SPRING 2010

Engineering Momentum

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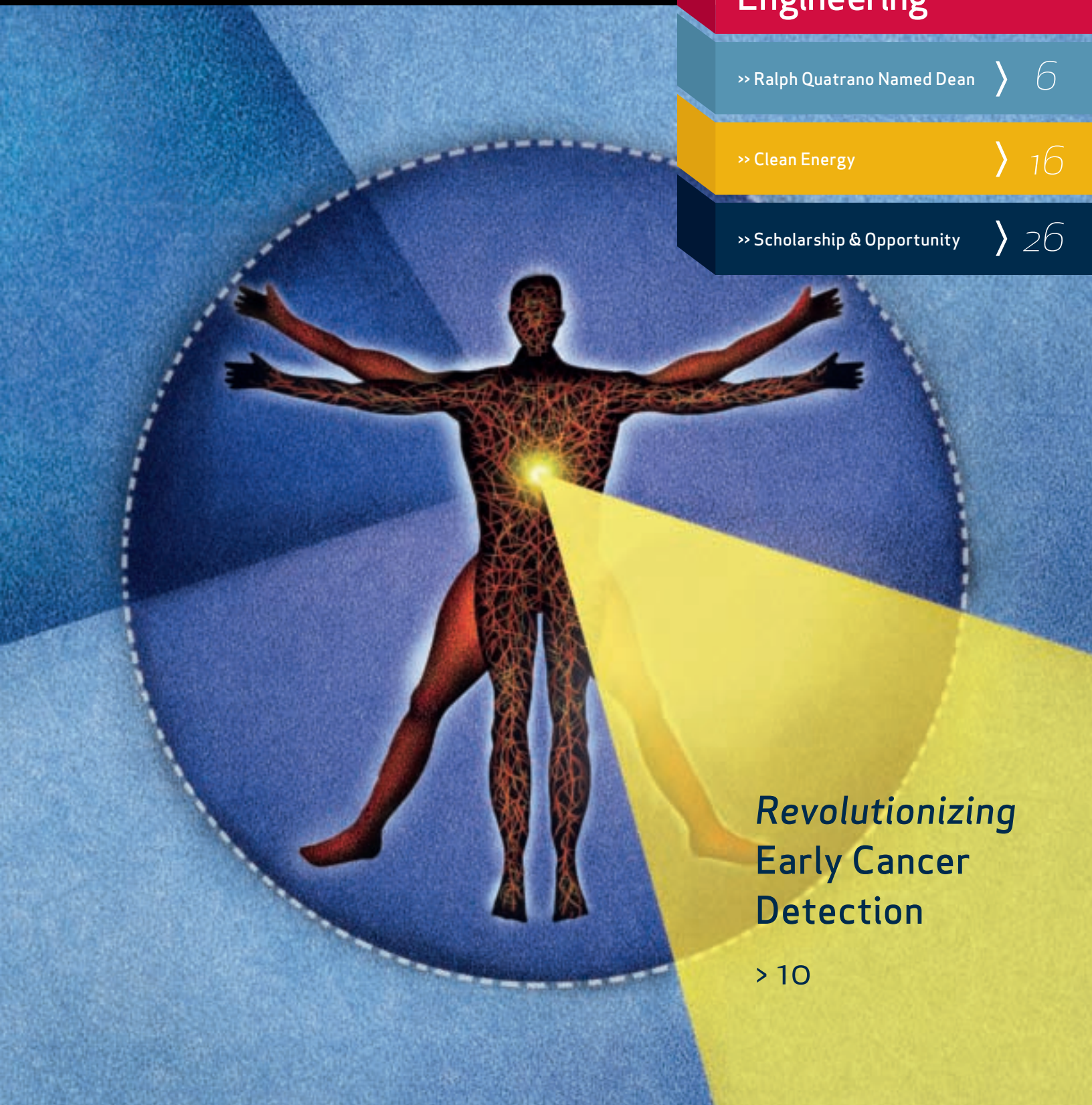
Washington University in St. Louis

Engineering



Revolutionizing Early Cancer Detection

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SOLAR ENERGY

Construction on Stephen F. & Camilla T. Brauer Hall was completed in April 2010. The building was designed for LEED-gold certification, and its finishing touches included the installation of rooftop solar panels.

WUSTL PHOTO

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SPRING 2010

Washington University in St. Louis

Engineering

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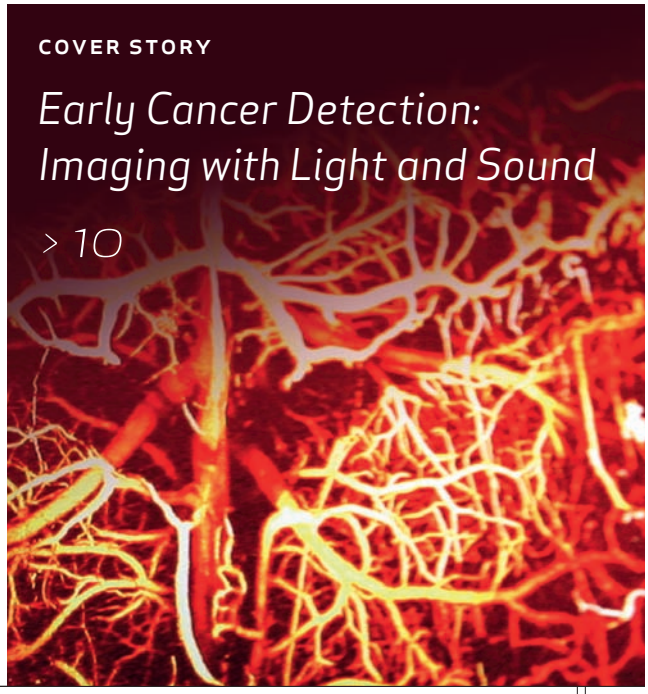

