the School of Medicine’s Department of Anatomy and Neurobiology, and the associated equipment

and facilities here. I concluded that Washington University is where I want to be,” he says.

## Initial Focus on Dynamics & Vibrations

Dean Salvatore P. Sutera, Ph.D., recruited Bayly from Duke University in 1993. At that time, Sutera was chairman of the Department of Mechanical & Aerospace Engineering.

“Initially, we expected Phil to be a major support teaching in the areas of dynamics and vibrations, and he has established an excellent teaching record. As time went on, he branched out into new research areas, including biomedical,” Sutera says.





*In a new project funded by the Children’s Discovery Institute, “we are studying the cellular substructures called cilia. This project ties together what I have explored previously and gives me opportunities to combine what I know about drill bits and biomechanics,” Bayly explains.*

already principal investigator or co-investigator on five projects studying brain development or brain injury. “I pretty much left manufacturing engineering after 2004,” he says.

The 2004 – 2005 academic year was significant for several additional reasons: Bayly was named the 2004 School of Engineering & Applied Science Professor of the Year, and in March 2005, he was installed as the first Lilyan & E. Lisle Hughes Professor of Mechanical Engineering. Then he took a well-deserved sabbatical – his first opportunity since receiving tenure.

### Today’s Focus: Biomechanics

Today, Bayly’s research focuses on how mechanical changes in tissues affect their function. “Phil has really established himself as a major researcher in biomechanical engineering,” Sutera observes.

One NIH-funded project focuses on traumatic brain injury, including the sort of injury that can occur when an athlete experiences a head impact. “The acceleration of the head causes the soft tissue inside the skull to be deformed and sometimes damaged,” Bayly explains. His interest is both professional and personal: he and his children are avid soccer fans and players.

Bayly holds dual appointments in the Department of Mechanical, Aerospace & Structural Engineering and in the Department of Biomedical Engineering – fields sometimes perceived as fundamentally disparate. His publications range from drilling, milling and reaming to myocardial infarction, ventricular fibrillation and traumatic brain injury. He admits, “I have a hard time turning down an interesting project.”

He became more selective, though, in 2004 – another pivotal year.

In 2004, his last manufacturing student graduated, and his last industrial research project concluded. By that time, Bayly was

Photo by DAVID KILPER/WUSTL PHOTO



Larry A. Taber, Ph.D., the Dennis & Barbara Kessler Professor of Biomedical Engineering, Gang Xu, post-doctoral research associate, and Philip Bayly, Ph.D., the Lilyan & E. Lisle Hughes Professor of Mechanical Engineering, study mechanical aspects of the folding of the brain's surface, or cortex, during development. Folding gives the higher mammalian brain more surface area (and hence more intellectual capacity) than a smooth brain of comparable volume.

He also collaborates with Larry Taber on a National Science Foundation-funded project studying how the surface of the brain, the cortex, develops its folds. Abnormal folding is associated with autism, schizophrenia and other neurological problems.

### New Challenge as Department Chair

Last year marked another milestone in Bayly's career. In July 2008, Dean Sutera appointed Bayly department chair, an offer that afforded him another opportunity to "come up and look around." Once again, as he had done in 1999 and

2004, Bayly welcomed the new challenges and additional responsibilities.

Developing the department is a top priority. "We have a tremendous challenge and opportunity. We should have 20 to 25 faculty, similar to Duke, Rice and Princeton. This is a favorable environment for a particular kind of engineer," Bayly says. He identifies a love of collaboration, versatility and a passion for exploring as the markers of success at Washington University.

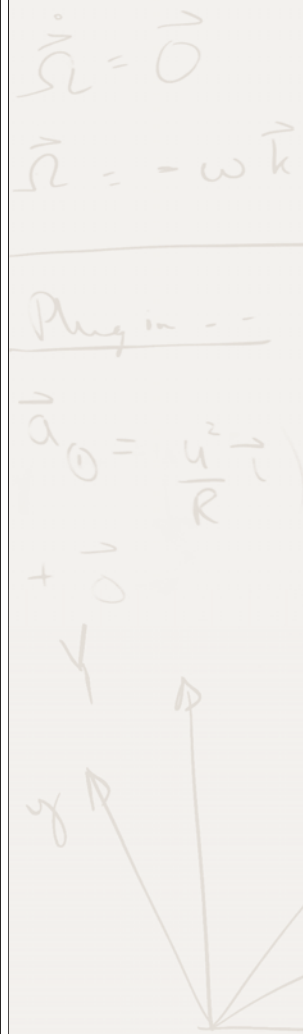
Bayly concludes, "The most exciting thing about my new position is the opportunity to help people explore, discover new knowledge and have an impact with their careers that they couldn't have anywhere else."

» For more information about Professor Bayly and his research, visit the School's Web site: [engineering.wustl.edu/faculty/bayly](http://engineering.wustl.edu/faculty/bayly).

COURTESY PHOTO



THE BAYLY FAMILY IN AKUMAL, MEXICO  
Zachary (11), Rebecca, Alison (15) and Phil.

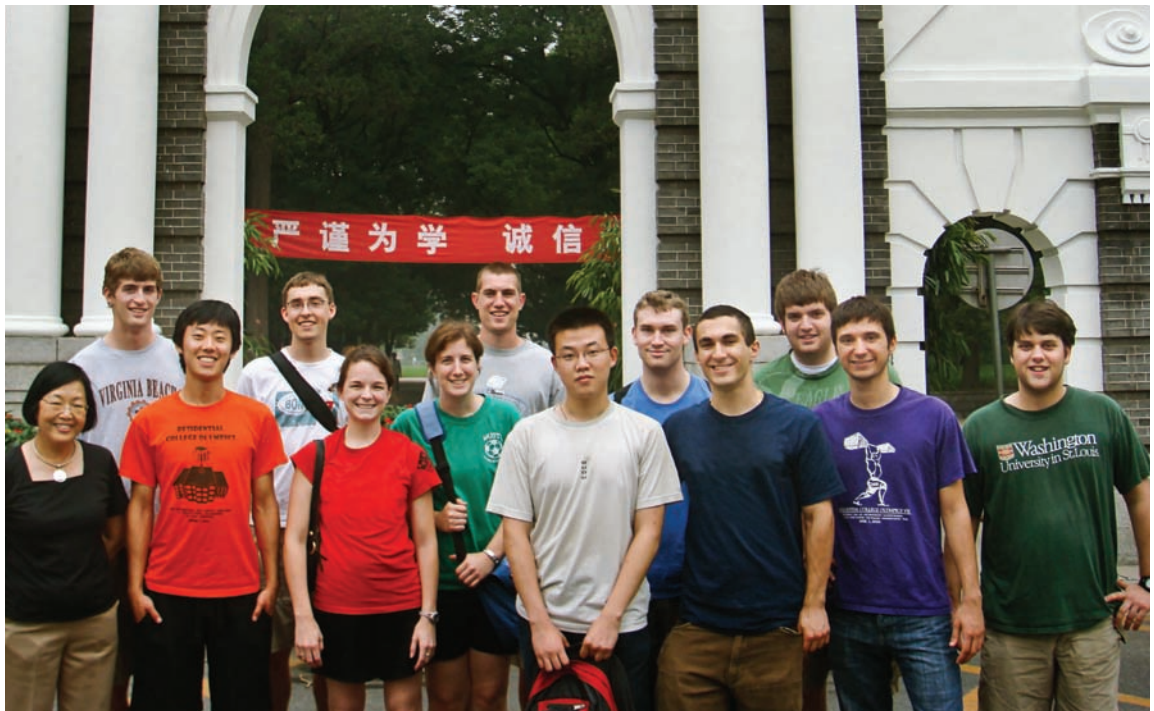


## YOUNG ENGINEERS VISIT BEIJING

# A Quality Trip

Written by CANDACE O'CONNOR

At Tsinghua University, left to right: Ruth Chen, Tyler Nading, James Wang, Cameron Ball, Liz Campbell, Nicole Stennes, Cameron Smith, Qisheng Ou, Nicholas Cobet, Neema Rastgar, Jeffrey Knudsen, Mark Kieffer and Stephen Feinberg.



