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Engineering

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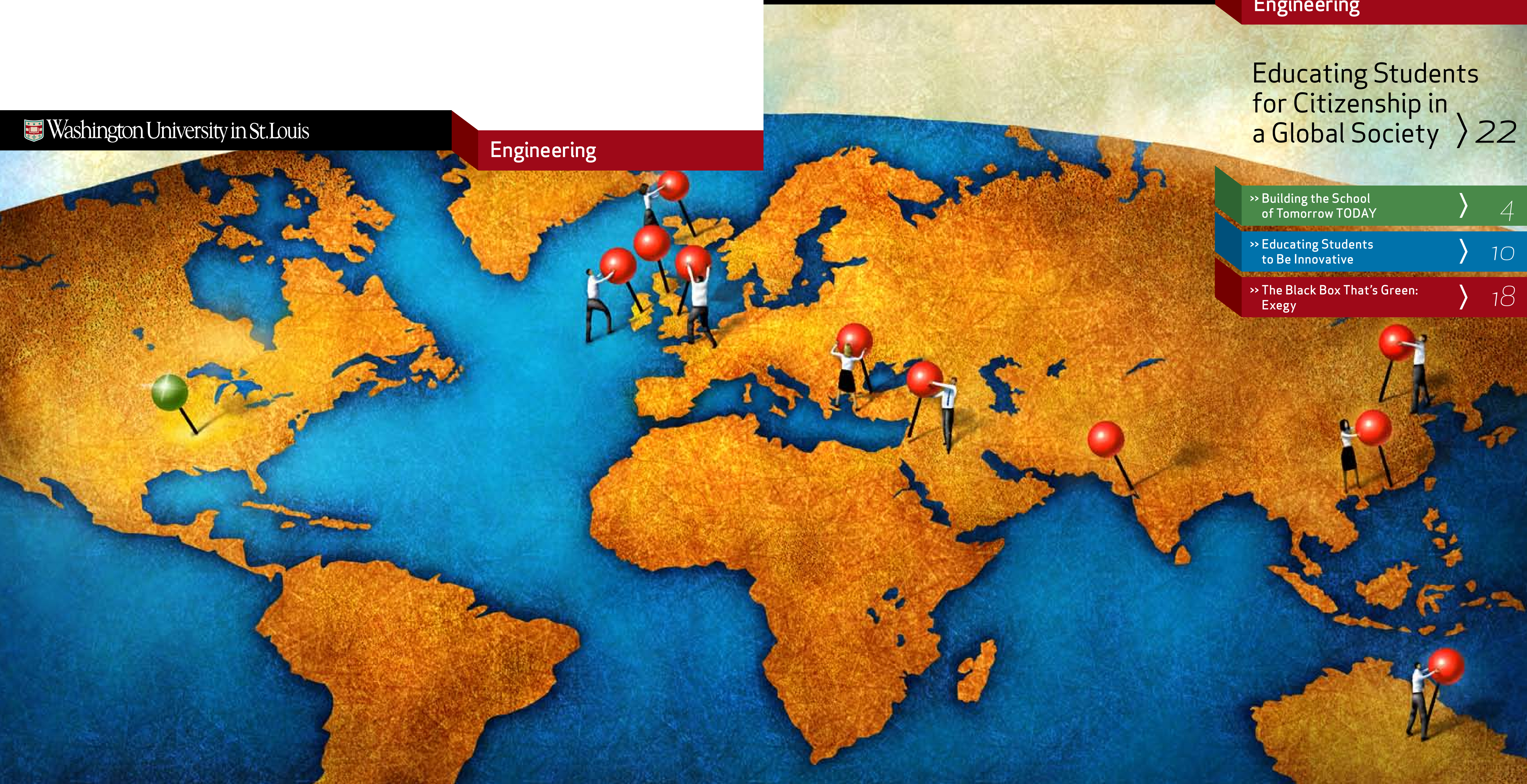
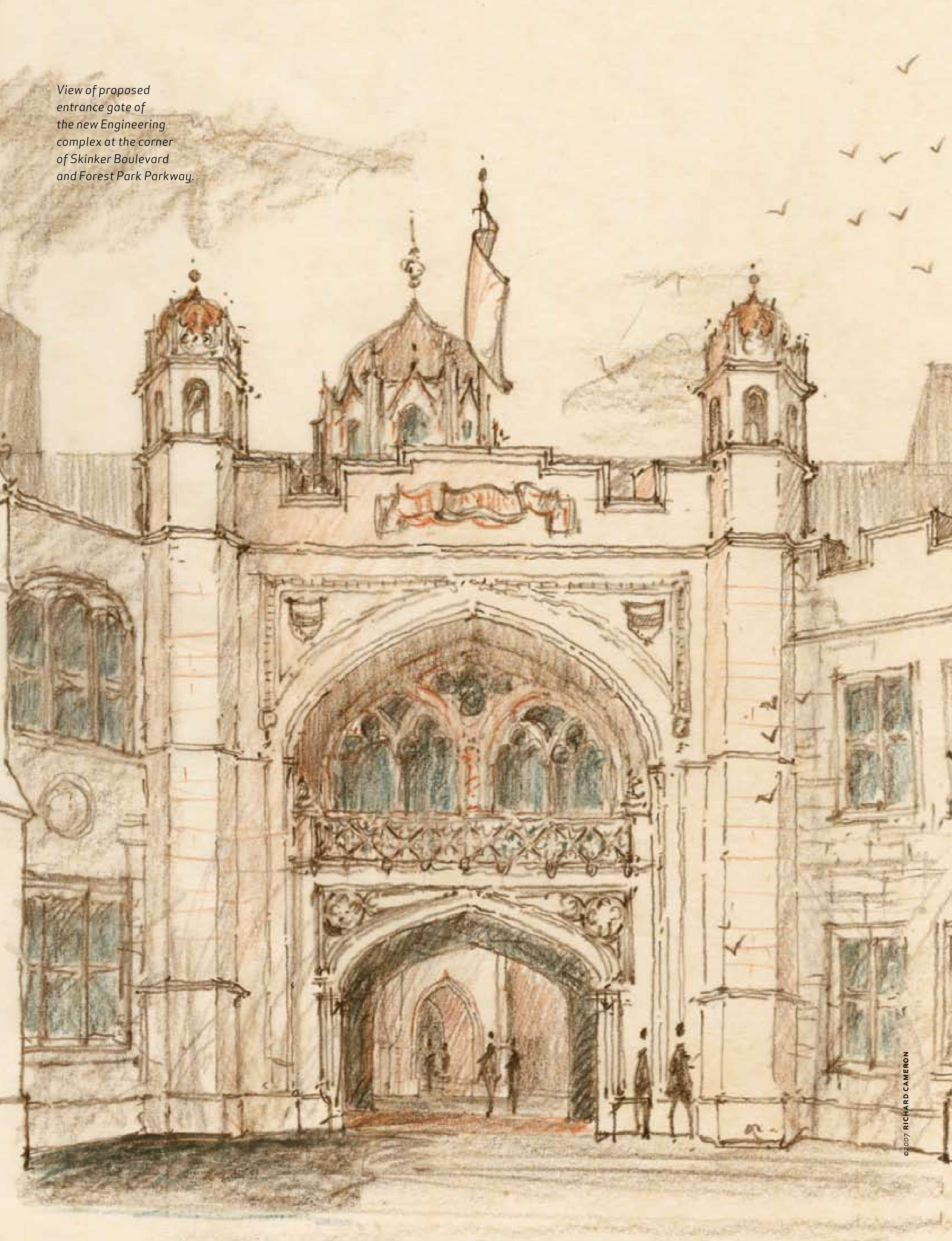


Educating Students for Citizenship in a Global Society 〉22

» Building the School of Tomorrow TODAY 〉 4
» Educating Students to Be Innovative 〉 10
» The Black Box That's Green: Exegy 〉 18



View of proposed entrance gate of the new Engineering complex at the corner of Skinker Boulevard and Forest Park Parkway.

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Contents

SPRING 2008

Washington University in St. Louis

Engineering

IN THIS ISSUE

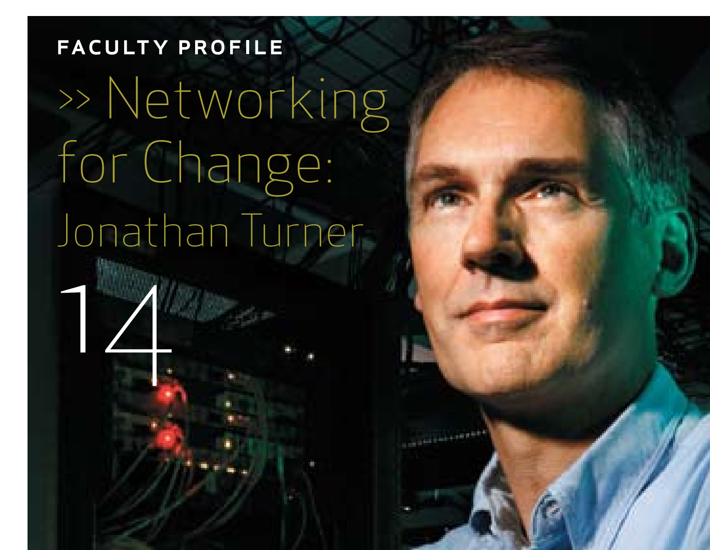
2 From the Dean
4 Special Feature
10 Student Profile
14 Faculty Profile
18 Alumni Profile
22 Cover Story
28 News
36 Faculty Updates

SPECIAL FEATURE
>> Building the School of Tomorrow TODAY 4

STUDENT PROFILE
>> Educating Students to Be Innovative 10

ALUMNI PROFILE
>> The Black Box That's Green: Exegy 18

COVER STORY
>> Educating Students for Citizenship in a Global Society 22



FACULTY PROFILE
>> Networking for Change: Jonathan Turner 14

Photo by GEOFF STORY

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Make No Little Plans

It is with much excitement that I introduce the first edition of our new School magazine. This magazine heralds the beginning of the next era at Washington University School of Engineering and Applied Science. It is the next era rather than a new era, because our plans build on the progress of the past and the great strengths that exist today in engineering.

Photo by JOE ANGELES

MARY J. SANSALONE
Dean, School of Engineering and Applied Science

All of the schools within Washington University are engaged in a multi-year strategic planning activity, the outcomes of which will set the course for the University for the era leading up to 2020. Engineering has been able to create bold plans for the future, thanks to Chancellor Mark S. Wrighton's strong commitment to and support for the School of Engineering and Applied Science.

Engineering's planning activity began with and constantly came back to a key set of questions:

- *What does the world need?*
- *Where can we have an impact?*
- *What should we stand for as an Engineering School?*

Our Vision

The School's vision recognizes the changing role of engineering as a discipline within the university. So much of the excitement in research and teaching is at the interface with other disciplines, and technology is enabling other disciplines. We believe that in the next decade, engineering will come to be defined through its innovative partnerships with other disciplines. We anticipate that this interplay of disciplines will have a profound effect on the future of engineering research and education. The School's vision also acknowledges a responsibility to respond to national and international needs in health, energy, environment, security, and poverty. Through this lens, we see engineering as a discipline that is in service to society.