Rendering by RICE ASSOCIATES/DAVE RUIZ

WUSTL PHOTO

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

IT IS HARD TO BELIEVE that it has been two years since Chancellor Wrighton asked me to serve as interim dean of the School of Engineering & Applied Science. Having invested at that point the past 40 years of my academic career here, this was a responsibility and honor I was happy to accept. Now, at the end of my term, it is interesting to reflect on all that has transpired over the past two years.

We launched several new master of engineering programs, a Master of Project Management program, and interdisciplinary undergraduate minors in mechatronics and energy engineering. We welcomed ten new outstanding professors to our faculty, maintaining the number of tenured and tenure-track faculty at 81.

We also launched or joined several new significant research initiatives, including public health, nanotechnology, and renewable energy and sustainability.

We continued to set new records in the quality, size, and diversity of our student body. This past fall, we welcomed our largest engineering freshman class ever, with an average ACT composite of 32.8 and SAT total of 1450. In biomedical engineering, our largest undergraduate major, the ratio of freshman women to men is now equal. The quality of our doctoral student body remains extremely high, too. For fall 2009, we admitted only 20 percent of the applicants, and of that group, they had an average quantitative GRE score of 774.

The most visible development from the past two years is Stephen F. & Camilla T. Brauer Hall, which, after 21 months of construction, will open this spring. Brauer Hall will become known as a landmark, critical to the continued development of the departments of Biomedical Engineering and Energy, Environmental & Chemical Engineering. We are deeply indebted to Steve and Kimmy Brauer for their steadfast leadership and generosity.

BRAUER HALL
Looking north from Brookings Drive, Brauer Hall is the newest addition to the School of Engineering & Applied Science.

GREEN HALL
Looking southwest from the corner of Forest Park Parkway and Skinker Boulevard.

Rendering by RICE ASSOCIATES/DAVE RUIZ

Groundbreaking for Preston M. Green Hall, the next phase of our new complex of engineering buildings at the northeast corner of the Danforth Campus, occurred on April 30.

Green Hall will attach to Brauer Hall and will provide additional research facilities that are critical to the continued progress of our strategic plan.

As I prepare to hand the baton to the next dean, Dr. Ralph Quatrano, an outstanding scientist and experienced administrator, I am especially pleased with our School's readiness to collaborate across disciplines and across the world to solve many of the formidable challenges of the 21st century. I am grateful to everyone in the Washington University engineering family who has helped me guide the School during the past two years. Our collective accomplishments are a reflection of the innovative and tireless work of our remarkable faculty and staff, the dedication and support of our devoted alumni and friends, and the talents and abilities of our exceptional students.

Salvatore P. Sutera, Ph.D.
Dean & Senior Professor

LOOKING BACK

In the past two years, the School of Engineering & Applied Science launched

FOUR NEW MASTER'S PROGRAMS

and two interdisciplinary undergraduate minors;

added

TEN NEW PROFESSORS;

launched or joined several

NEW RESEARCH INITIATIVES;

AND WELCOMED

our largest freshman class, with an average ACT score of 32.8, and an average SAT total of 1450.

LOOKING FORWARD

BRAUER HALL

will open its doors in spring 2010, and groundbreaking took place on April 30, 2010 for

GREEN HALL,

the next phase of our new engineering complex.

Stay connected and informed about news and events!

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NEW ACADEMIC PROGRAMS

Computer Science & Engineering

A 30-unit full-time or part-time program designed for students wanting to change careers and enter the computer science and engineering profession or for current computer science and engineering professionals who wish to advance their skills and education. Students have the ability to customize their program to specific interests.

Energy, Environmental & Chemical Engineering

A 30-unit full-time or part-time program designed for students wanting to enhance skill sets for industrial careers. In addition to specialized tracks in advanced energy technologies, environmental engineering science, technology for environmental public health and international development, energy and environmental nanotechnology, and energy and environmental management, students learn about project management, business, leadership, and entrepreneurship.

Mechanical Engineering

A 30-unit full-time or part-time program designed for students who want to advance technical and project management skills. Students have the ability to customize their program to specific interests.

Energy Conversion & Efficiency Concentration for the Master of Science in Mechanical Engineering

A concentration designed for students wanting mechanical engineering skills for energy applications, especially for renewable energy and technology that improves energy conversion and efficiency.