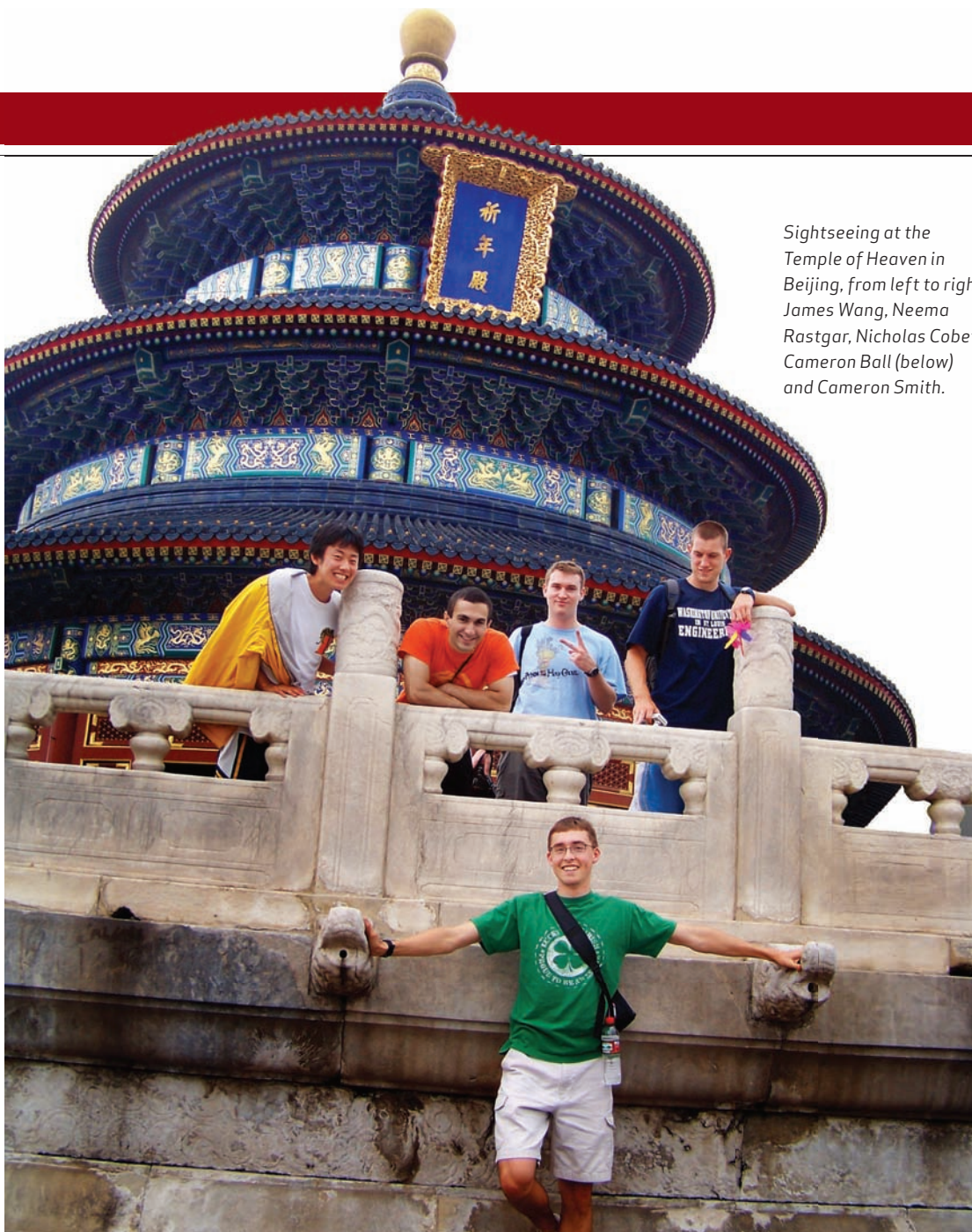
COURTESY PHOTO

Before the Olympic Games last summer, Beijing was crackling with excitement as it prepared to welcome an international group of athletes and spectators. But the city was also worried about its well-known air-quality problem – and, behind the scenes, leading scientists were working hard to monitor and alleviate it.

Amid this busy time, from June 25 to July 12, a group of 11 Washington University engineering students came to visit, led by faculty members Jay Turner and Ruth Chen. They were taking part in the inaugural International Experience class, sponsored by the Department of Energy,

Environmental & Chemical Engineering and the McDonnell International Scholars Academy, with the goal of enriching students' global understanding of air pollution.

*“China is such a rapidly developing country with a huge industrial base and big purchases of cars,” says Turner, associate professor. “We will never again see anything like this in our lifetimes. We wanted to expose students to the energy and environmental challenges in this incredibly complex system.”*



COURTESY PHOTO

Sightseeing at the Temple of Heaven in Beijing, from left to right: James Wang, Neema Rastgar, Nicholas Cobet, Cameron Ball (below) and Cameron Smith.

By the end of the trip, they had all gained an appreciation for Chinese courtesy and competence, history and technology. Most of all, through visits to air-quality sites and classes taught by Chinese faculty at prestigious Peking and Tsinghua universities, they had learned about the scope of the Chinese battle against air pollution, which was visible all around them.

“I have never seen anything like it,” says Mark Kieffer, a senior in chemical engineering from Fairview Heights, Illinois. “I only saw the blue sky about twice in two weeks. I was unaware of how many environmental issues the Chinese are

dealing with and how much they are doing to fix those problems.”

This program had its roots in a May 2007 International Symposium on Energy and Environment held at Washington University and attended by scholars from partner universities in the McDonnell International Scholars Academy, including some from Peking and Tsinghua. Ruth Chen, research associate, made contact with them, and Turner and Chen both traveled to Beijing for further meetings.

## Jay Turner

Associate Professor



Professor Turner’s research focuses on air-quality characterization with an emphasis on fine particulate matter measurements and data analysis. He is currently working with stakeholders in several states on technical aspects of their fine particulate matter air-quality management and planning processes.

Professor Turner is a 2003 recipient of Washington University’s Distinguished Faculty Award, which recognizes collective contributions to research, education and community service. His research has been sponsored by the U.S. Environmental Protection Agency, Electric Power Research Institute and regional planning organizations.