Our Collaborations

In developing our intellectual vision and collaborative efforts, we asked, "What are the fundamentally important research questions?" and then, "How can engineering contribute?" A set of cross-cutting intellectual themes has emerged from our planning discussions. They are:

- *Energy and Environment*
- *Neural Engineering*
- *Quantitative Systems Biology*
- *Advanced Materials*
- *Imaging and Sensing Technologies*
- *Virtual Presence Technologies*

As part of our planning discussions, the engineering faculty asked the question:

"How do we **educate** our very talented **undergraduate students** for an increasingly **global** and technological society?"

1 HALLMARK 1: **Educate students to be innovative engineers.**

2 HALLMARK 2: **Educate students so they are prepared for graduate study.**

3 HALLMARK 3: **Educate students for leadership roles.**

4 HALLMARK 4: **Educate students for citizenship in a global society.**

» The discussions that ensued led to a set of "hallmarks" that will characterize the Washington University Engineering undergraduate experience.

These themes cut across departments within the School of Engineering and across the other schools at Washington University. They are serving as the basis for extended faculty cluster hires within the School and across schools. To complement these intellectual themes, Engineering will participate in a number of collaborative initiatives, including biomedical informatics, public health, and technology for social and economic development.

Our Departments

There are now five departments within the School of Engineering.

- *Biomedical Engineering*
- *Computer Science & Engineering*
- *Electrical & Systems Engineering*
- *Energy, Environmental & Chemical Engineering*
- *Mechanical, Aerospace & Structural Engineering*

The Department of Energy, Environmental, and Chemical Engineering was created in 2006 by bringing together a graduate Environmental Engineering Science program and the Department of Chemical Engineering.

In 2007, Mechanical and Aerospace Engineering and Civil Engineering joined together to create one department — Mechanical, Aerospace, and Structural Engineering — with the goal of offering a coherent set of programmatic offerings that builds on the shared intellectual interests of the faculty in mechanics and materials.

To build critical mass and core disciplinary strength in each department, our plan is to expand the School's faculty by 30 percent by 2020.

Our Future Buildings

In parallel with our intellectual planning, the School created a comprehensive master plan for a new engineering complex at the northeast corner of the Danforth Campus. We are now well into the design of Phase I — a state-of-the-art, 230,000-square-foot building.

When I think about the plans we have developed, I cannot help but recall Daniel Burnham's words: *"Make no little plans, for they have no magic to stir men's hearts."*

Mary J. Sansalone

» In this and future editions of our magazine we will tell you about a host of new initiatives developed to support these hallmarks.

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. So please write us at ***magazine@seas.wustl.edu****, and share your thoughts.*

Building the School of Tomorrow TODAY

Watercolor renderings by **RICHARD CAMERON**
Technical renderings by **RMJM HILLIER ARCHITECTURE**

>> In recognition of the School's critical need for state-of-the-art research and instructional facilities, the School began developing a comprehensive Master Plan for a new complex of buildings in 2006. The chance to develop a Master Plan at the same time the School was developing new intellectual directions inspired the faculty to think boldly and comprehensively about the future.

Washington University's Danforth Campus looking west toward Brookings Hall along Brookings Drive.

With the goal of achieving a coherent and unique complex of buildings, the School engaged a single architectural firm to create a Master Plan and to design the entire complex of buildings and outdoor spaces. In December 2006, several architectural firms were invited to compete for the project, and **RMJM Hillier Architecture** — a firm specializing both in the design of laboratory buildings and in historic preservation — was selected by a review committee of Engineering faculty, staff, students, University administrators, and Trustees.

The project team includes firms with extensive experience in working with universities and designing for sustainability:

- **Jaros, Baum & Bolles** *Mechanical, electrical, and plumbing*
- **Robert Silman Associates** *Structural engineering*
- **Jacobs Consultancy** *Laboratory design*

THE COLOR OF INSPIRATION
Richard Cameron, of the Institute for Classical Architecture, was brought in as a consultant; his watercolor renderings have been the inspiration for the exteriors.

Guidelines

Keep It Traditional
The proposed complex should recognize and respect the presence of Brookings Hall, and refer to the architectural styles and features of the buildings and outdoor spaces that form the Brookings Quadrangle.

Make It Sustainable
As energy and environment are intellectual themes of the School of Engineering and the University, the new buildings should reflect the School's and University's commitment to sustainable technology and design.

Encourage Collaboration
The new complex should encourage interaction and collaboration not only within Engineering but also across disciplines.

>> Gothic Style swept campuses across the country in the latter part of the 19th century. The three most notable campuses affected were Princeton University, University of Pennsylvania, and Washington University in St. Louis.

© 2007 RICHARD CAMERON

View of the East Quad and part of Phase 1 of the proposed Engineering complex.

The Vision

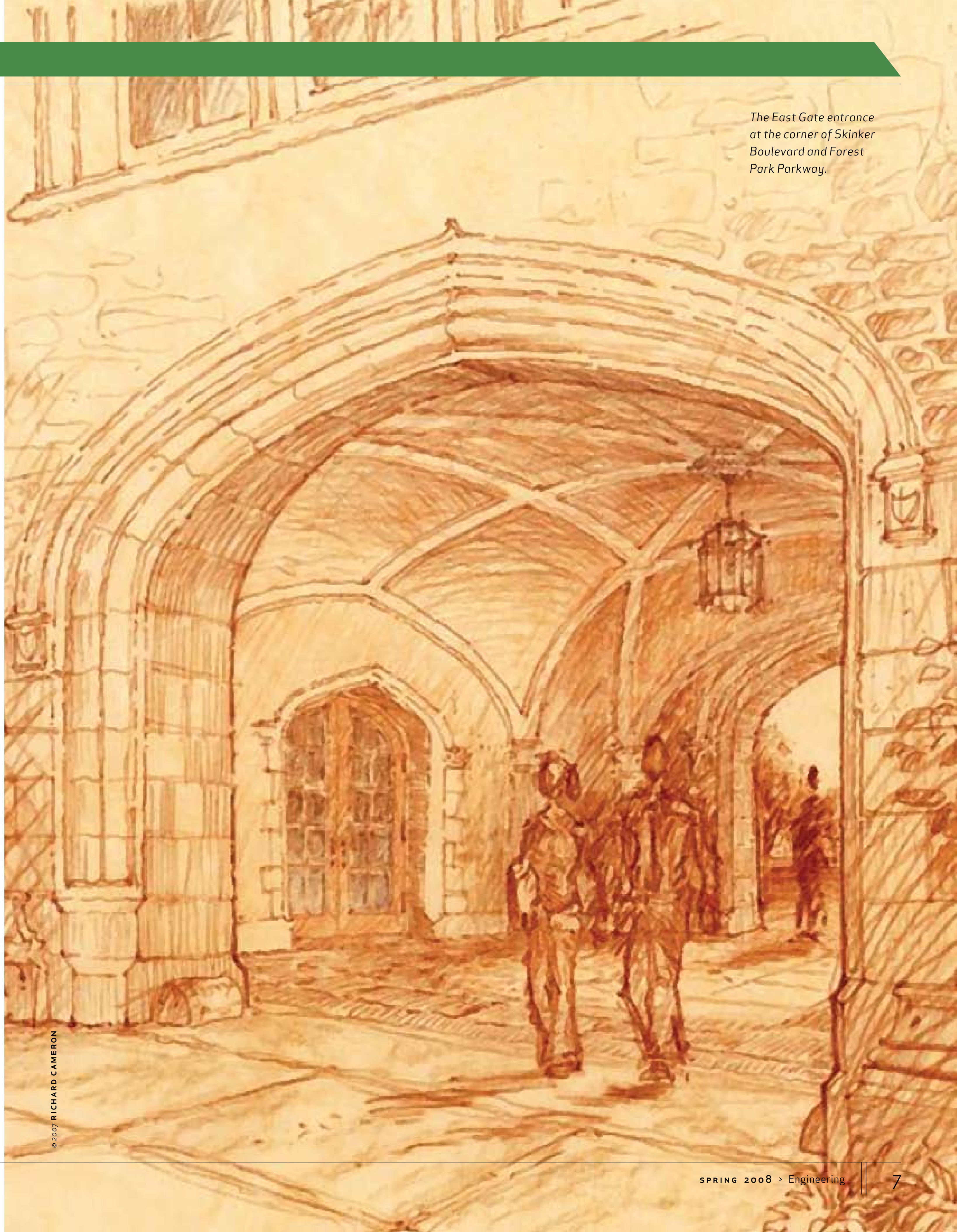
The design precedents for the new complex came from a diverse array of sources much like the original Washington University campus plan created by Cope & Stewardson in 1900.

Cope & Stewardson's exterior design was based on academic precedents from Oxford and Cambridge universities, which embodied a rich mix of sources in academic, ecclesiastical, and palatial architecture spanning more than 500 years. Since the sources were not "pure," the architects were free to adapt the precedents to new building types, sizes, and arrangements. It was a compression of many centuries of design to a style that has a striking cohesiveness. This style is better known as "Collegiate Gothic" and is the single most identifiable architectural style for higher education in the United States. Cope & Stewardson and its successor firm worked at the University for more than 25 years, making the core campus one of the most complete essays in the development of the style in the United States. The evolution of the firm's work demonstrated the richness of the historical precedents and the power of their cohesive planning to make special places.

In 1915, *Architectural Record* wrote about the Cope & Stewardson plan for Washington University. In their words,

"It was a plan full of subtleness and unexpected charm, of picturesque arrangements of courts and compositions of facades, features not strikingly evident on paper, yet convincing in reality."

It will not be a surprise if the same will be said in a few years about the 2007 Hillier plan for Engineering's new complex, which has maintained authenticity in traditional design for the exteriors, and, in addition, set as its governing principles, making humane spaces, inside and out, and creating a group of buildings and spaces that reaches out to both the existing campus and the adjacent city neighborhoods.



The East Gate entrance at the corner of Skinker Boulevard and Forest Park Parkway.