Master of Project Management

A 36-unit part-time program designed for students wanting to gain or enhance the knowledge and skills needed to effectively work as a project manager in business or engineering professions.

Interdisciplinary Undergraduate Minors

Interdisciplinary undergraduate minors in mechatronics, the combination of electronic and mechanical components for "smart" systems, and energy engineering.

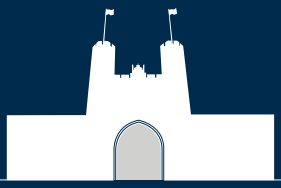
FAST FACTS

1,062  Undergraduate Students (from 50 States & 27 Countries)

13:1 Undergraduate-Student-to-Faculty Ratio 

464 Master's Students  **311** Doctoral Students

19,200  Alumni

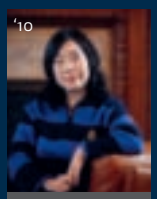
81 Tenured/Tenure-Track Faculty 

$21.2 M  Research Expenditures (2009)

37 Endowed Professorships

193 University of Missouri-St. Louis/ Washington University Joint Program students

8 NSF CAREER Awards in Five Years



The National Science Foundation's Faculty Early Career Development (CAREER) award is a prestigious award for the support of early career-development activities of teachers-scholars.

Ralph Quatrano
NAMED DEAN

Written by **DIANA LUTZ**
Photo by **GEOFF STORY**

RALPH S. QUATRANO, PH.D., immediate past dean of the Faculty of Arts & Sciences and the Spencer T. Olin Professor at Washington University in St. Louis, will become dean of the School of Engineering & Applied Science on July 1, 2010. Quatrano succeeds Salvatore P. Sutera, Ph.D., who has served as interim dean since July 1, 2008.

"Ralph Quatrano has been an outstanding academic leader at Washington University for over a decade," says Chancellor Mark S. Wrighton. "Ralph assumes the deanship at a very important period in the history of the School of Engineering & Applied Science — a school with a strong vision for the future developed by the excellent work of the previous and current school leaders. I am confident that Ralph will build a community where world-class teaching and research are a priority."

"I'm honored to be appointed," says Quatrano. "The School of Engineering & Applied Science's strategic plan offers an exciting vision for the future, one that clearly calls for engineering to take an increasingly important role in critical research across all disciplines.

"The School of Engineering & Applied Science's strategic plan offers an exciting vision for the future, one that clearly calls for engineering to take an increasingly important role in critical research across all disciplines."

"Building strong, interdisciplinary relationships has been an important part of my career, both as a researcher in the lab and as dean of Arts & Sciences. I've had interaction with the engineering school, and have grants with the faculty; I've published with the faculty in computer science, and I have active research programs in systems biology, imaging sciences, genomics, and informatics. I look forward to building on these synergies going forward.

"Engineering and the physical sciences are intimately related to the future of the life sciences. It is going to be very important in the next decade that the biological and medical sciences integrate with engineering, and I feel that this position, looking back from engineering into the life sciences, will be exciting and challenging for me."

Quatrano was interim dean of Arts & Sciences from July 1, 2008, until June 30, 2009, following the appointment of Edward S. Macias, Ph.D., long-term Arts & Sciences dean and executive vice chancellor for academic affairs, as Provost.

Ralph S. Quatrano, Ph.D., the Spencer T. Olin Professor, will become dean of the School of Engineering & Applied Science, effective July 1, 2010.

Ralph Quatrano at a Glance

1962
Bachelor's in botany, Colgate University

1964
Master's in botany, Ohio University

1968
Doctorate in biology, Yale University

1968–1986
Faculty member in botany, Oregon State University

1986–1989
DuPont research manager in molecular biology, Wilmington, Delaware

"I worked closely with Ralph in his capacity as chair of biology and as interim dean of the faculty of Arts & Sciences," says Macias, the Barbara & David Thomas Distinguished Professor in Arts & Sciences. "His leadership is a good match for the School of Engineering. During the course of the search process, I have had the opportunity to meet with a number of engineering faculty. I am very impressed with the caliber of our faculty in engineering. I am indebted to those who served as members of the search committee. Their identification of Ralph Quatrano speaks highly of Ralph, of course, but also of the school itself. I think this is a wonderful outcome, and I look forward to the next chapter in engineering's distinguished history."

"Ralph Quatrano is an excellent fit for the deanship because of his longstanding commitment to integrating education and research between life sciences, physical sciences, mathematics, and engineering," says Shelly Sakiyama-Elbert, Ph.D., associate professor of biomedical engineering and co-chair of the advisory committee for the engineering dean search. "Ralph Quatrano participated in the development of the engineering school's strategic plan, which includes areas of focus cutting across Engineering, Arts & Sciences, and Medicine; he helped recruit faculty to build strength in those focus areas."

> *"Ralph Quatrano's leadership is a good match for the School of Engineering."*
>
> — EDWARD S. MACIAS, PH.D.

Internationally Known Scientist

Quatrano came to Washington University in 1998 to assume the chair of one of the nation's most highly regarded biology departments. In addition to serving as chair, he was director from 2005 to 2007 of the Division of Biology & Biomedical Sciences, a university-wide consortium including medical, engineering, and science programs.