## Ruth Chen

Research Associate



Dr. Ruth Chen teaches environmental toxicology and risk assessment, risk management and decision making in the Department of Energy, Environmental & Chemical Engineering. She is also the coordinator of the International Experience Program.

Dr. Chen is a recipient of a joint CDC biomonitoring grant and EPA outreach grant to investigate pesticide exposures in populations exposed to products from an industrial facility. Prior to her work at Washington University, Dr. Chen was an environmental toxicologist for the State of Tennessee.

Photos by GEOFF STORY



*During their stay in Beijing, students had plenty of time for sightseeing. From left to right: Jeff Knudsen, Liz Campbell and Nicole Stennes.*

For the inaugural trip, they selected students who had strong academic records and diverse understandings of the Chinese culture: from one who spoke the language fluently to another who had eaten Chinese food only twice in his life. Enrichment classes, sponsored by the department, acquainted the students with history and language basics, as well as Chinese environmental and energy issues.

For Turner, another exciting experience was their visit to a national academy of atmospheric chemistry laboratory, where scientists showed them models built to forecast pollution during the Olympics. "We're excited if we can use one or two models and look at such problems retrospectively," he says. "To look at them prospectively using five models was truly amazing."

A highlight for Chen was their trip to a Chinese plant of St. Louis-based Emerson that makes

transformers to detect the temperature of gas and oil pipelines. "Not only is its equipment constantly being refined," she says, "but the company has good working conditions, with great noise control and ventilation. This is the way a company should work – and we saw it in action."

Students were intrigued by their Peking and Tsinghua classes, offered by top-notch professors who spoke excellent English. Intensely busy during this pre-Olympic period, faculty still gave unhurried time to the students, with honest assessments of air quality. They also discussed the ecological challenges of bringing one new power plant on line each week to accommodate the burgeoning urban population.

"We also had plenty of time for sightseeing," says Mark Kieffer, "and everything we saw was exciting. I loved the opportunity to try so many different foods – Peking duck is indescribable!"



*“While we were there, the most interesting air-quality installation I saw was a giant tower measuring air-quality parameters at different heights,” says Kieffer. “It was one of the most advanced – and largest – pieces of equipment I have seen in my life.”*



*Energy, Environmental & Chemical Engineering Ph.D. student Melissa Holtmeyer (left on Dabancheng Wind Farm in China's Xinjiang Province) traveled to China for two months to work on an international collaborative research project with Tsinghua University. She spent time with the undergraduate students during their stay in Beijing. “The experience has forever changed the way I think about energy and its uses,” says Holtmeyer.*

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***On campus, the students will continue their work with special projects stimulated by the Chinese experience. Kieffer will research the feasibility of using selective catalytic reduction in cars, while others will tackle the impact of pollution on solar panels, health effects, long-range transport of sulfur, motor vehicle emissions, ozone, Three Gorges Dam, man-made rain, coal-fired power plants, alternative energy sources and Chinese ethanol production.***

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In summer 2009, the program will sponsor a trip to Seoul, Korea, and in 2010 to Mumbai, India.

Washington University students were polite, outgoing and curious – a credit to their country, say Chen and Turner. “They are all such bright and wonderful people,” adds Chen, “and it was a great learning experience for both the students and the teachers.”

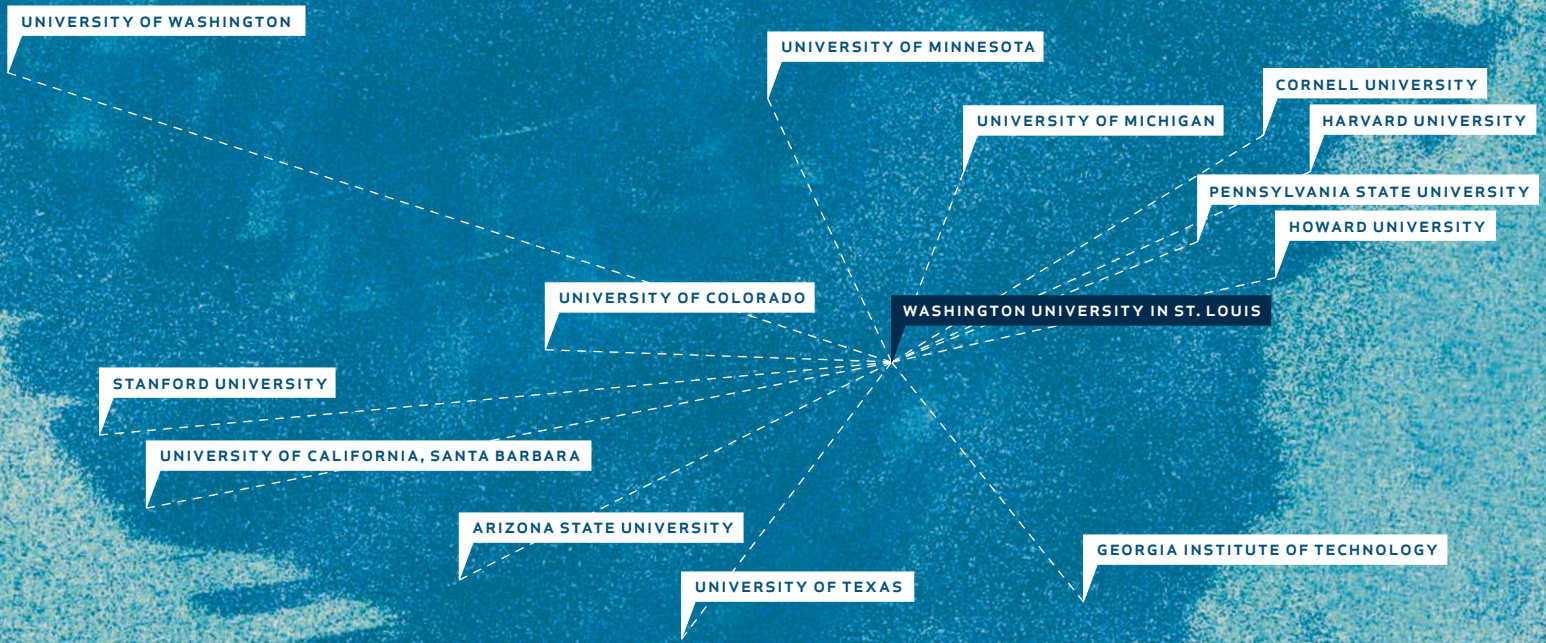
» For more information about the Department of Energy, Environmental & Chemical Engineering, visit the department’s Web site: [eece.wustl.edu](http://eece.wustl.edu).

» The 2008 International Experience in Beijing was partially funded by the International Scholars Program and generous donations by Dr. Richard Mattione, BSSM’77, and Mrs. Gloria Feldman.