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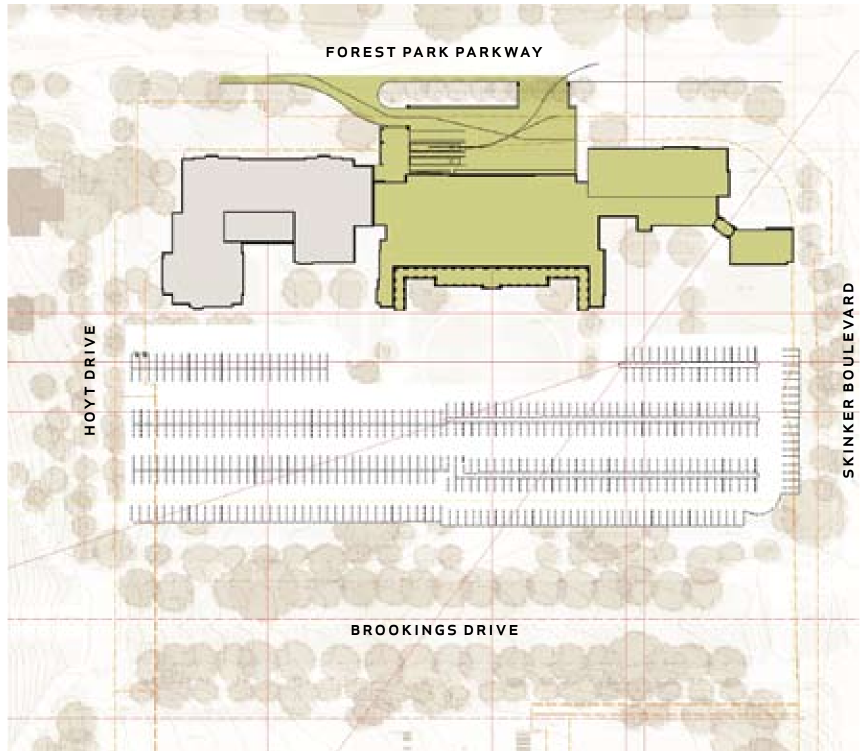
Phase 1

The first phase of the building plan, which is now in the design stage, calls for a 230,000-square-foot building which will house:

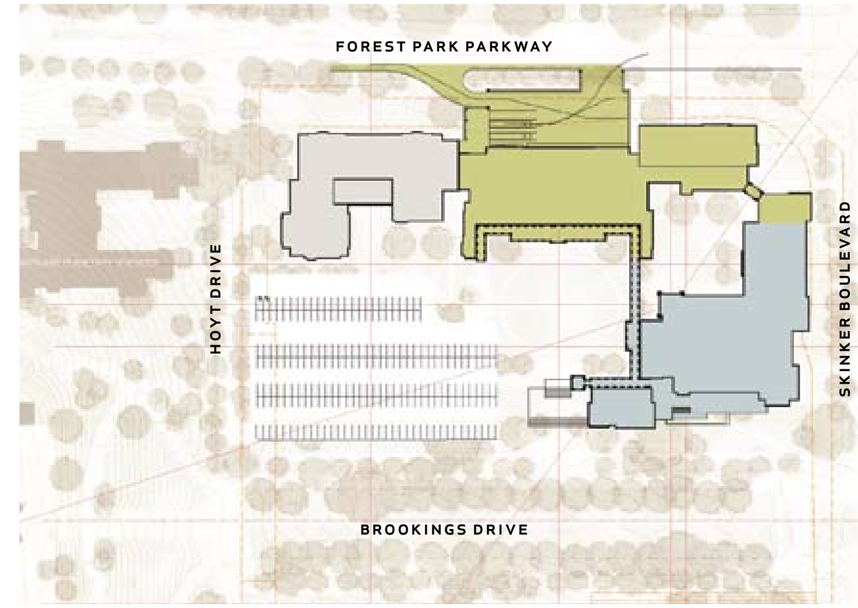
- **Energy, Environmental, and Chemical Engineering and the International Center for Advanced Renewable Energy and Sustainability (I-CARES)**
- **Research laboratories** for Biomedical Engineering
- **Undergraduate instructional laboratories** for both Energy, Environmental, and Chemical Engineering and Biomedical Engineering
- **Specialized research facilities**, including instrumentation rooms, imaging facilities, and a clean room
- **Specialized teaching facilities**, including a state-of-the-art, distance learning classroom to support international collaborations
- **Studio-style classrooms** for teaching software and systems design for Computer Science and Engineering



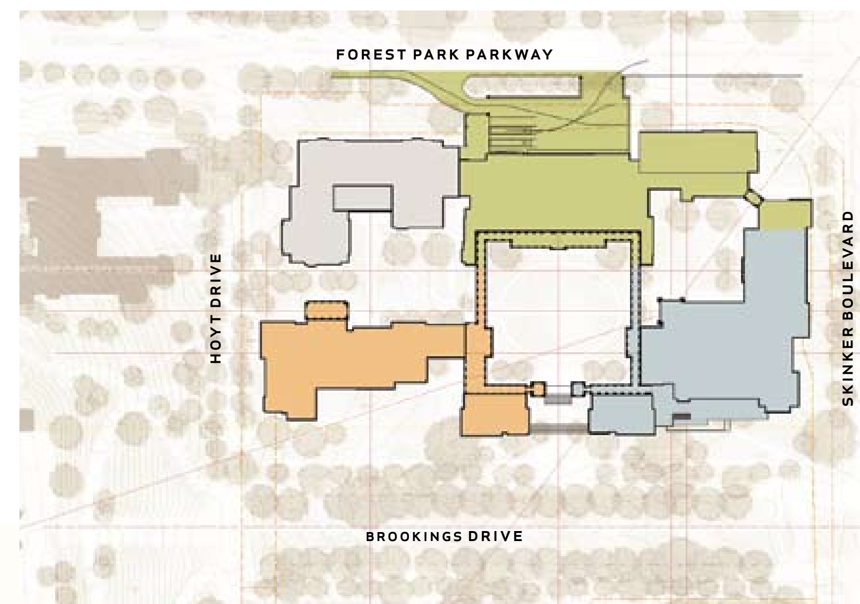
» The master plan was completed in August '07 and calls for about 600,000 square feet of new space distributed through three phases. The plans show the layout of the proposed buildings and three internal courtyards. The elevations capture a rich tapestry of the "Collegiate Gothic" style and the historical precedents of the original campus buildings, drawing from a number of styles, medieval through neoclassical.

WEB UPDATES

Please visit us on the Web for updates, and to view more renderings and elevations at: ***engineering.wustl.edu.***



Subsequent phase



Subsequent phase

(BELOW) *Looking west toward Brookings Hall; the gate is at the corner of Skinker Boulevard and Forest Park Parkway.*

Designing for LEED Platinum Certification

Home to the first Department of Energy, Environmental, and Chemical Engineering, Washington University aspires to be a model for others in responsible use of energy and other resources. The first phase of the new engineering complex is being designed for a LEED Platinum rating from the U.S. Green Building Council. Currently, there are approximately 70 LEED Platinum-certified buildings in the United States.

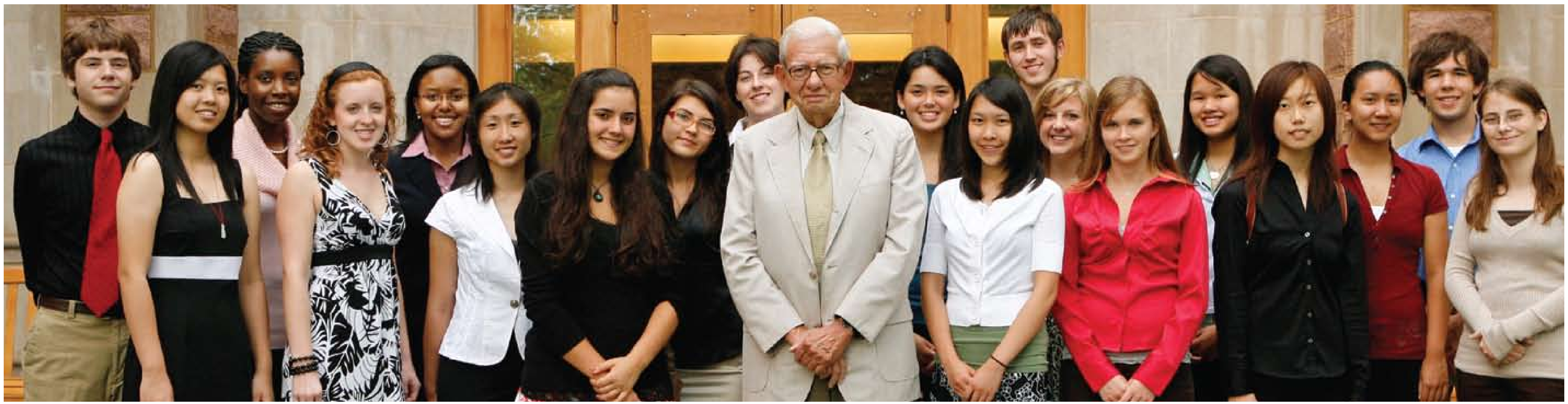
SOME OF THE PROPOSED SUSTAINABLE DESIGN FEATURES INCLUDE:

- **Recycled materials**
- **Rainwater recycling** for use in irrigation
- **Reduced water consumption** through the use of low-flow fixtures
- **Alternative energy sources,** including photovoltaics and fuel cells

For more information about the U.S. Green Building Council or the LEED rating system, visit the Council's Web site at ***www.usgbc.org.***

EDUCATING STUDENTS TO BE innovative

Photos by **GEOFF STORY**
Illustration by **LEIGH WELLS**



FROM LEFT TO RIGHT
Austin Jones, Sijie Dai, Alice Ndikumana, Rebecca Strubberg, Allison Pitt, Alice Meng, Anca Timofte, Nil Gural, Kylia Miskell, James McKelvey, Sarah Fern, Alicia Shiu, Alex Tatara, Caitlin Chicoine, Lisa Thompson, Tiffany Ogawa, Yijie Zhang, Yueyang Fei, John Hergenroeder, and Kaitlin Burlingame

» Students pursue research projects in areas as diverse as tissue engineering, the mechanics of brain development, and regeneration and rewiring of neural tissue. They develop biosensors and synthesize nanomaterials for use in energy and environmental technologies.

Inspired by the legacy of former Dean James M. McKelvey and funded in part by a grant from the Clare Boothe Luce Program of the Henry Luce Foundation, the School of Engineering offers undergraduate students the opportunity to find out what makes attending a research university so special.

Engineering freshmen designated as either McKelvey or Luce Research Scholars receive anaward of $8,000 each, which can be used to conduct research with one or more faculty members from engineering, medicine, and the sciences.

Research grants permit students to earn a stipend for working on a research project, traveling to a conference, and buying materials for their work. Scholars spend at least one summer at Washington University immersed in research.

McKelvey and Luce scholars benefit from special programming that helps them gain familiarity with important questions and emerging challenges in research. The program also provides numerous opportunities for improving writing and speaking skills, as

Scholars are expected to publish their research, participate in forums, and give presentations.

The Research Scholars participate in the exciting process of discovery on their way to developing innovative solutions to challenging, and as yet, unsolved problems. By collaborating with faculty and graduate students and often other undergraduates working in a research group, Scholars also develop teamwork skills and learn how to work in an unstructured environment.

CLARE BOOTHE LUCE
1903–1987

As the first woman from Connecticut elected to Congress and the first American woman ambassador to Italy, Clare Boothe Luce understood and appreciated the obstacles women faced in career advancement. Just a few of her diverse accomplishments included editor, playwright, social activist, journalist, and diplomat. She received the Presidential Medal of Freedom; wrote a successful Broadway play, *The Women*, which was made into a movie; and worked as the associate editor for *Vanity Fair*.