His research group often collaborates with Washington University School of Medicine researchers as well as with scientists from Monsanto and the Donald Danforth Plant Science Center.

He took a leadership role in a consortium of more than 100 international researchers and the Joint Genome Institute of the Department of Energy to sequence and annotate the moss genome. This effort culminated in a major publication in 2008 in *Science* with Quatrano as corresponding author.

Quatrano earned his bachelor's in botany with honors from Colgate University in 1962; his master's in botany from Ohio University, Athens, in 1964; and his doctorate in biology from Yale University in 1968.

After completing his doctorate, Quatrano became a faculty member in botany at Oregon State University, Corvallis, a position he held until 1986.

During his last two years at Oregon State, he founded and directed the university's Center for Gene Research and Biotechnology.

Quatrano moved from Oregon State to DuPont in Wilmington, Delaware, where he was research manager in molecular biology for the next three years.

"Ralph Quatrano participated in the development of the engineering school's strategic plan, which includes areas of focus cutting across Engineering, Arts & Sciences, and Medicine; he helped recruit faculty to build strength in those focus areas." — SHELLY SAKIYAMA-ELBERT, PH.D.

He left DuPont in 1989 to become the first John N. Couch Professor of Biology at the University of North Carolina at Chapel Hill. He served as chair of the Department of Biology at Chapel Hill from 1992 to 1997, before joining Washington University as chair of the Department of Biology and the Spencer T. Olin Professor of Biology.

Quatrano has been a visiting professor or investigator at many different institutions, including the University of Naples, Cambridge University, the University of Leeds, and the Marine Biological Laboratory at Woods Hole.

Having published more than 160 research papers, Quatrano has given invited seminars at institutions worldwide. He has won teaching awards at the undergraduate and graduate levels and has mentored 20 graduate students and 40 postdoctoral fellows and visiting scientists.

He was editor-in-chief for five years of the journal *The Plant Cell*, the premier journal of plant biology; president of the American Society of Plant Biologists; a member of the Advisory Committee for Biological Sciences Directorate for the National Science Foundation; on the Scientific Advisory Board of the Rockefeller Foundation International Program on Rice Biotechnology; and, from 1991 to 1998, on the Board of Reviewing Editors for *Science* magazine, the publication of the American Association for the Advancement of Science (AAAS).

Quatrano is a fellow of the AAAS and the Academy of Science of St. Louis as well as an inaugural fellow of the American Society of Plant Biologists (ASPB).

In 2010, ASPB is honoring Quatrano with the prestigious Adolph E. Gude Jr. Award for his outstanding contributions in promoting plant science nationally and internationally.

1989–1997

John N. Couch Professor of Biology, University of North Carolina at Chapel Hill (Department Chair from 1992 to 1997)

1998–2008

Chair of the Biology Department and Spencer T. Olin Professor at Washington University in St. Louis

2005–2007

Director, Division of Biology & Biomedical Sciences

2008–2009

Interim Dean, Faculty of Arts & Sciences

2010

Adolph E. Gude Jr. Award, American Society of Plant Biologists

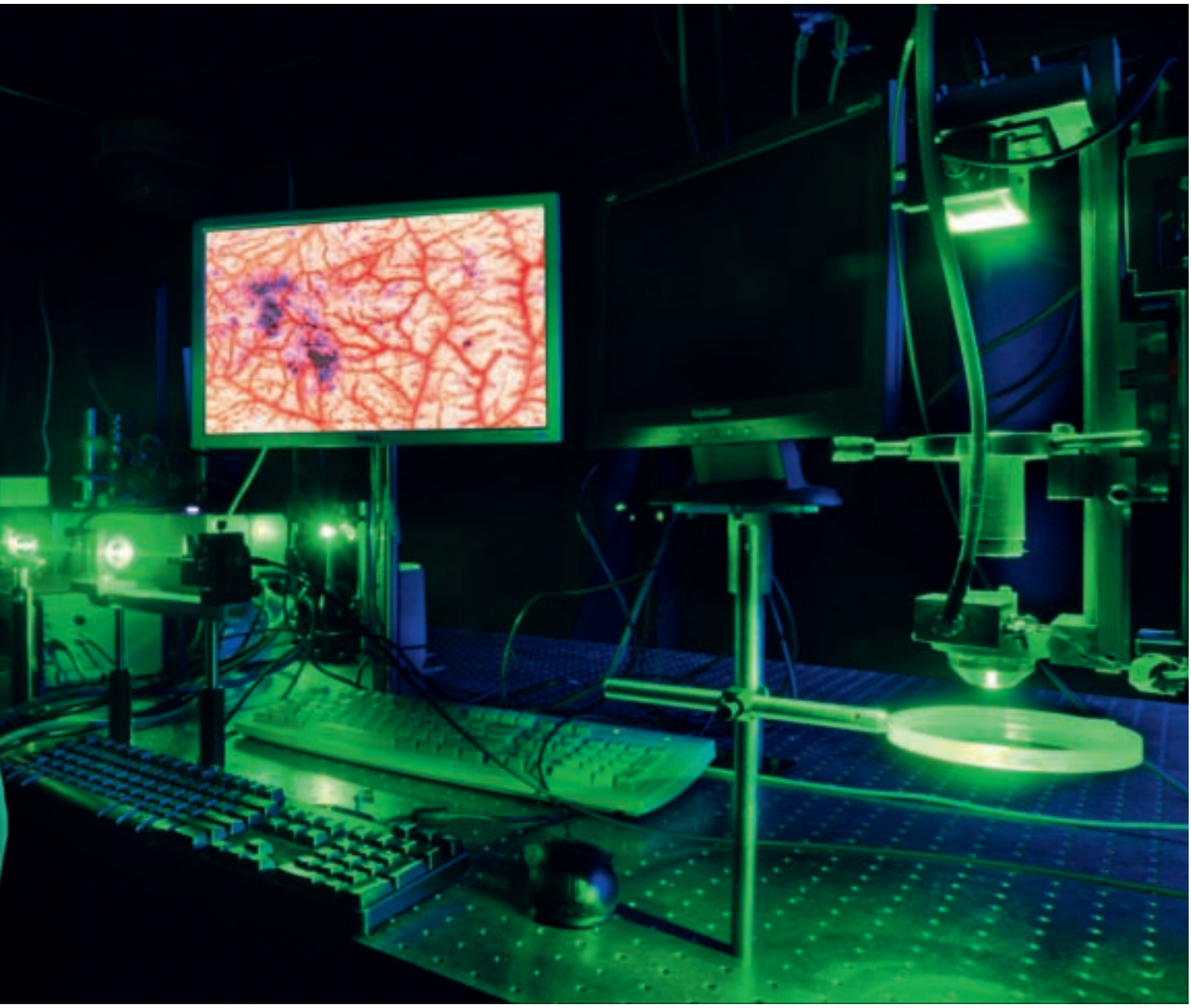
Written by **CANDACE O'CONNOR**
Photos by **GEOFF STORY**