RESEARCH FEATURE

Written by RICK SKWIOT

Photos by GEOFF STORY



# SMALL TECHNOLOGY, Big Breakthroughs

NATIONAL  
NANOTECHNOLOGY  
INFRASTRUCTURE  
NETWORK

*“The NNIN membership gives Washington University in St. Louis a flag on the national nanotechnology map,” says Dong Qin, associate dean for research and principal investigator for the \$2.5 million NNIN award.*



Imagine manmade structures that can fight cancer, convert sunlight to electric power and help clean the environment. That future can be glimpsed now in the School of Engineering & Applied Science, where the smallest of technologies – nanotechnology – is leading to big breakthroughs, including a recent invitation to join the National Nanotechnology Infrastructure Network (NNIN).

In NNIN, funded by the National Science Foundation, the School of Engineering joins 13 other national research institutions – from Cornell and Harvard to Georgia Tech and Stanford – in providing extensive support and expertise in nanoscale fabrication, synthesis, characterization, modeling, design, computation and education in an open environment available to all qualified users, including other research institutions and corporations.



**DONG QIN**  
Associate Dean for research and principal investigator for the \$2.5 million NNIN award

## What Is Nanotechnology?

“Very small stuff.” That’s how Younan Xia, the James M. McKelvey Professor and a noted nanotech pioneer, defines nanotechnology. He says it generally “deals with very small structures – 100 nanometers or less,” with a nanometer amounting to a billionth of a meter.

Xia, a chemist with appointments in Biomedical Engineering; Energy, Environmental & Chemical Engineering; Chemistry; Biochemistry and Molecular Biophysics; and Radiology – and with more than 300 publications and 10 patents – says that many areas come into play in the nanotech field. But ultimately “chemists are mainly responsible for making nanostructured materials,” says Xia. “At some point, it is all chemical – atoms and molecules.”

These chemically created nanostructures are being applied by biomedical engineers, environmental engineers and other researchers to address critical needs in medicine, the environment, public health, energy, industry and more.

***The NNIN will be “an enabler,” says Qin, to create such new nanomaterials and advance nanotechnology research.***

“It provides the tools to do cutting-edge research, like a machine shop,” Qin says, that will allow universities and industries access to sophisticated and costly instrumentation and a “clean room” suited for nanofabrication.

The facility will also encourage collaborations among Washington University researchers and external users, as well as help lure top researchers to the University, according to Qin.

**>> The width of an average human hair, for comparison, measures some 100,000 nanometers**

**PRATIM BISWAS**

Ph.D., the Stifel & Quinette Jens Professor of Environmental Engineering Science and chair of the Department of Energy, Environmental & Chemical Engineering  
> Aerosol Technology



**FRANK YIN**

M.D., Ph.D., the Stephen F. & Camilla T. Brauer Distinguished Professor of Biomedical Engineering and chair of the Department of Biomedical Engineering  
> Biomechanics and Atomic Force Microscopy

***“It’s a good investment to help recruit faculty” in engineering, scientific and medical disciplines across campus, says Qin. “You save start-up costs for major instrumentation” for individual researchers, and “you blend research communities together,” creating interdisciplinary synergies that can lead to significant breakthroughs.***



### Addressing Nanotoxicity Concerns

The University’s NNIN niche focuses on health and environmental concerns – one of which is the potential for toxic nanostructures to taint public health and the environment. Their small sizes, says Qin, allow them to enter tissues and cells and interact with functional bio-molecular structures. But the NNIN will provide support to researchers who work to guard against such eventualities, she says.

“We will provide a set of commercially unavailable nanoparticle instrumentation for nanotoxicity and environmental studies,” says Qin.

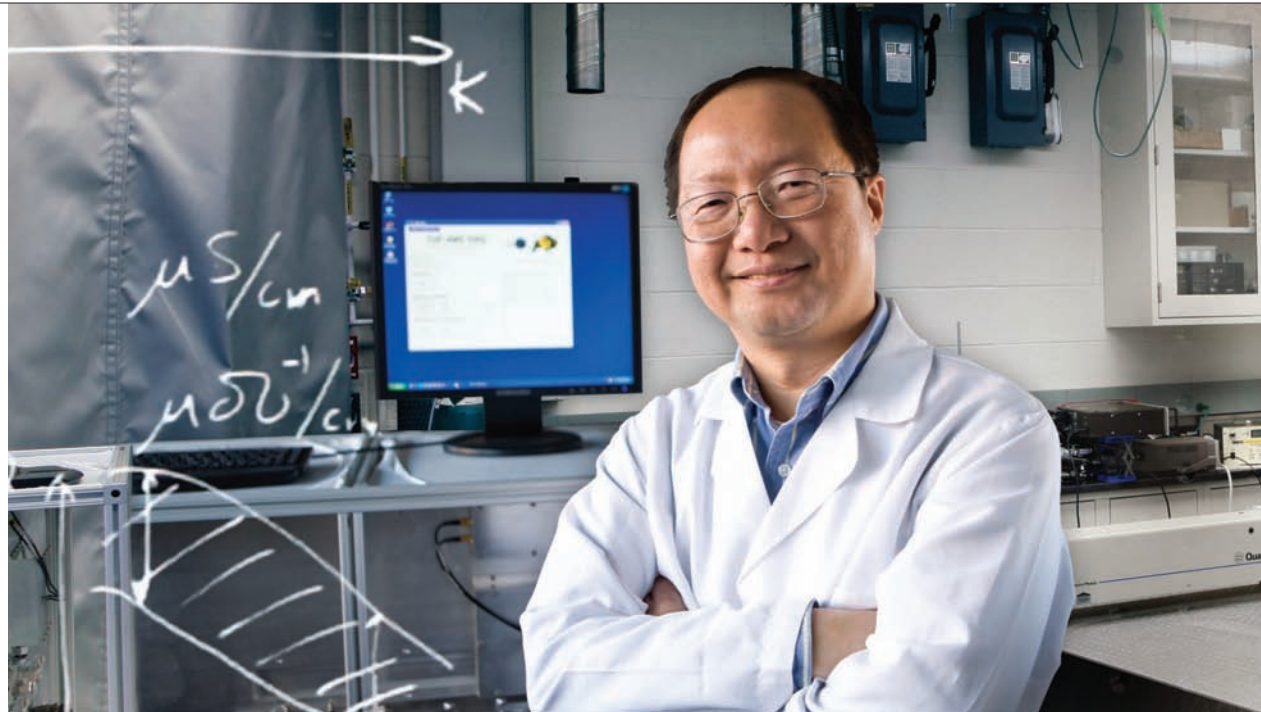
Xia underscores the importance of such nanotoxicity research, contending that nanotechnology and its attendant risks are here to stay.

“Eventually nanotechnology will be common everywhere, whether you like it or not, including its environmental impact, the threat that the nanoparticles can get into the environment,” he says.

“Any chemical has two sides, positive and negative. I am optimistic about the positive side,” says Xia, citing the ability of manmade nanoparticles to fight toxicity – for example, nanostructure membranes designed to remove organic toxins from drinking water.

Pratim Biswas, Ph.D., the Stifel & Quinette Jens Professor of Environmental Engineering Science and chair of the Department of Energy, Environmental & Chemical Engineering, also works in the area of nanotoxicology. He has recently identified some metrics that relate to biological function, which will help design nanomaterials that are functional but safe.