Since its first grants in 1989, the Clare Boothe Luce Program has become the single most significant source of private support for women in science, engineering, and mathematics. Awarding nearly $120 million in grants in total, this program has assisted more than 1,500 women to enter, study, graduate, and teach in science, engineering, and mathematics.

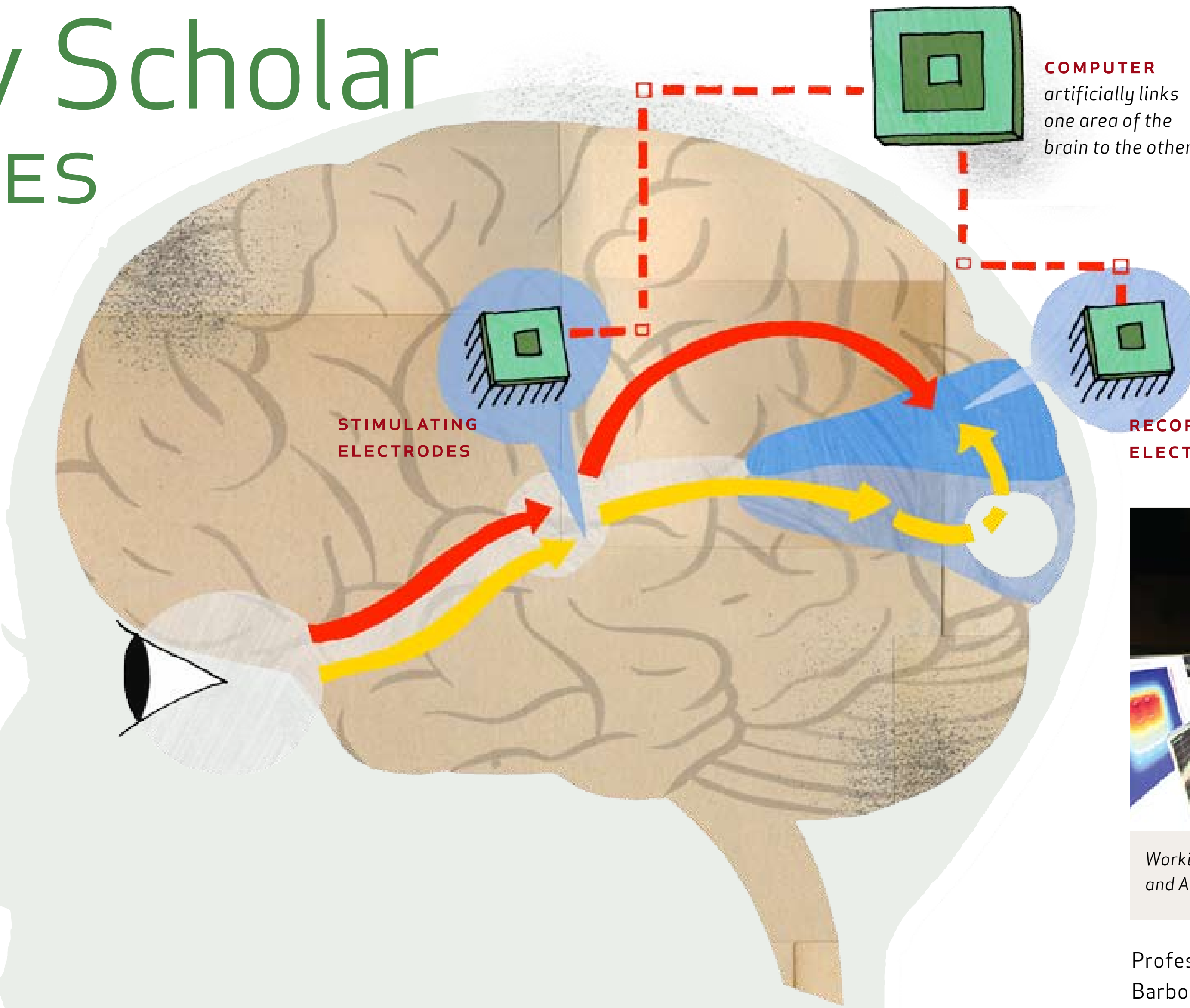
JAMES M. MCKELVEY grew up in University City, Mo. and attended University City High School. After completing his undergraduate degree in Chemical Engineering from the University of Missouri–Rolla, Jim returned to St. Louis and attended Washington University, where he earned a M.S. in Chemical Engineering in 1947 and a Ph.D. in Chemical Engineering in 1950.

After earning his Ph.D., Jim joined DuPont in Wilmington, Del. While at DuPont, he conducted research in polymer processing, an area in which Jim became a leader. In 1954, Jim joined the faculty of Johns Hopkins University, and in 1957, he returned to Washington University as an Associate Professor of Chemical Engineering. In 1960, Jim became a full professor; and in 1962, he was named department chair. Just two short years later, Jim became the seventh dean of the engineering school.

During his 27 years as dean, Jim led the School to national prominence in engineering research and education. Jim was also responsible for many innovations, including the Engineers' Scholarship Program, the Dual Degree Program, and the Cooperative Education Program. Under his leadership, three new buildings — Bryan, Lopata, and Jolley — were constructed. The School's endowment grew from $4 million to nearly $52 million, and research expenditures grew substantially.

McKelvey Scholar

AUSTIN JONES



Austin Jones, now a sophomore in Biomedical Engineering, has the distinction of being selected as the School of Engineering's first McKelvey Scholar. During the summer of 2007, Austin worked with Biomedical Engineering Assistant Professor Dennis Barbour, M.D., Ph.D., on a project involving neural circuits in the brain. Professor Barbour explains that "the focus of the project is to grow new nerve tissue and wire it up to form a functioning circuit in the brain."

Encouraging Innovation

Their work involves growing new nerve tissue using a growth factor (a protein) embedded within a slow-release polymer coated onto electrodes implanted into the brain. The new nerve tissue is then rewired using electrical stimulation from the electrodes. Because the brain's immune response will ultimately reject a prosthetic, this technique to embed the prosthetic electrodes, wire new circuits, and then remove the electrodes has the potential to implement a permanent "brain bypass" without the need for indwelling foreign bodies. Austin developed a computational model that examines electrode geometry, polymer release, and growth factor concentration, and predicts how these factors may influence circuit growth.

Austin is most interested in the bioelectrical aspect of this research. In particular, he says,the design of the electrode array fascinates him. His work, which he is continuing during the academic year, represents the very first steps of what could develop into a major research project with possibly tremendous long-term impact. The results of Austin's summer research work will be the basis for an NIH research proposal.

According to Austin, "This summer research experience taught me how to learn outside the classroom. Research is unstructured, and one cannot rely on finding the answers in textbooks. I have found instead that I learn from others who are working with me, and they learn from me as well. It is the exchange of ideas that leads to insights and discoveries. I enjoy this much more than classroom learning."

Without the McKelvey Scholar Award, Austin would have returned home to Kentucky to work at a summer job. Instead, he was paid a stipend to try his hand at research, working with a faculty member of his choosing. Austin first heard about Professor Barbour's work in his first semester Introduction to Biomedical Engineering course (BME 140) taught by Biomedical Engineering Department Head, Professor Frank Yin, the Stephen F. and Camilla T. Brauer Distinguished Professsor of Biomedical Engineering. Professor Barbour visited the course and gave a lecture to the students on his research.

Working side-by-side in the lab, Professor Barbour and Austin study the results of their experiments.

Dean Mary J. Sansalone is not surprised that Austin both enjoyed and learned so much from his research experience. She says, "When one watches Professor Barbour with his students, you understand why students love being in his lab. He is constantly questioning, constantly encouraging them to think more deeply about what they are seeing, and to then think beyond the obvious conclusions to find the real implications of what they are observing." And she points out that, "Austin's experience working under Professor Barbour's guidance is one of the unique opportunities that faculty in a research university can offer to their students."

Barbour's Lab

The vertebrate nervous system routinely achieves feats of pattern recognition unparalleled by modern computers. The natural algorithms underlying this pattern recognition and the neuronal circuitry computing them both represent targets for research in my lab.

We rely upon a variety of techniques to explore these issues, including:

- **Single neuron recordings** from awake subjects
- **Electrophysiological and optical recordings** of auditory and visual neurons in acute brain slice preparations
- **Focal glutamate uncaging** in brain slices to map excitatory projections
- **Computational modeling** of putative neuronal circuitry

These methods facilitate our main long-term objective of understanding how complex sounds are encoded in higher auditory centers of the brain, particularly under conditions of interfering noise.

A more thorough understanding of this natural encoding has the potential to contribute to the engineering of improved devices for interfacing with humans, including hearing aids, auditory prostheses, and computers capable of recognizing speech. We are also investigating novel methods of rewiring brain circuitry to take on new functions and effectively replace damaged tissue.

FACULTY PROFILE

Jonathan S. Turner, the Barbara J. and Jerome R. Cox, Jr., Professor of Computer Science, is working on a collaborative project, initiated by the National Science Foundation, aimed at reinventing the Internet through groundbreaking research on "virtual routers" that will process data in new ways.

Networking for Change:

JONATHAN TURNER

Written by **CANDACE O'CONNOR**
Photos by **GEOFF STORY**

Most of us use the Internet daily, never thinking about the technology that lies behind it: the packets of data that flow through the networks, past switches that ultimately route them to their destination. Nor do users consider how the Internet's underlying architecture could change to make the system more reliable, efficient, powerful, and flexible.

88%
OF AMERICANS SAY THE INTERNET PLAYS A MAJOR ROLE IN THEIR LIFE

Jonathan S. Turner, the Barbara J. and Jerome R. Cox, Jr., Professor of Computer Science, has been considering questions like these for years. While at Bell Labs early in his career, he did landmark work on ways in which networks — data, voice, and video — could converge in a single, integrated system. Rejoining Washington University in 1983 as a faculty member, he developed ideas for multicast communications through networks that can distribute audio and video data to many viewers. Now he is working on a collaborative project, initiated by the National Science Foundation, aimed at reinventing the Internet through groundbreaking research on "virtual routers" that will process data in new ways.

"We're seeing a shift to this concept, because the Internet is increasingly resistant to change as it becomes bigger and more successful," says Turner, recently appointed chairman of the Department of Computer Science and Engineering, a position he also held from 1992 to 1997.

"The technology at the heart of the Internet hasn't changed in 25 years. It's not that we haven't come up with better ways to do things. The research community has developed improvements to that core technology, but it has been extremely difficult to get those improvements deployed."

1977
One of the first students to earn degrees through the Dual Degree Program

1983
Rejoins Washington University as a faculty member

1986
Released visionary paper leading the way to our networked world

1989
Co-founded the Engineering School's Applied Research Laboratory

1992
Appointed chairman of the Department of Computer Science, served until 1997

1993
Honored with Washington University Founders Day Distinguished Faculty Award

A major joy for Turner was being named to the Cox professorship, donated by and named for his longtime friend and collaborator. "That was the crowning highlight of my career," says Turner.