IMAGING WITH LIGHT AND SOUND: *REVOLUTIONIZING* EARLY CANCER DETECTION

FOR YEARS, the field of optical imaging in biological tissue had languished, with few advances and no significant growth. The concept was promising — using light to image organs, cells, and blood vessels, noninvasively and without any radiation — but it seemed impossible to obtain high-resolution images at any significant depth. Then came Lihong V. Wang's seminal paper, which appeared in the July 2003 issue of the journal *Nature Biotechnology*.

"2003 is the magic number," says Wang, Ph.D., now the Gene K. Beare Distinguished Professor in the Department of Biomedical Engineering. "We published the first paper on functional imaging using photoacoustics. That excited everybody and attracted newcomers to the field."

Today, Wang has a chart showing the growth in research worldwide since the publication of his paper, the most cited in his field. In 2003, only some 30 presentations were made on photoacoustic tomography in the largest conference on this topic, but through the following years, that number rose dramatically:



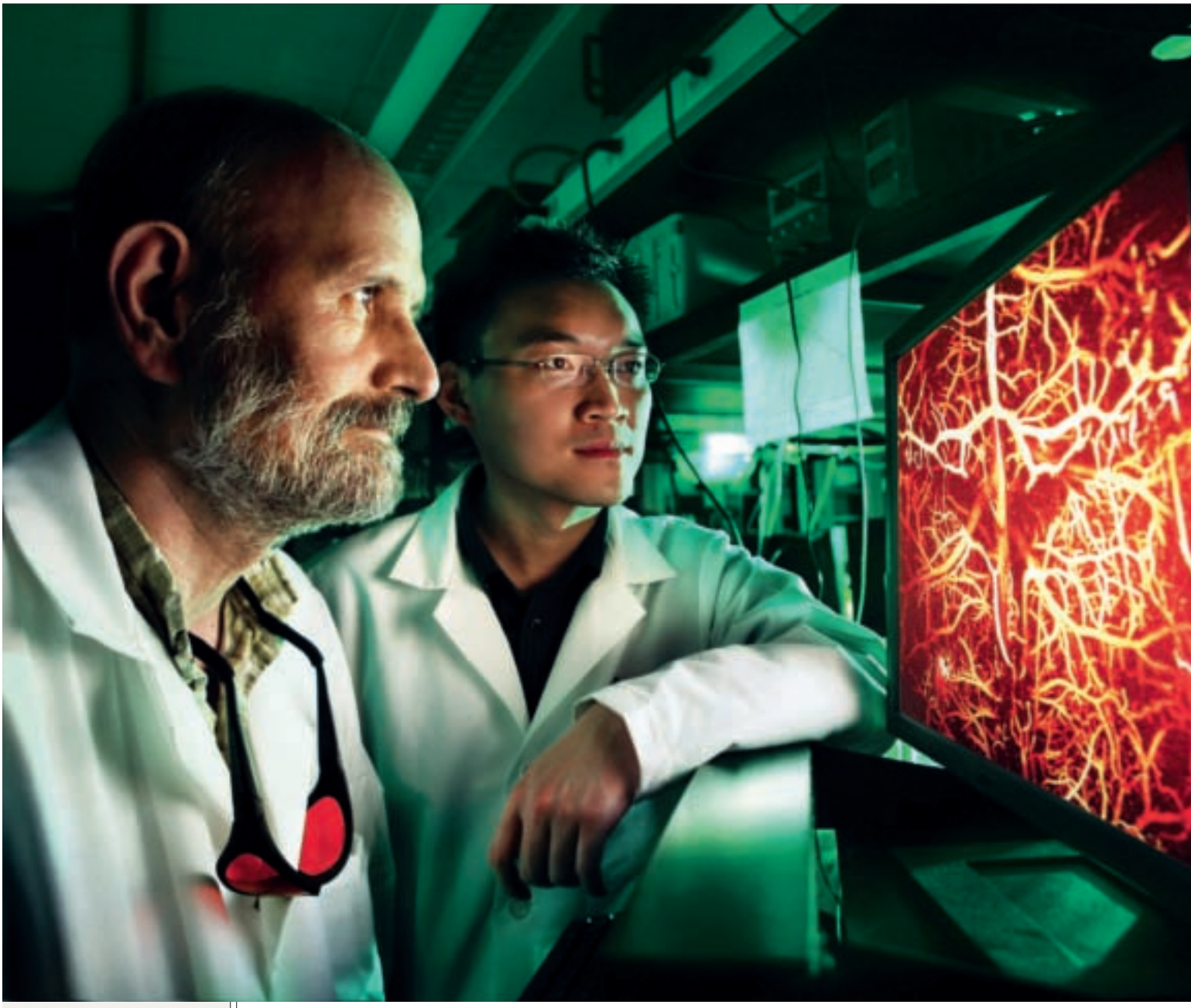
to 40 by 2004, 80 by 2007, and 132 in 2010. Wang and his lab were the founders of a new area of scientific inquiry — one that combined light and sound to create a new form of functional imaging — with many potential applications for cancer research.