Associate Professor Da-Ren Chen (front) directs the Nanoparticle Research and Technology Lab in the School of Engineering. Ta-Chih Hsiao and Marit Meyer (background) and Fan Mei (right) are Ph.D. students in the Chen Lab.



**YOUNAN XIA**  
James M. McKelvey  
Professor  
> *Gold Nanocages*



**LAN YANG**  
Assistant Professor  
> *Micro-Laser Single-Molecule Sensing*

## NANOTECHNOLOGY RESEARCH VECTORS

There are many examples of important nanotechnology research under way in the School of Engineering.

### Gold Nanocages

Through chemical processes, Xia and his researchers have developed gold nanocages that can aid in medical imaging, cancer treatment and drug delivery. He describes the nanostructure as “a little gold box with all eight corners cut off, tens of nanometers in size, with single-crystal walls as thin as one nanometer.”

The cages are durable enough to be injected into the bloodstream and serve as contrast agents for imaging, allowing ultrasensitive detection of biomarkers, possibly even single molecules. The nanocages can convert light into heat, causing targeted tumor cells to die without applying a chemical drug. They can also be used as vehicles to accurately deliver drugs when and where they are needed in a body.

While still in the development stage and just now moving into animal studies, Xia’s nanocages hold the potential for significant benefit in medical imaging and cancer treatment.

### Micro-Laser Single-Molecule Sensing

Lan Yang, a Department of Electrical & Systems Engineering assistant professor who runs the School of Engineering’s Laboratory of Micro/Nano Photonics Research Group, has collaborated with Biology and fellow Electrical & Systems Engineering researchers to use a nano-waveguide coupled with ultra-high-quality optical silicon microcavities for biosensing with single-molecule resolution.

“The signal is really amplified. You can see a single molecule,” says Yang.

“The ultra-high-quality microcavities achieved by spin-on glass technology could be used,” says Yang, “to determine certain antibodies in a serum sample and capture any changes.” It also provides more accurate glucose sensing than current glucose meters, she says, and could play an important role in biomedical research, clinical diagnosis, food safety, homeland security and pharmaceutical testing.

### Aerosol Technology

The Department of Energy, Environmental & Chemical Engineering’s Biswas Lab is using aerosol technology to create made-to-order



nanostructures with applications in biomedicine, energy and the environment.

The Biswas Lab also developed flame and furnace aerosol reactors to synthesize new nanotechnology materials “with control of size, shape and composition,” says Biswas.

“We’re highly collaborative with medical researchers and very much guided,” he says. “We know what properties are needed and then work to create tailor-made materials.”

***They are also using nanotechnology to address environmental issues, such as finding new ways “to make fossil fuels benign,” says Biswas – for example, in coal combustion, “to ensure it is clean and to capture the carbon dioxide and convert it to useful products.”***

The Biswas Lab is also working on solar-based technologies to convert light into electricity and on splitting water to produce hydrogen, “a very clean energy source,” says Biswas.

He says aerosol nanotechnology holds great promise because of its scalability, the capacity for industry to produce such materials in large quantities.

### Nanoparticle Toxicity

The Chen Lab – headed by Associate Professor Da-Ren Chen – is collaborating with the University of Rochester to investigate nanoparticle toxicity related to public health. The Chen Lab has found that chemical impurities on the surface of nanoparticles can significantly alter the biological responses of cells exposed to the particles, emphasizing the need for quality control of synthesized nanoparticles prior to exposure studies.

### Nanoparticle Effect on Pathogenic Bacteria

The Tang Lab – led by Assistant Professor Yinjie Tang – is investigating the stress response of mycobacterium and other bacteria in the presence of nanoparticles. The results could help determine whether nanoparticles could be useful in inhibiting unwanted microbial activity and perhaps lead to new ways to treat diseases such as tuberculosis.

» [nano.wustl.edu](http://nano.wustl.edu)



**LI HONG WANG**  
Gene K. Beare  
Distinguished Professor of Biomedical Engineering  
> Photoacoustic Imaging and Nanomaterials



**DA-REN CHEN**  
Associate Professor  
> Nanoparticle Toxicity Research



**YINJIE TANG**  
Assistant Professor  
> Nanoparticle Effect on Pathogenic Bacteria

# Finding Global Success

## AT THE INTERFACE BETWEEN COMPUTER SCIENCE & BUSINESS

Written by C.B. ADAMS

Photos by GEOFF STORY

As the chief executive officer and co-founder of Creditex – a wholly owned subsidiary of IntercontinentalExchange (ICE), a leading operator of global derivatives exchanges and over-the-counter (OTC) markets – it may surprise some that Sunil Hirani received his Bachelor of Science degree in computer science in 1988 from Washington University’s School of Engineering & Applied Science. Yet, Hirani says it is not really much of a stretch.

*“Everything in my life has grown on what went before. Whether I am working in engineering and computer science or in business and finance, it is still the same thing: problem solving. The disciplines of computer science and engineering are very useful tools and useful ways of thinking about the world,” he says.*


Hirani was born in India and immigrated to Texas with his parents when he was 10. His father was an engineer, and Hirani assumed he would pursue a career in engineering, too.

“Engineering was all I knew. Everyone that we knew was an engineer or in engineering or a related field. I didn’t know anything else,” he says.

But from an early age, he also had an interest in the way businesses and commerce worked. When he was mowing the lawn, he would daydream about obtaining a truck to enable him to mow more lawns – and then obtaining even more trucks. “Even as a kid, I had this idea about creating a business. I always had something on the side,” Hirani says.

In high school, he sold concert tickets. As an engineering student at Washington University, he created extracurricular income by purchasing unused meal plans (primarily from women) and selling them (primarily to men) with a modest markup during the course of a semester.





**SUNIL HIRANI**  
CEO and co-founder  
of Creditex and  
1988 graduate of  
Washington University's  
School of Engineering  
& Applied Science

**Crain's New York Business named Hirani to the "40 Under 40" list in 2006. One year later, he was also named a recipient of the Ernst and Young Entrepreneur of the Year Award for financial services. In addition, Creditex earned a place on Deloitte's New York Technology Fast 50 List. Deloitte reported that the company experienced revenue growth of 779% from 2001 to 2005.**

*Sijie Dai, a sophomore chemical engineering/pre-med student in the School of Engineering, is a recipient of an undergraduate scholarship funded by Sunil Hirani and his wife, Blanca. "Without this scholarship, I cannot even fathom the amount of knowledge I would have missed out on these four years," says Dai.*



Hirani graduated and worked for Lockheed Martin for approximately four years as a software engineer. He designed, developed and implemented software and hardware systems for NASA's space program in Houston. During that time, he regularly considered making a drastic change and moving to New York City to "do something" in finance on Wall Street.

"Some friends counseled me and said, 'You really need to go to business school first,'" he says. That is when he decided to attend the J.L. Kellogg Graduate School of Management at Northwestern University.

Before he founded Creditex in 1999, Hirani worked at Deutsche Bank and Bankers Trust, where he was involved with numerous aspects of the over-the-counter (OTC) derivatives business. He also helped develop the credit derivatives business in North America at Deutsche Bank. Creditex is the first and leading e-trading platform in credit derivatives, and is used by more than 1,000 traders at the world's top financial institutions. In 2007, the platform executed more than \$3 trillion in credit default swap (CDS) indices and single-name CDS.