Computer Science and Engineering graduate students Mike Wilson, Mart Haitjema, and Charlie Wiseman talk with Jon Turner in Whispers Café.

1997
Co-started company, Growth Networks

2000
Growth Networks acquired by Cisco Systems

2004
Won the Arthur Holly Compton Faculty Achievement Award

2007
Honored with Alumni Achievement Award from the School of Engineering

Elected to National Academy of Engineering

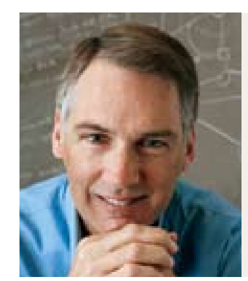
Reappointed Chair of Computer Science and Engineering

Why? The management of the Internet is highly distributed — into about 20,000 networks and nearly the same number of network providers — and any change must be adopted by everyone, which creates a serious barrier to innovation. To get around this problem, Turner wants to develop an infrastructure of parallel virtual networks, defined less by hardware than by software that is logically distinct from its physical box.

A creative teacher, who won the Washington University Founders Day Distinguished Faculty Award in 1993 and the Arthur Holly Compton Faculty Achievement Award in 2004, Turner engaged a class of graduate students in this same question by requiring each student to create ideas for Internet reinvention and present their ideas to the class. Afterward, students were asked to comment on the ideas in a blog Turner set up online.

Nationally, Turner has a well-earned reputation for success, with 30 patents for his work in switching systems and many widely cited publications, including a seminal 1986 paper on network architecture. One of the first students to earn degrees through the Dual Degree Program, Turner received dual degrees from both Washington University (electrical engineering and computer science) and Oberlin College (theater) in 1977. Later, Turner earned master's and doctoral degrees from Northwestern University. In 2007, he was honored by Washington University again with an Alumni Achievement Award from the School of Engineering, and he was recognized nationally by his election to the National Academy of Engineering.

"Even when Jon was a student, we were aware that he was special. He often surprised his instructors with his insight and continued to impress all who worked with him at Bell Labs and again at the University," says Jerome R. Cox, Jr., senior professor of computer science and former department chairman. "In his visionary 1986 paper, Jon led the way to our networked world, and today we again have his leadership in the NSF's effort to reinvent the Internet. I am very pleased and proud that he now holds the Cox professorship."



>> Faculty Profile

JONATHAN S. TURNER

Barbara J. and Jerome R. Cox, Jr., Professor of Computer Science

As a young faculty member at the University, Turner established the Advanced Network Group, which led to his development of an innovative asynchronous transfer mode (ATM) switch and one of the first metropolitan area network demonstrations of ATM technology.

In 1989, Cox, Turner, and Guru Parulkar, co-founded the Engineering School's Applied Research Laboratory, and in 1997, the three also started a company, Growth Networks, which was acquired by Cisco Systems in 2000 in a transfer arrangement that was a model for such initiatives at the University.

"Jon Turner ranks among the University's top engineering professors of all time," says James McKelvey, dean of engineering from 1964 to 1991 and now a senior professor of engineering. "He is an outstanding teacher and an inspiration to his students; he provides important leadership to his department; and his research contributions have received international recognition. The University is indeed fortunate to have Jon Turner as a faculty member."

Reappointed chair of Computer Science and Engineering in 2007, Turner is also working on departmental goals, particularly elements of a strategic plan that will help move the department into the future. A new "virtual presence" initiative is one theme, which will involve faculty experts in graphics, user interfaces, and networks; another is an increasing emphasis on applications of computing to medicine and biology. He expects the department's already high level of research productivity to continue to grow as the faculty and students explore new areas of research.

THE BLACK BOX THAT'S GREEN: Exegy

Written by **CANDACE O'CONNOR**
Photos by **GEOFF STORY**

>> Each day on Wall Street, harried traders scramble to make profitable deals as data floods in from exchanges around the world. In government intelligence agencies, national security analysts are bombarded by messages that need processing. In pharmaceutical labs, scientists screen thousands of possible medications, but accelerated results would mean a faster track to life-saving cures.

Exegy, Inc., a young St. Louis-based company founded by Washington University School of Engineering faculty, is solving these problems with new high-performance technology that collects, filters, mines, and processes information hundreds of times faster than ever before. At the 2006 Supercomputing Conference, they tagged the small appliance they produce to do this work as "the black box that's green" — creating solutions that are more space-saving, energy-efficient, and profitable for the user.

"We've put St. Louis on the technology map," says Exegy's co-founder and chief technology officer Ron Indeck, who is currently on leave from Washington University, where he is The Das Family Distinguished Professor of Electrical Engineering. "When you went to New York before and talked to people about high-performance computing, St. Louis was not the first place to come to mind. Today, if you go to some of these high-end firms and mention St. Louis, they'll immediately think of Exegy and our latest technology."

RONALD INDECK
Co-founder & CTO

Their firm, originally called Data Search Systems, Inc. (DSSI), got its start in 2003 after Indeck and his School of Engineering colleagues — computer

Washington University Faculty and Alumni at Exegy.

J. J. STUPP M.B.A., 1983

ROGER CHAMBERLAIN D.Sc., Professor of Computer Science & Engineering

MARK FRANKLIN Ph.D., The Hugo F. and Ina Champ Urbauer Professor of Engineering Department of Computer Science & Engineering

RON INDECK Ph.D., The Das Family Distinguished Professor of Electrical Engineering

RON CYTRON Ph.D., Professor of Computer Science & Engineering

MICHAEL DEWULF M.S., 2007

DAVID SCHUEHLER D.Sc., 2004

BENJAMIN BRODIE M.S., 2004

JASON WHITE M.S., 2003

BILL HILDEBRANDT B.A., 1981

J. J. STUPP
Co-founder & CFO

scientists Ron Cytron, Mark Franklin, and Roger Chamberlain — pooled their talents to develop this technology. DSSI acquired an exclusive license from the University and seed money from Bush-O'Donnell & Co.; its principal, Jim O'Donnell, M.B.A. '74 and a University trustee, eventually became Exegy's chairman and chief executive officer. Another Olin Business School graduate, J.J. Stupp, M.B.A. '83, a startup expert with deep family roots at Washington University, came on board as a founder and chief financial officer.

"For an early-stage technology company, all the planets are aligned," says Stupp. "We have knock-out technology, a fantastic team, huge market opportunities, great investors, and a big opportunity to build a very important company here."

Exegy, which began life in the Center for Emerging Technologies, recently moved to a spacious building in Webster Groves. With $24 million of capital now in hand, they have expanded quickly – and of their 50 employees, 22 are School of Engineering graduates. In addition, Exegy hires work-study students and summer interns from Washington University. Indeck has shifted to the company fulltime, but Cytron, Franklin, and Chamberlain remain at the University, serving on Exegy's technical advisory board.

While their innovative engineers are always working on refinements, the basic Exegy product is based on what Indeck calls "heterogeneous computing" — a blend of hardware and software specially designed for efficiency by doing tasks in parallel, not in a series, as in conventional computing. "This paradigm is really unusual in that people have talked about it for decades," he says, "but no one has actually been able to put it together and make it work."

Take the term "golden retriever." To find it in a dictionary, a person would hunt for the "g" then the "o" and so on; microprocessors work in the same sequential fashion, though much faster. But Exegy technology allows the computer to search for the entire term all at once. "In fact, we can look at 10,000 such words at a time," Indeck says. That speed means a user does not need to operate as many servers, thus saving space and energy.

At the moment, Exegy has two products, both available for lease: the Exegy Ticker Plant, which can process 2 million messages per second; and the Exegy Text Miner, which can search data feeds in real time at 5 gigabits per second. The first is a boon for stock traders, who need to aggregate and format data; the second, for national security personnel, who must comb through mountains of data hunting for strings of words. Other applications — for chemical companies, transportation agencies, and industries — are also developing rapidly.

"We did a pilot, proof-of-concept exercise with one local company," says Indeck, "targeting a process that took them about eight days to complete. We went in there with our machine, dropped it onto the desk, and 18 1/2 minutes later, we were done. That is a factor of 620 times improvement in performance."

With their flexible platform, Exegy has many state-of-the-art ideas in the pipeline — all "industry-changing" solutions, says Indeck, that will allow analysts to ask questions they could never ask before, and go down paths they couldn't previously imagine. Exciting times for Exegy? "That is an understatement," Indeck says. "The team we have here has put it all together, and it is just phenomenal."

JUSTIN THIEL *M.Sc., 2007*

JEREMY WHATLEY *M.Sc., 2001*

BERKLEY SHANDS *M.Sc., 1983*

EDWARD SPITZNAGEL *D.Sc., 2005*

SCOTT PARSONS *M.S., 1990*

MICHAEL HENRICHS *B.S.C.S., 2003*

MICHAEL MOORE *M.I.M., 1985*

NATHAN McVICAR *B.S., 2006*

DAVID TAYLOR *D.Sc., 2004*

» How do four busy engineering professors come up with an idea that develops into a successful company?

The key, says Ron Indeck, is multi-disciplinary thinking, in which colleagues draw on each other's expertise to create a novel concept.

The Exegy seed first germinated during a conversation between Indeck, whose background is in applied physics with a specialty in information storage, and Mark Franklin, who focuses on computer architecture. For years, Indeck worked on the problem of storing information in smaller and smaller packages, "but Mark appropriately asked: 'Now that you have stored the information, how are you going to access it?'"

The following conversation was illuminating. "The conclusion we came to was that conventional systems were not going to address the problem. So we pulled in Ron Cytron and Roger Chamberlain — and we solved the problem," says Indeck.

That kind of collaboration represents a seismic shift in engineering. Fifty years ago, Indeck says, engineers worked individually on narrowly focused questions. "Today, typical solutions do not result from that type of approach. They involve finding a completely new approach — and that took four of us thinking together to discover the answer."

EDUCATING STUDENTS FOR CITIZENSHIP IN A Global Society

Illustration by **DAVID CUTLER**

Washington University Engineering students can now choose from a wide range of opportunities for both study abroad and international internship experiences, including programs in Beijing, Hong Kong, Istanbul, Mumbai, Seoul, and more.

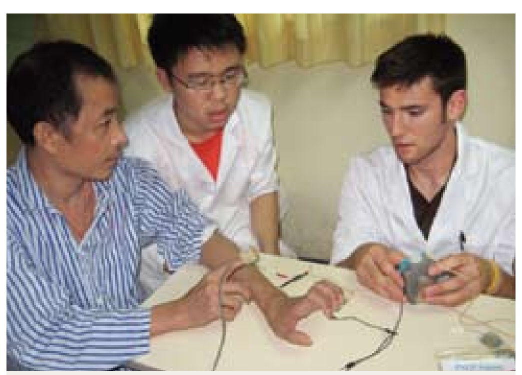
Expanding Engineering Education Globally

Written by **RICK SKWIOT**

>> *The School aims to educate its undergraduate students for leadership roles in an increasingly global and technological society.*

The Washington University exchange team at their hotel in Hong Kong. From left to right: (front row) Ian Pearson, Thomas Chen, Kate Achtien, Katherine Ku, Corinne Pascale, Maiko Kume, (back row) Bob Hamilton, Jon Steer, Professor Frank Yin, Kristi Tanouye, Professor Joe Klaesner.