"Lihong's pioneering work is a wonderful example of an innovative combination of physics, engineering, and medicine," says Frank C.P. Yin, M.D., Ph.D., the Stephen F. and Camilla T. Brauer Distinguished Professor of Biomedical Engineering. "Its high temporal and spatial resolution will enable us to obtain structural and functional information more safely, cheaply, and easily than with any existing method. I predict that it will revolutionize our approach to diagnosing and treating diseases and produce as-yet-unimaginable benefits to humankind."

In an unfavorable economic climate, Wang's work has attracted significant funding, particularly from the National Institutes of Health (NIH). Over the past three years, he and his group have received some $15 million in grants, with another $1.9 million in the offing.

EARLY CANCER DETECTION

Lihong Wang, the Gene K. Beare Distinguished Professor in the Department of Biomedical Engineering, conducts multiple collaborative projects supported by the National Institutes of Health, dedicating to early cancer detection with the revolutionizing photoacoustic imaging technology.



OPTICAL IMAGING
Research Associate Professor Konstantin Maslov and graduate student Song Hu in the optical imaging laboratory.

Often, they collaborate with physicians — breast surgeons, radiologists, GI specialists, and dermatologists, among others — from the Washington University School of Medicine.

"The collaboration between Mallinckrodt Institute of Radiology (MIR) and the Department of Biomedical Engineering has been terrific," says Gilbert R. Jost, M.D., Elizabeth Mallinckrodt Professor of Radiology and Director of MIR. "By working at the medical school, Lihong Wang has been able to explore important clinical applications of his new imaging technique."

Wang himself is invited to give frequent talks on photoacoustic tomography across the United States and around the world: in Japan, Turkey, China, Belgium, and Canada last year alone. "Every time I give a talk, I find new potential collaborators or users," says Wang, who also has joint appointments in MIR and in Electrical & Systems Engineering. "They are interested in these technologies to solve their own research problems."

Using Light for Imaging

While scientists have long been interested in using light for imaging, the nature of light made that difficult. Fire a laser pulse into tissue, and the light particles continue on a straight path for only a short distance, usually less than 100 microns — approximately the width of a hair.

"Then they encounter something, such as cell nuclei, and get scattered," says Wang. "Photons just bounce around, making it challenging to achieve high-resolution imaging at depths beyond approximately 1 mm."

After they scatter, however, the photons continue to penetrate tissue, up to a depth of around 5 centimeters (about 2 inches). That would make it possible to image a compressed breast, for example, and check for tumors. But how to harness the errant photons and retrieve the critical spatial information?

"If you want to image a piece of relatively thick tissue and see the middle plane, which is the hardest plane to image, the illumination and detection photon paths will both be tortuous," says Wang. "That means any feature in the middle plane will be blurred out."

Photoacoustics Is Born

When the field of photoacoustics first developed, it had no relation to imaging. In June 1880, Alexander Graham Bell tested a "photophone," an alternative to the telephone. Bell's idea was to encode sound into a light beam, propagate the beam in air, then convert the beam back to sound again. However, this phone required "line of sight" transmission, and the idea proved impractical.

The idea of adapting photoacoustics to imaging came along during the 1980s, when some industry scientists began using this technique for non-biological-materials testing. At that point, they were hunting for sub-surface cracks in metal or ceramic materials. How to extend this concept to three-dimensional structures?