In June 2008, IntercontinentalExchange (ICE) announced the merger agreement to acquire Creditex Group Inc., with a transaction consideration of \$625 million. ICE has invited senior Creditex management to continue with the combined company. At this time, both Creditex and ICE are working on a global clearinghouse for credit derivatives.

***"If we look at what we do in the market structure, such as finding solutions for the marketplace and creating exchanges or marketplaces, it is like solving a puzzle. What is interesting is that we are using technology and finance in a real-life laboratory to continuously do experiments," Hirani says.***



COURTESY PHOTO

**THE HIRANI FAMILY** Camila (7), Blanca, Maya (5), Sunil and Sameer (3).

Hirani's innovative approach expanded Creditex's business globally, including the launch of T-Zero®, the leading credit derivatives trade capture and affirmation platform, and is now working on a centralized counter party for clearing credit derivatives, which has been called for and encouraged by U.S and European regulators and governments.

Hirani is a member of the School of Engineering's National Council and Eliot Society. As an Eliot Fellow, he and his wife, Blanca, established an engineering scholarship fund to be awarded to students with the greatest need. The Hiranis recently committed a generous donation for scholarships to be spread throughout the undergraduate schools at Washington University.

"I maintain a relationship with the University because I am impressed by its many aspects, including its global programs. The McDonnell Scholars is an awesome program that helps get the University's name out there globally. That is important, because we do live in a global world. The education that I received at the University was invaluable, and I will be forever grateful for being accepted and graduating from Washington University," Hirani says.

*Bachelor of Science,  
Computer Science*



*Software Engineer at  
Lockheed Martin*



*J.L. Kellogg  
Graduate School of  
Management*



*Deutsche Bank and  
Bankers Trust*



*Creditex*



*Intercontinental-  
Exchange*

2008

# ALUMNI ACHIEVEMENT

» *The School of Engineering & Applied Science honored seven distinguished alumni at the annual Alumni Achievement Awards.*

## Paul L. Chandeysson, M.D.

> BSEE '58, BSME '58  
Alumni Achievement Award



Paul Chandeysson was the first person with degrees in engineering and medicine to be employed by the Bureau of Medical Devices.

In his role at the Bureau, Paul helped expedite the approval of several life-saving devices, including the implantable defibrillator and the automatic external defibrillator, which are used on airplanes and in public buildings.

Following graduation from Washington University, Paul served in the U.S. Army and later earned a master's degree in nuclear engineering from Stanford University. Paul returned to school and graduated with distinction in 1976, at the age of 40, from George Washington University Medical School. Paul practiced medicine as a nuclear medicine physician at several hospitals and later became chairman of the Department of Nuclear Medicine at the Washington Hospital Center.

## Sunil G. Hirani

> BSCS '88  
Alumni Achievement Award



Sunil Hirani is the chief executive officer and co-founder of Creditex, a global market leader and innovator in the execution and processing

of credit derivatives. Used by more than 1,000 traders at the world's top financial institutions, Creditex is the first and leading e-trading platform in credit derivatives.

Before he founded Creditex in 1999, Sunil worked at Deutsche Bank and Bankers Trust, where he was involved with numerous aspects of the OTC derivatives business.

Crain's New York Business named Sunil to the "40 Under 40" list in 2006. One year later, he was also named a recipient of the Ernst and Young Entrepreneur of the Year Award for financial services.

## Donald A. Jubel

> BSME '73  
Alumni Achievement Award



Donald Jubel was first introduced to the family business started by his father, Spartan Light Metal Products, while riding in an 18-wheeler

truck. Spartan Light Metal Products provides highly engineered aluminum and magnesium die cast solutions for the power train markets.

In 1978, Don became the initial project engineer for Spartan's magnesium operation. Spartan currently employs approximately 900 people with operations in Sparta, Illinois; Mexico, Missouri; Hannibal, Missouri; St. Louis, Missouri; Detroit, Michigan; and Tokyo, Japan. After working in several positions in operations, engineering and sales Don became president on January 1, 1991, and later added the title of chief executive officer in 1999.

## Charles E. Simmons

> BSEE '70  
Alumni Achievement Award



Charles E. Simmons retired in 2000 from Network Appliance Inc., where he worked as vice president of marketing and vice president of corporate development. At Network



# AWARDS

Photos by KEVIN LOWDER/WUSTL PHOTO

Appliance Inc., he was responsible for strategic planning, mergers and acquisitions, and corporate partnerships during a period that saw the company grow from \$50M to \$600M in annual revenue.

Prior to his service at Network Appliance Inc., Charlie managed several marketing functions and program management for Sun Microsystems Inc. Charlie also worked as a manager for Spectra-Physics, a manufacturer of microwave systems for defense, and as a design engineer for Watkins Johnson, a manufacturer of microwave systems for defense.

## Ellen W. Zegura

> BSCS '87, BSEE '87, MSCS '90, DScCS '93  
Alumni Achievement Award



Ellen Zegura oversees the research and graduate programs for the School of Computer Science at Georgia Tech. She is the first chair of this newly organized school and previously served as interim dean of the College.

Ellen's research interests center on computer networks and the Internet, and she is very highly regarded within the networking research community. As a professor, Ellen's research work concerns the development of wide-area (Internet) networking services and, more recently, mobile wireless networking.

She now chairs the Science Council for the National Science Foundation's GENI (Global Environment for Network Innovation) Initiative. This initiative is a major National Science Foundation program and is expected to lead to the creation of a national network research test bed to address the limitations of the current Internet.

## Michael Lefenfeld

> BSChE '02  
Young Alumni Award



Michael Lefenfeld is president and chief executive officer of SiGNa Chemistry, a company based in New York, New York, that he co-founded in late 2003. In conjunction with Dr. James Dye, a former professor at Michigan State University, Michael discovered a way to stabilize alkali metals and their derivatives by combining them with nano-structured metal oxides to yield a stable powder retaining all of the chemical reactivity. Also, when mixed with water, this powder produces cheap, clean hydrogen gas. In short, his discovery has led to the "first advancement in alkali metal chemistry in 100 years" by creating

a material useful for manufacturing pharmaceuticals, petroleum refining and fuel cells.

In July 2005, the Forbes Nanotech Report named SiGNa as "the company to watch." Three months later, *Business Week Magazine* named Michael a top entrepreneur under 25.

## Michael K. Gibbons

> MSME '91, MBA '97  
Dean's Award



As program manager for the Boeing EA-18G, Mike Gibbons led a team through a five-year, \$1.2 billion development effort to

culminate in 2008. The program will replace all existing carrier-based electronic attack aircraft by 2012.

Mike graduated with a Bachelor of Science degree in mechanical engineering at the top of his class from Georgia Tech in 1983. He started his career at McDonnell Aircraft (now the Boeing Company) as a structural analyst working on the F/A-18 Program. In his 25 years with Boeing, Mike has enjoyed working on a wide variety of assignments including the F/A-18, F-15, AV-8B, A-12, JSF and multiple classified programs. Although Mike considers himself a St. Louis native, he has benefited from several moves around the nation, including time spent in Southern Maryland, Los Angeles, Fort Worth and Seattle.