Senior Corrine Pascale was among nine Biomedical Engineering students who, while at Guangzhou, worked alongside students from Hong Kong Polytechnic University (HKPU). She describes her two-week China study trip as a life-changing experience.



A patient receives FES treatment from Barry He Yi Xin (center) and Robert Hamilton (right).

The patient hadn't walked for months. The HKPU students helped our group apply electrodes to his legs for functional electrical stimulation therapy, which would send "walk signals" along the healthy nerves of his legs," says Corrine.

"We activated the stimulation therapy, and he took his first shaky step forward. For the next 20 minutes, he slowly paced from one end of the room to the other. When we helped him back to bed at the end of the session, I didn't need a translator to know what he was feeling: It was victory."

Corrine says the trip also sensitized her to varying cultural nuances, knowledge that could ultimately impact her work. Experienced with standard American medical care and procedures from her work at a Pittsburgh hospital, she was surprised to see physicians and therapists touching patients without wearing sanitary gloves. But she soon learned the reason.

"In China, gloves are seen as a dehumanizing barrier between doctor and patients, who want to be touched and have hands-on care, not care that is detached and clinical, but human and caring," says Corrine.

Department of Biomedical Engineering Head Frank Yin, the Stephen F. and Camilla T. Brauer Distinguished Professor of Biomedical Engineering, who, with Assistant Professor of Physical Therapy Joe Klaesner, led the Washington University contingent in China, says such hands-on, international educational experiences for students can significantly influence the careers of young engineers.

Senior Katherine Ku gives evidence to Yin's contention. "The trip encouraged me to think more globally, beyond the boundaries of standardized U.S. health care," Katherine says. "It opened my eyes to the endless opportunities pediatric physical training has to offer. I never considered this field until I met Chinese children with cerebral palsy. Interacting with them motivated all of us to produce the best ankle-foot orthoses for each of them. We would spend hours sanding the edges of our orthoses to maximize comfort for our patients."

The trip will also inform senior projects for a Biomedical Engineering design course with Professor Klaesner this spring.

"To be exposed to new things that were just theoretical until now, and to see universal needs and desires transcend language, can have a great impact on a person's life. It could motivate you for life."

— PROFESSOR FRANK YIN

The August collaboration with HKPU is just such an engineering-medical collaboration and the first exchange resulting from a recently signed three-year agreement between the universities. That agreement calls for an upcoming visit by HKPU students to the Washington University School of Medicine's Physical Therapy Program, a prospect that cheers Thomas Chen, part of the University student contingent on last summer's China trip.

The Washington University Engineering and HKPU students in Hong Kong with Professor Frank Yin, Grace Yin, and Professor Joe Klaesner.

"The trip allowed me to meet new friends, both from Washington University and from Hong Kong Polytechnic University." says Thomas. "We had to struggle together to learn how to create orthoses that will help patients deal with their disorders and to learn how to use functional electrical stimulation therapy in a safe manner to promote recovery from injuries." This spring Thomas is slated to receive two Bachelor of Science degrees from the Departments of Biomedical Engineering and Energy, Environmental, and Chemical Engineering.

"Thankfully, this program is an exchange that works both ways, and I may be seeing some of the Hong Kong students again this upcoming spring at Washington University."

— THOMAS CHEN

In China, Chen and the other students first met with HKPU faculty in the Department of Health Technology and Informatics, who introduced them to research initiatives in functional electrical stimulation, and in the fabrication and application of orthotics. Then, at Sun-Yat Sen University in Guangzhou, they met with Department of Medical Rehabilitation Medicine members to learn about stimulation therapy applications for stroke patients, before traveling to the Dongguan Rehabilitation Center to study orthotic applications for children suffering from cerebral palsy.

It was at Sun-Yat Sen University that Yin and the others witnessed what he called a "wonderful, maturing experience" for students. A 13-year-old patient there, who had been forced to walk dragging his foot ever since suffering a stroke as an infant, was fitted with stimulation therapy diodes.

"With the stimulation," says Yin, "he was able to walk normally. If one could see the smile on the boy's face — it could be a career-changing experience."

Chen concurs. "This trip has shown me the effect that a biomedical device can have on a patient. I would have never imagined how a technique such as stimulation therapy could have so much effect on not only a person's therapies but also on his or her spirits. This trip has also stressed the importance of research for me."

This summer, as part of a new international experience course, Department of Energy, Environmental, and Chemical Engineering Associate Professor Jay R. Turner and Research Associate Ruth Chi-Fen Chen will lead 12 sophomores and juniors to Beijing to study air quality and other environmental factors in what Turner calls "a natural laboratory."

"The School of Engineering is striving to instill in its undergraduate students a passion for scholarship and innovation, and the ability to adapt to change and lead in a rapidly evolving global community. Our students are learning to ask what does the world need, and where might they have an impact in responding to those needs."

— DEAN MARY J. SANSALONE

For more information on our International Programs, visit our Web site at ***engineering.wustl.edu.***

"We may never again in our lifetimes see such a rapid expansion of a big economy," says Turner. "It's a wonderful opportunity to look at environmental, sustainability, and health aspects."

The students will visit government air-quality monitoring stations, meet with researchers at Peking and Tsinghua universities — both McDonnell International Scholars Academy partner institutions — and travel to power plants, wastewater treatment plants, and other facilities to learn firsthand about Chinese and global environmental issues. "Such international experiences," says Turner, "are crucial to the students' ability to succeed in a changing professional environment."

"Students are truly entering a global engineering world where having international business and cultural experiences will be critical to their success and their ability to function in those environments," says Turner, who believes that many future engineering challenges will be global, not local issues.

"Our students will be learning about the import and export of pollutants," says Turner. "Chinese dust storms are not confined to China."

The students' Chinese experience and study will form the basis for research projects in a new fall 2008 class, International Experience in Energy, Environmental, and Chemical Engineering.

"The 2008 trip and course are a prototype for future international learning experiences," according to Pratim Biswas, chair of the Department of Energy, Environmental, and Chemical Engineering and the Stifel and Quinette Jens Professor.

"We intend to go to a McDonnell Academy partner university city every year and do this in collaboration with faculty at our partner schools," says Biswas. "Having 24 partner universities allows for a wide range of undergraduate opportunities."

In fact, the department is already planning for an international experience in Seoul, South Korea, during the summer of 2009, which will focus on environmental issues.

Bold Action in Energy & Environment

In October 2006, Washington University became the first university in the world to create a department of Energy, Environmental, and Chemical Engineering (EECE) by bringing together faculty involved in an interdisciplinary environmental engineering science graduate program and faculty in the Department of Chemical Engineering.

Under the visionary and energetic leadership of Pratim Biswas, the Stifel and Quinette Jens Professor and one of the world's leading experts in aerosols research, faculty in this new department is organized into four cluster areas of aerosol science and engineering; aquatic processes; metabolic engineering and systems biology; and multiscale phenomena.

While the faculty members contribute core expertise to the clusters, they collaboratively work with each other and with colleagues in different departments and schools in three thematic areas:

> *Energy and Environment*
> *Advanced Materials*
> *Sustainable Technologies for Public Health and International Development*

Faculty members also work through the McDonnell Academy Global Energy and Environment Partnership (MAGEEP), a partnership of universities from around the world, to collaborate on educational programs and study issues related to energy and the environment.

Photo by GEOFF STORY

PRATIM BISWAS
Department Chair &
Stifel and Quinette Jens Professor

This department is also the anchor of the University's new International Center for Advanced Renewable Energy and Sustainability (I-CARES), which is led by Himadri Pakrasi, the George William and Irene Koechig Freiberg Professor of Biology and Professor of Energy in EECE.

With an original core faculty of 12, the department launched a cluster of searches in 2006. Two new faculty in the aquatic processes area joined the department this academic year – Professors Cynthia Lo (Ph.D., MIT) and Young-Shin Jun (Ph.D., Harvard). In addition, two more will join next academic year. Yinjie Tang, currently a postdoctoral fellow at the University of California-Berkeley, accepted a position in the metabolic engineering and systems biology area. Ramki Kalyanaraman, currently an assistant professor of physics at Washington University, will join the Department in July, bringing expertise in nanomaterials with applications to energy. The department is also collaborating with the School of Medicine to recruit a faculty member with expertise in environmental public health.

With so many fundamentally important research problems to be tackled, expanding student interest, the wealth of possibilities afforded by international collaboration, and a new building on the drawing board, the next decades should prove to be an exciting time for this new Department of Energy, Environmental, and Chemical Engineering.

For more information about this department, visit its Web site at ***eec.wustl.edu.***

ENERGY, ENVIRONMENTAL & CHEMICAL ENGINEERING

Aerosols
> Combustion
> Nanoparticle Technology
> Instrumentation
> Particle Emission Control
> Air Quality and Environmental Informatics

Engineered Aquatic Processes
> Aquatic Chemistry
> Water Treatment
> Quantum and Molecular Level Modeling of Interfaces
> Environmental Restoration

Metabolic Engineering and Systems Biology
> Cellular Pathways for Chemical Transformation
> Biological Routes to Chemical/Energy Production

Multiscale Phenomena
> Complex Fluids and Rheology
> Instability and Nonlinear Dynamics
> Nanoscale and Mesoscale Phenomena
> Catalysis and Reaction Engineering

Photo by JOE ANGELES

"We believe we have a responsibility to meet national and international imperatives in energy, environment, and health. To this end, we have launched a bioenergy initiative and created a new Department of Energy, Environmental, and Chemical Engineering. Our goal is to become a hub for environmental and energy research, education, innovation, and action, and to educate the next generation of global leaders."

— CHANCELLOR MARK S. WRIGHTON

Celebrating History

Biomedical Engineering at Washington University

Professor Frank Yin with recent Biomedical Engineering graduates.

1964 1968

The Department of Biomedical Engineering, which recently celebrated its 10th anniversary, continues to build upon the long tradition of excellence in biomedical engineering at Washington University.

The origins of biomedical engineering at Washington University date back to the early 1960s when Professor Jerome Cox, Jr. and Maynard Engebretson designed and built a digital computer (the HAVOC) especially for auditory research.

In 1964, Cox founded the Biomedical Computer Laboratory at the Washington University School of Medicine, and soon thereafter, Wesley Clark formed the Computer Systems Laboratory at Washington University. Clark and his colleague, Charles Molnar, are known for developing the LINC (Laboratory Instrument Computer) at Lincoln Laboratory at the Massachusetts Institute of Technology for use in biomedical research; the LINC is widely recognized as the first personal computer.