In Wang's 2003 paper, he and his colleagues showed that photoacoustic imaging could provide detailed images of internal structures and overcome the problem of photon diffusion. With extraordinary clarity, their images of an animal brain depicted blood vessels and brain function. They had higher resolution than any other optical images of the brain ever obtained before.

"Imaging scientists were convinced that photoacoustics really makes a difference," says Wang. "This was the right way to go."

What was Wang's approach? Converting light into sound, which scatters 1,000 times less than light — and thus produces a dramatically improved optical image.

First, the laser sends light pulses into tissue; as it is absorbed, it generates a minute temperature rise, which creates an ultrasonic sound wave detectable by an ultrasound transducer. The location and size of the target structure are calculated by computer, using a sophisticated triangulation technique.

"You are essentially listening to an optical structure," Wang says. "You're hearing the picture instead of looking at it."

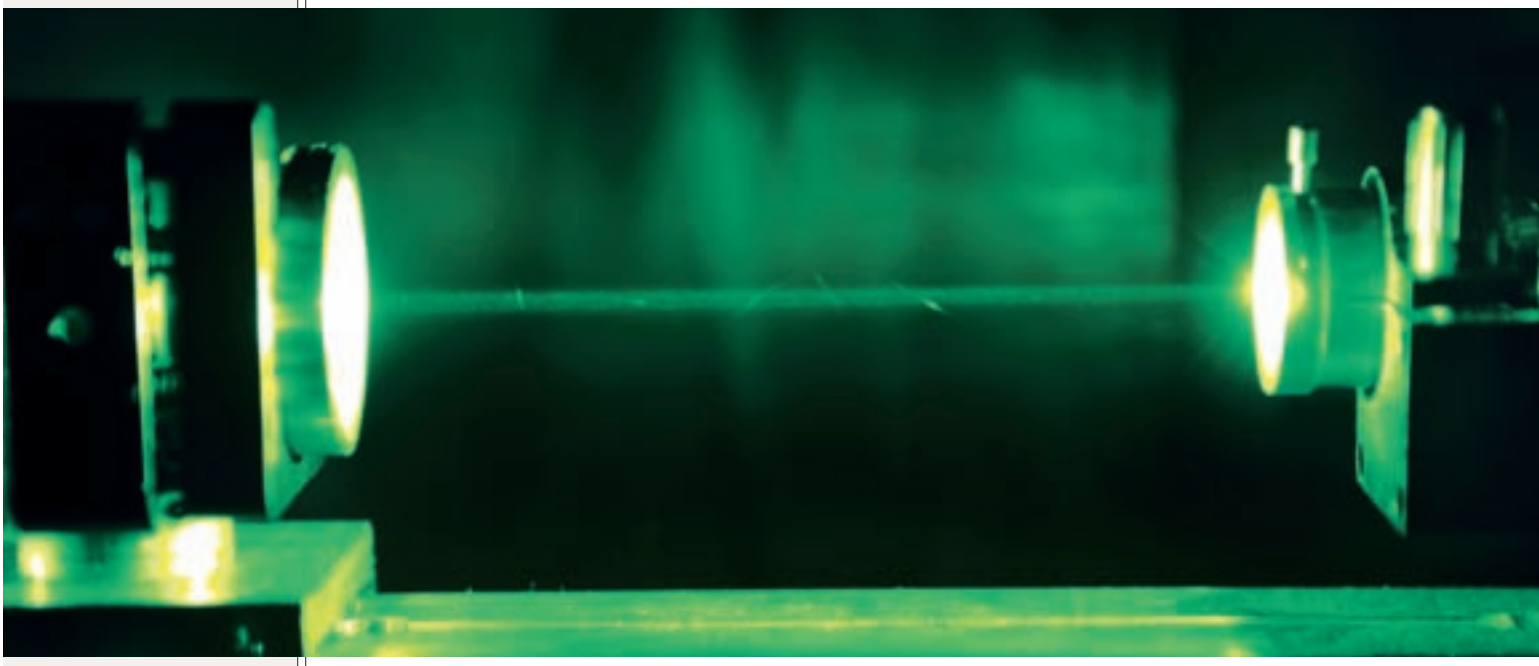
With this method, they can provide a look at many different aspects of physiology: hemoglobin, melanin, fat, even water in tissue. Thus, unlike X-ray imaging, photoacoustic imaging is not just structural imaging; rather, it is also functional imaging, able to tell whether tissue is alive and functioning properly by measuring its physiological parameters.

With this information, physicians will be better able to detect cancer early, says Wang. For instance, photoacoustic imaging can measure the oxygen saturation of hemoglobin, which correlates with hypermetabolism, a hallmark of cancer. The same thing is true of the concentration of hemoglobin, which correlates with angiogenesis — another predictor of cancer.

Photoacoustic tomography can also do molecular imaging that detects biomarkers such as integrins, a family of receptor proteins that regulate cell growth and tend to overexpress in cancer. Further, it can detect gene expression: Is a particular gene being expressed in cancer? By pinpointing which gene it is, can we target therapy more precisely?