» [engineering.wustl.edu/alumni](http://engineering.wustl.edu/alumni)

# New Leadership



Photo by GEOFF STORY

**Gruia-Catalin Roman** was reappointed chair of the Department of Computer Science & Engineering, effective July 1, 2008.



Photo by GEOFF STORY

**Philip Bayly** was appointed chair of the Department of Mechanical, Aerospace & Structural Engineering, effective August 1, 2008.



Photo by GEOFF STORY

**Joseph O'Sullivan** was appointed dean of the University of Missouri-St. Louis/ Washington University Joint Undergraduate Engineering Program, effective August 1, 2008.



Photo by CAMPUS IN FOCUS

**Errol Sandler** was named associate dean for the Sever Institute of Continuing Studies on April 18, 2008.

» Research and biographical profiles for School of Engineering professors are available on the Web: [engineering.wustl.edu/faculty](http://engineering.wustl.edu/faculty).



**New in 2009!**  
**Master of Engineering in Energy, Environmental & Chemical Engineering**  
[eece.wustl.edu](http://eece.wustl.edu)

# Student Projects



**LEFT** Engineering students Aaron Clark, Brook McKeown, Jake LaMountain, Evan Nixon and Sarah Cahill engage in a challenge to stack toy donuts in an attempt to simulate a real-world example of how the work of engineers can improve one's quality of life.

**RIGHT** Engineering students Ruth Nan and Brian O'Neal were among the students in Professor Daniel Rode's class who collaborated with Engineers Without Borders on the light project.

## Freshman Students Engage in Real-World Engineering Challenges

Students enrolled in Engineering Freshman Seminar (EN120) recently completed a project to test effective methods for creating prosthetic hands.

"One of the goals of all of our projects is to attempt to simulate a real-world engineering problem," said EN120 Projects Course Director Richard Speyer.

For one project, freshmen were asked to build a prosthetic hand to improve the quality of life for people in three sample scenarios. One scenario was for a child, "Johnny," who was born without a hand but wanted to be able to play just like all of the other boys and girls at his preschool.

"The reaction from the students was very positive," said Speyer. "They enjoyed building the hands and testing them out on a variety of different tasks. It was very rewarding for them to see their design come to fruition and successfully execute the tasks."

## Engineers Without Borders Project Lights Up Grand Center

In October 2008, Engineers Without Borders and students enrolled in ESE (Electrical & Systems Engineering) 230 built LED lights for a special community percussion performance that featured students from St. Louis elementary and high schools.

"Sam Fok of Engineers Without Borders did a wonderful job of pulling together and coordinating Washington University students from my ESE 230 class to build the LED lights for the drums," said Professor Daniel Rode. "All in all, this was a community-service project very well done indeed. It was inspiring to see so much community outreach and volunteer effort for our city's young people."

Professor Arye Nehorai and Research Associate Ed Richter supported students by providing advice, facilities and supplies to build 100 electronic circuits for the drums.

» For expanded information on these stories and more student accomplishments, visit [engineering.wustl.edu](http://engineering.wustl.edu).



Photo by GEOFF STORY

*"We highly value these projects for both the technical and social aspects of engineering. For our undergraduates, these connections, contributions and experiences are very beneficial."*

**ARYE NEHORAI,**  
Ph.D., the Eugene & Martha Lohman Professor of Electrical Engineering and chair of the Department of Electrical & Systems Engineering

## Endowed Professor Installations

Photos by GEOFF STORY

### YOUNAN XIA

The James M. McKelvey Professor

- > Ph.D., Harvard University, 1996
- > M.S., University of Pennsylvania, 1993
- > B.S., University of Science & Technology of China, 1987



XIA

*Younan Xia was installed as the inaugural James M. McKelvey Professor on September 2, 2008.*

The James M. McKelvey Professorship is named in honor of the School of Engineering & Applied Science's seventh dean. The professorship was established in 2003 with a gift from the JSM Charitable Trust and John F. McDonnell, retired chairman of the board of the McDonnell Douglas Corporation, to support research in the Center for Materials Innovation.

The Xia research group is pursuing cutting-edge research in three major frontiers: nanotechnology, materials chemistry and biomaterials. His research interests include synthesis of nanomaterials, biomaterial interface, energy conversion and storage, drug delivery, as well as neural and tissue engineering. His group invented gold nanocages whose tunable optical properties make them excellent candidates for biomedical applications including imaging contrast enhancement, photothermal therapy and controlled release. Xia currently has more than 300 publications and 10 patents.

### IGOR EFIMOV

The Lucy & Stanley Lopata Distinguished Professor of Biomedical Engineering

- > Ph.D., Moscow Institute of Physics & Technology, 1992
- > M.Sc., Moscow Institute of Physics & Technology, 1986

*Igor Efimov was installed as the Lucy & Stanley Lopata Distinguished Professor of Biomedical Engineering on November 25, 2008.*



EFIMOV

Prior to joining Washington University in 2004, Professor Efimov was a professor at Case Western Reserve University for four years.

Professor Efimov also held positions at the Cleveland Clinic Foundation, the University of Pittsburgh's School of Medicine and the Institute of Biological Physics in Puschino, Russia.

Professor Efimov investigates bioelectric mechanisms of cardiac

normal conduction and arrhythmia. Using state-of-the-art biophotonic imaging, he works on development of novel anti-arrhythmia therapies, including low-energy, painless defibrillation therapy for atrial fibrillation and ventricular tachycardia. Using molecular biology, tissue engineering and multimodal imaging techniques, the Efimov Lab works to engineer the pacemaker and conduction system of the heart.



## Recent Promotions

### RICHARD AXELBAUM

Professor

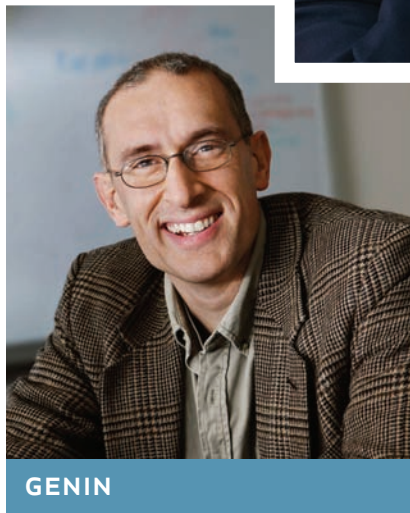
- > Ph.D., University of California – Davis, 1988
- > M.S., University of California – Davis, 1983
- > B.S., Washington University in St. Louis, 1977

*Professor Axelbaum was promoted from associate professor to professor.*

Professor Axelbaum is the director of the Consortium for Clean Coal Utilization. He also heads the Laboratory for Advanced Combustion and Energy Research and previously served as the associate director of the Center for Materials Innovation. Recently, Professor Axelbaum's research efforts have focused on addressing global concerns over carbon dioxide emissions by developing approaches to carbon capture and storage.