1964

4W2 (4-week wonder) computer was designed, built, and debugged in a class taught by Cox and Clark. A later version pioneered work in radiation treatment planning.

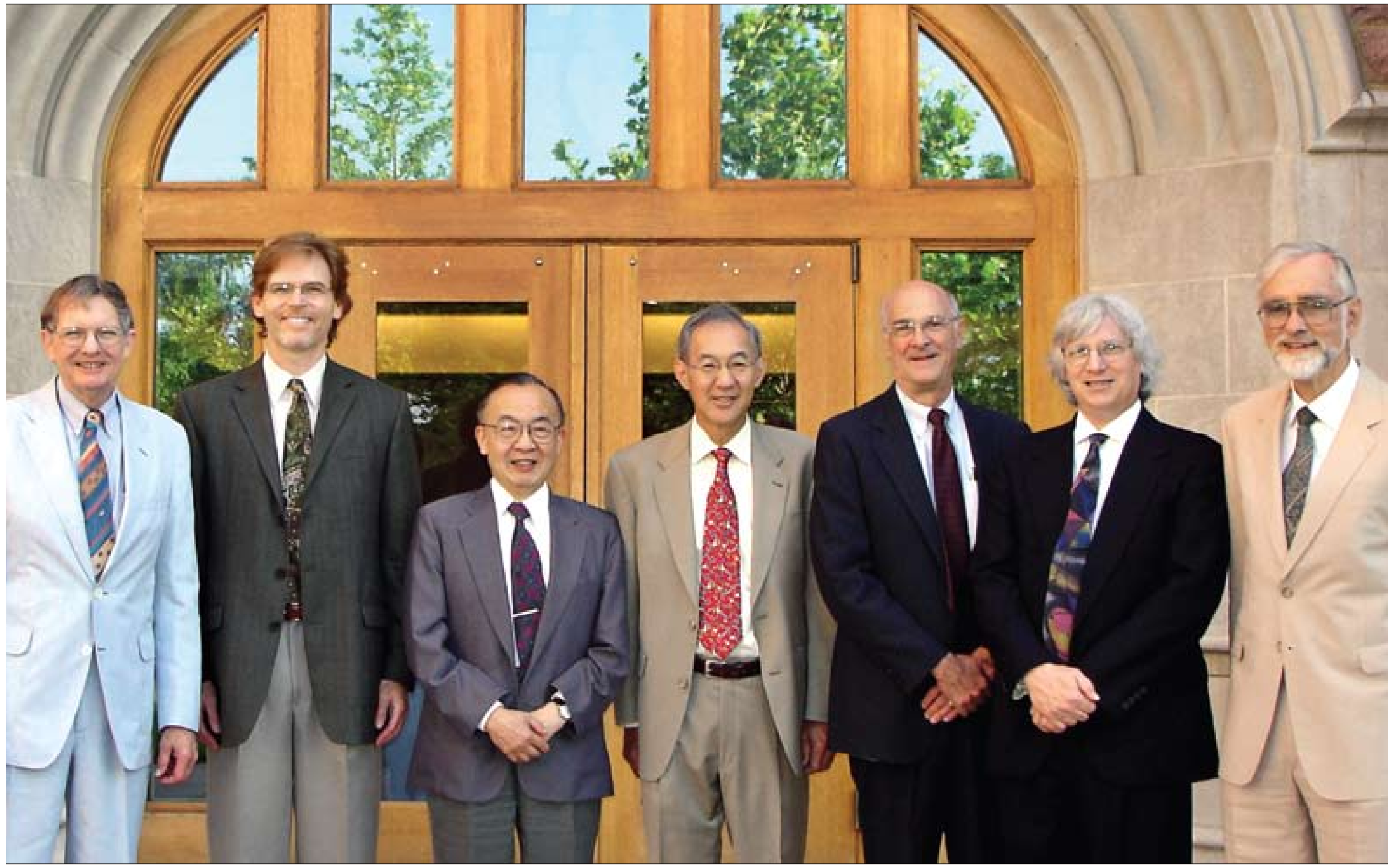
As the first established collaboration between Engineering and Medicine at Washington University, engineers from the Biomedical Computer Laboratory and the Computer Systems Laboratory worked together to bring about significant changes to laboratory and clinical computing world wide.

Throughout the 1950s and 1960s, the Schools of Engineering and Medicine provided joint appointments for the electrical engineers and computer scientists who led the Biomedical Computer Laboratory and Computer Systems Laboratory, and as a result of this collaboration, biomedical engineering became a strong and rapidly expanding research activity in both schools.

The scope began to broaden beyond biomedical computing when Salvatore Sutera was appointed chair of the Department of Mechanical Engineering in 1968. Professor Sutera collaborated with colleagues from Chemical Engineering, Surgery, Pathology, and Medicine to win NIH sponsorship for several projects related to artificial organs, microcirculation, and cellular mechanics.

1968

Sutera studying the degradation of red cells in shear flow.



TODAY

In June 2007, the department held a symposium to celebrate its 10th anniversary. Distinguished members of the biomedical engineering community who presented included *(left to right)*: Lawrence P. Schramm, Ph.D., from Johns Hopkins; Bruce J. Tromberg, Ph.D., from UC-Irvine; Shu Chien, M.D., Ph.D., from UC-San Diego; Frank Yin, M.D., Ph.D. from Washington University; Peter Katona, Sc.D., from George Mason; Douglas A. Lauffenburger, M.D., from MIT, and Charles R. Steele, Ph.D., from Stanford.

Together with a core faculty of 15, 60 faculty members from other engineering departments and the School of Medicine work together to support the broad spectrum of biomedical engineering activity at Washington University. Support from the School of Medicine, particularly former Dean William Peck and current Dean Larry Shapiro, has helped to make biomedical engineering at Washington University what it is today.

1970 | 1972 | 1993 | 1997 | 2002

From 1970 to 1978, Professors Jerome Cox, Jr., R. Martin Arthur, William Pickard, Russell Pfeiffer, and others founded and offered an intensive 21-month Master of Health Care Technology curriculum, including a clinical engineering practicum.

In 1972, the Interdepartmental Graduate Program in Biomedical Engineering was established to encourage interdisciplinary research, coordinate recruiting, and develop courses. In addition to receiving a graduate degree from their home department, graduate engineering students could earn a certificate in Biomedical Engineering through this program.

1972

Arthur *(far right)* promoting the variety of practicums that were available to engineering students in the Technology in Health Care Program.

In 1993, a doctoral degree program in Biomedical Engineering was established.

1993

Cox *(background)* and Sutera *(foreground)* advise biomedical engineering students.

Photo by GEOFF STORY

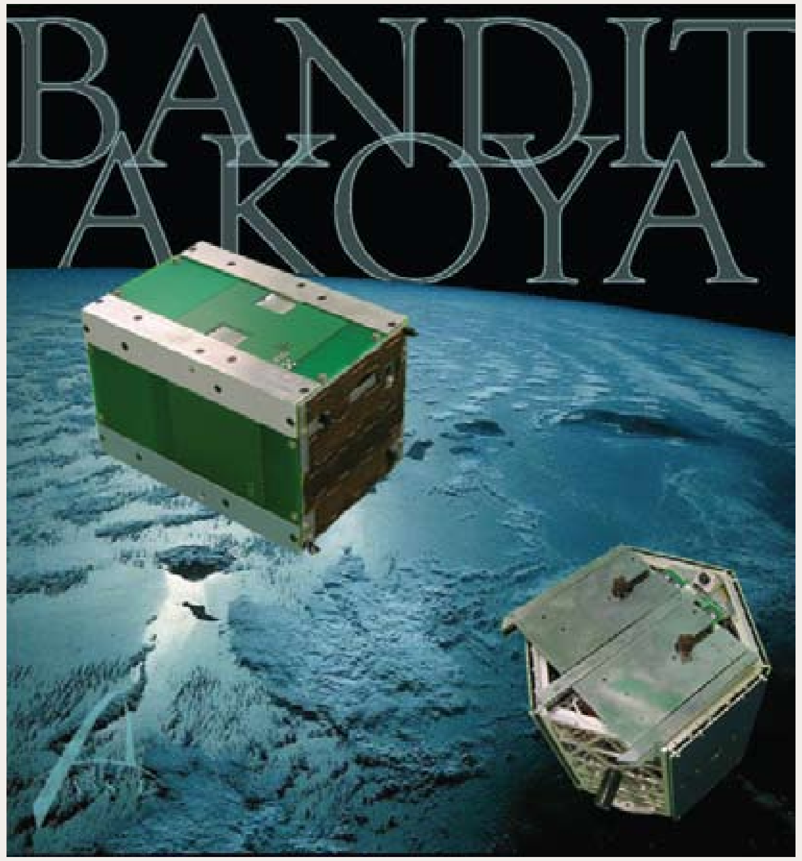
1997

Frank Yin, M.D., Ph.D., the Stephen F. and Camilla T. Brauer Distinguished Professor and Chair of Biomedical Engineering, joined Washington University to lead this new department.

As a result of the strategic planning of the mid-1990s, the Department of Biomedical Engineering was created in 1997; today, this department takes a modern, interdisciplinary approach to advancing basic science, with the hope to better understand, diagnose, and treat diseases affecting humankind.

2002

In 2002, the Uncas A. Whitaker Hall for Biomedical Engineering was completed.



ENGINEERING STUDENTS COMPETE IN NANOSATELLITE COMPETITION

>> LAST MARCH 27, a team of engineering students, advised by Assistant Professor Michael Swartwout, traveled to Albuquerque, N.M., to compete for an opportunity to launch a nanosatellite into space. Teams from 11 universities competed in the Nanosat-4 Competition, a design-and-build competition, which was sponsored by NASA, the United States Air Force, and the American Institute of Aeronautics and Astronautics. The team took second out of 10 entries in the competition.

The students combined their knowledge of structural, computer, electrical, mechanical, and systems science engineering to develop two nanosatellites — Akoya and Bandit. Akoya, which weighs 25 kilograms and is the size of a beach ball, is the "mother ship" to Bandit, which weighs 2 kilograms and is the size of a cantaloupe. When launched into space, Bandit would orbit Akoya, taking photos and making observations.

This type of "proximity operation" is not well understood currently.

The students also demonstrated their satellites at the 20th Annual Conference on Small Satellites in Utah on August 6, 2007.

Chen Receives Microsoft Fellowship

Written by TONY FITZPATRICK
Illustration by RON CHAN

>> Microsoft's fellowship is one of the most prestigious awards for young computer scientists. Chen, who joined the faculty in 2005, is the first Washington University researcher to be awarded the fellowship.

Photo by GEOFF STORY

>> YIXIN CHEN, PH.D., Assistant Professor of Computer Science & Engineering, is one of five faculty nationwide to receive a 2007 Microsoft Research New Faculty Fellowship.

The Program

The Microsoft fellowship provides an unrestricted cash gift of $200,000 and other resources, such as software, conference travel, and the opportunity to engage in research with Microsoft personnel for the next two years.