AXELBAUM



GENIN

### GUY GENIN

Associate Professor

- > Ph.D., Harvard University, 1996
- > S.M., Harvard University, 1993
- > M.S., Case Western Reserve University, 1992
- > B.S.E., Case Western Reserve University, 1990

*Professor Guy Genin was promoted from assistant professor to associate professor.*

Professor Genin was a post-doctoral researcher at Cambridge University and Brown University before he joined the faculty at Washington University in 1999.

Professor Genin's research interests include cellular, mineral and tissue mechanics at the tendon-to-bone interface, or "insertion."

He also studies the mechanics of mild brain injury through strain localization and the mechanical response of the brain to skull acceleration.

### YIN



### FRANK YIN

Department Chair and Professor

- > M.D., University of California – San Diego, 1973
- > Ph.D., University of California – San Diego, 1970
- > M.S., Massachusetts Institute of Technology, 1967
- > B.S., Massachusetts Institute of Technology, 1965

### *Stephen F. & Camilla T. Brauer Distinguished Professor of Biomedical Engineering*

In recognition of Professor Yin's leadership in the School of Engineering, Stephen and Camilla Brauer elevated their endowed professorship to distinguished.

In just 11 short years, Professor Yin created the University's Department of Biomedical Engineering. Today, with 16 core faculty, 300 undergraduates and 100 graduate students, the department is ranked among the nation's top biomedical engineering departments by *U.S. News & World Report*. The department builds upon the long tradition of excellence and cooperation among many different facets of the University, including work with Washington University's world-renowned School of Medicine, to bring a modern and truly interdisciplinary approach to advancing basic science with the hope of better understanding, diagnosing and treating diseases affecting humankind.

## New Faculty

### VITALY KLYACHKO

Assistant Professor of Biomedical Engineering

- > Ph.D., University of Wisconsin-Madison, 2002
- > M.S., B.S., Moscow State University, 1998

Professor Klyachko completed post-doctoral training at the Salk Institute in La Jolla from 2002 to 2007. In 2008, he became a faculty member in New York University's Department of Physiology and Neuroscience prior to joining the faculty at Washington University.

Professor Klyachko's research focuses on synaptic function and plasticity with the goal to understand how neural circuits analyze information in the brain. His work has important implications to neurological disorders such as mental retardation and Alzheimer's disease.



KLYACHKO



TANG

### YINJIE TANG

Assistant Professor of Energy, Environmental & Chemical Engineering

- > Ph.D., University of Washington, 2004
- > M.S., Tianjin University, 1999
- > B.S., Tianjin University, 1997

Professor Tang joined the School of Engineering faculty at Washington University in August 2008. From 2004 to 2008, Professor Tang worked as a post-doctoral fellow/project scientist at the University of California – Berkeley/Lawrence Berkeley National Laboratory. His expertise is in bioremediation of toxic compounds and

metabolic engineering of environmental microorganisms for biofuel production.

### VIKTOR GRUEV

Assistant Professor of Computer Science & Engineering

- > B.S., Southern Illinois University, 1997
- > M.S., Johns Hopkins University, 2000
- > Ph.D., Johns Hopkins University, 2004

Professor Gruev joined the Department of Computer Science & Engineering in August 2008.




GRUEV

His research interests are in computational low-power image sensors, adaptive optics and bio-inspired sensors.

# >> FAST FACTS

1,003 Undergraduate Students  
(from 50 states & 27 countries)



12:1 Undergraduate Student to Faculty Ratio



302 Doctoral Students



318 Master's Students



84 Tenured/Tenure-Track Faculty



19,000 Alumni



\$21.3 M Research Expenditures (FY08)

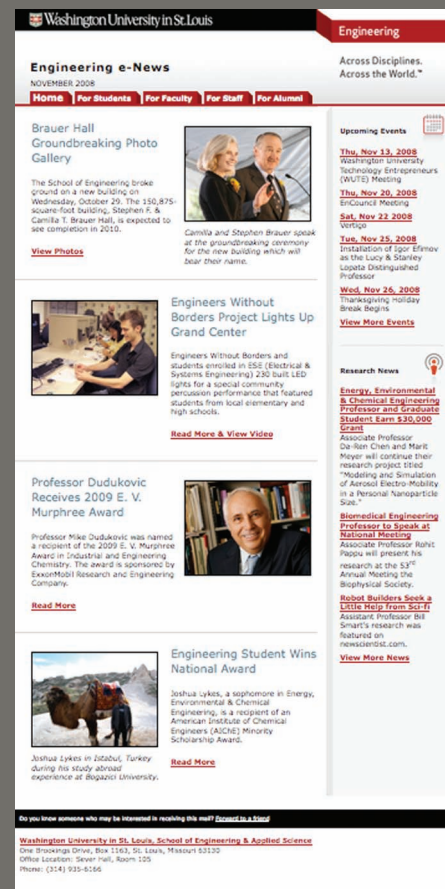


## Academic Departments:

Biomedical Engineering  
Computer Science & Engineering  
Electrical & Systems Engineering  
Energy, Environmental & Chemical Engineering  
Mechanical, Aerospace & Structural Engineering  
The Sever Institute of Continuing Studies

## Engineering e-News

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**Brauer Hall Groundbreaking Photo Gallery**  
The School of Engineering broke ground on a new building on Wednesday, October 29. The 150,876-square-foot building, Stephen F. & Camilla T. Brauer Hall, is expected to see completion in 2012.  
[View Photos](#)

**Engines Without Borders Project Lights Up Grand Center**  
Engines Without Borders and students enrolled in ESE (Electrical & Systems Engineering) 230 built LED lights for a special community outreach performance that featured students from local elementary and high schools.  
[Read More & View Video](#)

**Professor Dudukovic Receives 2009 E. V. Murphree Award**  
Professor Mike Dudukovic was named a recipient of the 2009 E. V. Murphree Award in Industrial and Engineering Chemistry. The award is sponsored by ExxonMobil Research and Engineering Company.  
[Read More](#)

**Engineering Student Wins National Award**  
Joshua Lykes, a sophomore in Energy, Environmental & Chemical Engineering, is a recipient of an American Institute of Chemical Engineers (AIChE) Minority Scholarship Award.  
[Read More](#)

**Upcoming Events**  
Thu, Nov 13, 2008  
Washington University Technology Entrepreneurs (WUTE) Meeting  
Thu, Nov 20, 2008  
EInCircuit Meeting  
Sat, Nov 22, 2008  
Vortigo  
Tue, Nov 25, 2008  
Installation of sign for new as the Lucy & Stanley Lopata Distinguished Professor  
Wed, Nov 26, 2008  
Thanksgiving holiday break begins  
[View More Events](#)

**Research News**  
**Energy, Environmental & Chemical Engineering Professor and Graduate Student Earn \$35,000 Grant**  
Associate Professor Da-Ren Chen and Marië Meyer will continue their research project titled "Modeling and Simulation of Aerosol Electro-Mobility in a Personal Nanoparticle Sizer."  
**Biomedical Engineering Professor to Speak at National Meeting**  
Associate Professor Raht Paapu will present his research at the 57th Annual Meeting of the Biophysical Society.  
**Robot Builders Seek a Little Help from Sci-Fi**  
Assistant Professor Bill Smart's research was featured on [newscenter.com](http://newscenter.com).  
[View More News](#)

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