Now in its third year, the fellowship program is administered by Microsoft Research's External Research and Programs group as part of its mission to support and collaborate with the academic community. The program is designed to identify and assist exceptional first-, second-, and third-year professors engaged in innovative computing research.

Each university in the nation may nominate one candidate, from which 10 are flown to Microsoft's headquarters in Redmond, Wash., to give a five-minute presentation to a panel of computer scientists, three from Microsoft and three from academia.

The Research

Chen won the fellowship for his research in nonlinear optimization, which has a number of applications in automated planning, medical operations, computational biology, and engineering design.

Chen developed an algorithm that reduces the time involved in solving a nonlinear optimization problem from a week to 100 seconds.

Working with Joseph O. Deasy, Ph.D., Associate Professor of Radiation Oncology in the School of Medicine, Chen is applying the algorithm to reduce the complexity of radiation therapy by letting multiple steps in procedures unfold rapidly and efficiently, minimizing tissue damage.

Similarly, Chen's technology can be applied to NASA software so that the decision procedures that rovers and satellites do in two hours could be executed in 30 seconds.

"The goal is that, by reducing the computational complexity of nonlinear optimization, we will develop fast and robust decision-making tools and significantly extend the ways that computing can be used in medical, scientific, and engineering applications," Chen said.

New Faculty

>> Washington University Engineering seeks to attract faculty, students, and staff who have the talents and desire to make a difference.

Photos by **GEOFF STORY**

Photo by JIHUN KO

Jun

YOUNG-SHIN JUN
Assistant Professor of Energy, Environmental & Chemical Engineering

Young-Shin Jun joined Washington University as an assistant professor after completing a postdoctoral fellowship at the University of California-Berkeley. Professor Jun's expertise is in molecular scale experimentation of environmental systems; she received her Ph.D. in Environmental Sciences and Engineering from Harvard University.

Kelleher

CAITLIN KELLEHER
Assistant Professor of Computer Science & Engineering

Caitlin Kelleher joined Washington University as an assistant professor after completing a postdoctoral fellowship and earning her Ph.D. in Computer Science at Carnegie Mellon University. Her research is in the area of human-computer interaction, and her work focuses on the design, development, and evaluation of a programming system for middle school girls called Storytelling Alice.

Xia

YOUNAN XIA
Professor of Biomedical Engineering

OTHER APPOINTMENTS
Biochemistry, Chemistry, Radiology, and Energy, Environmental & Chemical Engineering

Younan Xia joined Washington University from the Department of Chemistry at the University of Washington. Recognized as one of the world's leading materials scientists, Professor Xia's research interests include nanostructured materials as well as self-assembly and soft matter; he received his Ph.D. in Physical Chemistry from Harvard University.

Professor Xia will be installed this spring as the inaugural James M. McKelvey Professor, a professorship which was donated by John F. McDonnell and the JSM Charitable Trust.

Lo

CYNTHIA LO
Assistant Professor of Energy, Environmental & Chemical Engineering

Cynthia Lo joined Washington University as an assistant professor, coming from the National Institute of Standards and Technology, where she was a postdoctoral researcher. Professor Lo's expertise is in molecular scale modeling with applications in aquatic systems (solid-liquid interfaces); she received her Ph.D. from the Massachusetts Institute of Technology.

Endowed Professorship Installations

Goldman

SALLY GOLDMAN
Associate Chair, Computer Science & Engineering, The Edwin H. Murty Professor of Engineering

Ph.D., Electrical Engineering and Computer Science, Massachusetts Institute of Technology, 1990

M.S., Massachusetts Institute of Technology, 1987

B.S., Brown University, 1984

Professor Sally Goldman was installed as the Edwin H. Murty Professor of Engineering on April 11, 2007. She came to Washington University in 1990 as an assistant professor and is currently a professor and associate chair of the Computer Science and Engineering department.

Professor Goldman's research interests are in algorithm and data structure design and analysis, and in the foundations of machine learning algorithms with a current focus on content-based image retrieval and applications of machine learning to computer vision.

Taber

LARRY A. TABER
The Dennis and Barbara Kessler Professor of Biomedical Engineering

Ph.D., Aeronautics & Astronautics, Stanford University, 1979

M.S., Stanford University, 1975

B.S., Georgia Institute of Technology, 1974

On June 5, 2007, Professor Larry Taber was installed as the first Dennis and Barbara Kessler Professor of Biomedical Engineering. Taber, a founding member of the Department of Biomedical Engineering, has made significant contributions to understanding the role of mechanical factors that drive heart and brain development.

Professor Taber came to Washington University in 1997 from the University of Rochester, where he held appointments in mechanical engineering and pediatrics from 1982 to 1997. Prior to the University of Rochester, he was a research engineer in the biomedical science department of General Motors Research Laboratories from 1978 to 1982.

Professor Taber's research is focused on the biomechanics of cardiovascular and brain development.

Wang

LIHONG WANG
The Gene K. Beare Distinguished Professor of Biomedical Engineering

Professor of Radiology
Ph.D., Electrical Engineering, Rice University, 1992

M.S., Huazhong University of Science and Technology, 1987

B.S., Huazhong University of Science and Technology, 1984

On November 29, 2006, Professor Lihong Wang was installed as the first Gene K. Beare Distinguished Professor of Biomedical Engineering.

Prior to his arrival at Washington University in 2006, Professor Wang was the Royce E. Wisenbaker II Professor of Biomedical Engineering and Electrical Engineering at Texas A&M University from 1996 to 2006. He also worked at the University of Texas' MD Anderson Cancer Center as a postdoctoral fellow and later as an assistant professor from 1991 to 1996.

Professor Wang's research interest is in biophotonic imaging, and he is a leading researcher on new methods of cancer imaging.

Recently Promoted

Buhler

JEREMY D. BUHLER

Associate Professor of Computer Science & Engineering

Ph.D., Computer Science, University of Washington-Seattle, 2001

M.S., Computer Science, University of Washington-Seattle, 1998

B.A., Computer Science, Rice University, 1996

Jeremy Buhler joined Washington University in 2001. In addition to his appointment as associate professor in Computer Science and Engineering, Professor Buhler has secondary appointments in the Genetics Department of the Division of Biological and Biomedical Sciences and in the Biology Department in Arts and Sciences.

Professor Buhler's primary research interest lies in developing algorithms to search and analyze the massive amounts of DNA and protein sequence produced by modern molecular biology.

Gill

CHRISTOPHER D. GILL

Associate Professor of Computer Science & Engineering

D.Sc., Computer Science, Washington University in St. Louis, 2002

M.S., Computer Science, University of Missouri-Rolla, 1997

B.A., English and Biology, Washington University in St. Louis, 1987

Christopher Gill joined Washington University in 1997, first as a research associate, then an assistant professor, and now an associate professor. He also spent several years in industry as a software developer and system administrator.

Professor Gill's research focuses on assuring properties of distributed real-time and embedded systems in which software complexity, unpredictable environments, and heterogeneous platforms demand novel solutions that are grounded in sound theory.

Professor Gill is a recipient of the National Science Foundation CAREER Award.

Grimm

CINDY M. GRIMM

Associate Professor of Computer Science & Engineering

Ph.D., Computer Science, Brown University, 1996

M.A., Computer Science, Brown University, 1992

B.A., Computer Science, University of California-Berkeley, 1990

B.A., Art, University of California-Berkeley, 1990

Prior to joining Washington University in 2000, Professor Grimm was a postdoctoral researcher at Brown University and at Microsoft. She also held research assistant and lecturer positions at Brown.

Professor Grimm's research interests include surface modeling and illustrative rendering. She has developed manifolds for constructive surface building and analysis. She creates perceptual editing tools that support more intelligent manipulation of visual effects in scenes, and camera controls that support more effective display of data through the use of nonlinear perspective.

Professor Grimm is a recipient of the National Science Foundation CAREER Award.

Pappu

ROHIT V. PAPPU

Associate Professor of Biomedical Engineering

OTHER APPOINTMENTS

Biochemistry, Biophysics

Ph.D., Theoretical and Biological Physics, Tufts University, 1996

M.S., Solid State Physics, Tufts University, 1993

B.Sc., Physics, Mathematics, and Electronics, Bangalore University, 1990

Professor Pappu joined Washington University in 2001, after completing doctoral studies in Theoretical and Biological Physics at Tufts University. Professor Pappu also completed two postdoctoral fellowships, one at the Department of Biochemistry and Molecular Biophysics at Washington University School of Medicine between 1996 and 1998, and the second in the Department of Biophysics & Biophysical Chemistry at the Johns Hopkins University School of Medicine from 1998 to 2001.

His research focuses on the physics of denatured proteins, protein aggregation, and the role of intrinsically disordered proteins in regulatory and signaling pathways. His research is of direct relevance to the onset and progression of neurodegenerative and systemic diseases such as Huntington's disease (HD) and Alzheimer's disease.

Sakiyama-Elbert

SHELLY E. SAKIYAMA-ELBERT

Associate Professor of Biomedical Engineering on the Joseph and Florence Farrow Endowment

OTHER APPOINTMENTS

Surgery and Energy, Environmental & Chemical Engineering

Ph.D., Chemical Engineering, California Institute of Technology, 2000

M.S., Chemical Engineering, California Institute of Technology, 1998

B.S., Chemical Engineering and Biology, Massachusetts Institute of Technology, 1996

Professor Sakiyama-Elbert joined Washington University in 2000.

Professor Sakiyama-Elbert's research is highly interdisciplinary, combining an understanding of biology, chemistry, and biomedical engineering to develop new bioactive materials, which can enhance wound healing and tissue regeneration. Her research also includes drug delivery, gene delivery, and stem cell research. Her research is currently funded by the NIH and Wallace H. Coulter Foundation. She currently serves as the Vice President of Tissue Engineering Special Interest Group in the Society for Biomaterials.

Sept

DAVID SEPT

Associate Professor of Biomedical Engineering

OTHER APPOINTMENTS

Biochemistry, Biophysics, Physics, and Energy, Environmental & Chemical Engineering

Ph.D., Theoretical Physics, University of Alberta, 1997

B.S., Physics, University of Alberta, 1992

Professor Sept joined Washington University in 2001, after a postdoctoral fellowship at the University of California-San Diego from 1997 to 2001.

Using computer simulation techniques, Professor Sept is working to understand the dynamics, function, and organization of proteins within the cell. He is particularly interested in the molecular details of how polymers form and how they are regulated within the cell by drugs, small molecules, and other proteins. These factors have a direct bearing on the development of therapeutic agents, since controlling the stability of microtubules is one of the primary methods for treating diseases such as cancer. He is also working to develop new drugs for use in combating parasitic diseases such as malaria.

Faculty Profiles

History of WUSTL Engineering

Monthly E-Newsletter

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The Danforth Campus at Washington University in St. Louis. The lot at the northeast corner of the campus is the future site of the proposed new engineering buildings and green spaces.

Photo by STEVE STELZER/WUSTL