Wang's Background

Wang, a native of Guangshui in Hubei province, China, received bachelor's and master's degrees from Huazhong University of Science and Technology. Then he moved to the United States and earned a doctorate in electrical engineering from Rice University in 1992.



PHOTOACOUSTIC IMAGING
A nanosecond pulsed laser beam is launched into an optical fiber for photoacoustic excitation of biological tissue and high-resolution imaging.

Overall, this imaging method has a number of advantages over existing modalities. It is nonionizing radiation, so it does not carry the risks of radiation. It provides clear, high-quality images. To achieve deeper penetration, scientists can substitute radio-frequency waves for the light waves. Further, this is a "scalable method," says Wang.

"Using photoacoustic tomography, we can image shallow, but we can also image deep: from subcellular organelles through individual cells all the way to organs. It is the only functional imaging modality that allows us to image over so many levels of tissue structure, and that can potentially accelerate the translation of microscopic laboratory discoveries to macroscopic clinical practices."

He worked as a postdoctoral fellow and later as an assistant professor at the University of Texas M.D. Anderson Cancer Center. Next, he joined the faculty at Texas A&M University, and by the time he left in 2006, he was the Royce E. Wisenbaker II Endowed Professor of Biomedical Engineering and Electrical Engineering.

As a postdoctoral fellow, he became interested in imaging — but how could he get a good image using light alone? So he began thinking about different ways of combining ultrasound and light, and his research team created a model of photon transport in scattering media, called the Monte Carlo method, which is widely used today.

Coming to Washington University meant that he was much closer to a medical center than he had been at Texas A&M, where the nearest teaching hospital was 90 miles away.

"Washington University is able to provide an excellent environment for our translational research," he says.

Today, he has a 30-person group — the largest photoacoustic tomography laboratory in the world — with more than 50 percent postdoctoral fellows or faculty researchers and the rest Ph.D. students. The lab built its own photoacoustic equipment, including multiple three-dimensional microscopes; some of this technology has been licensed to outside companies for commercialization.

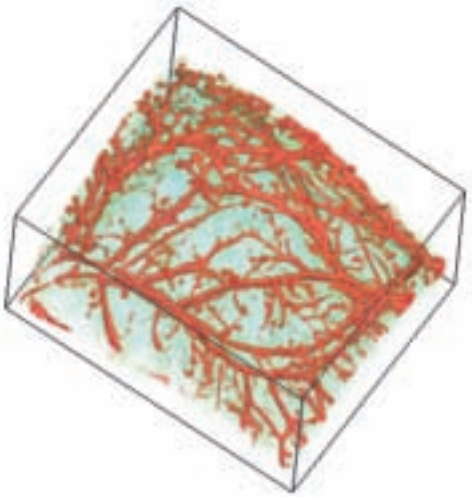
He works with fellow biomedical engineering faculty members, including Younan Xia, Ph.D., James M. McKelvey Professor, also in the Department of Biomedical Engineering, whose laboratory invented light-absorbent gold nanocages. Together, Wang and Xia have applied these nanocages and photoacoustics to map sentinel lymph nodes noninvasively, thus reducing a patient's exposure to radioactivity.

Through the years, he has garnered awards for his work, including the NIH FIRST Award and the National Science Foundation CAREER Award. He chairs the International Biomedical Optics Society, and is newly appointed editor-in-chief of the *Journal of Biomedical Optics*. He has written two textbooks, including one of the first in his field, *Biomedical Optics: Principles and Imaging*, which recently received the Goodman Book Writing Award from SPIE and the OSA — and some 206 peer-reviewed journal articles.

Looking five years into the future, Wang says he would like to see some giant strides forward in clinical applications with the help of photoacoustic imaging: melanoma screening and imaging, GI and colon cancer detection, neonatal brain imaging, breast cancer screening and imaging, transrectal prostate cancer detection, and possibly even low-cost brain cancer screening.

"Another application that is high on my list is early prediction of response to chemotherapy," says Wang. "Sometimes a cancer patient goes through the entire eight-week cycle of chemotherapy only to find that this was not the right drug. If we could detect the efficacy within the first two weeks, we could save a lot of time and potential side effects for the patient."

Of course, there are still hurdles to overcome. Right now, most of these applications are currently being tested in animals, with human trials to follow.



IMAGING
Images of a melanoma and blood vessels noninvasively acquired in vivo with a high-resolution photoacoustic microscope.

And they need to solve the problem of imaging through thick bone, such as the adult skull, which attenuates the ultrasound signal and distorts the image.

But the outcome of their work, they hope, will be a healthier world. "Prevention of cancer would be the best solution," says Wang, "but the second-best solution is early detection, because if cancer is identified early, it can likely be cured. Currently, we cannot prevent cancer, so we need to focus on early detection."

labs.seas.wustl.edu/bme/wang

LIHONG WANG
Gene K. Beare Distinguished Professor of Biomedical Engineering

Written by **NICK BENASSI**

CLEAN ENERGY

THE DEPARTMENT OF ENERGY MAKES THE LARGEST RESEARCH AWARD IN DANFORTH CAMPUS HISTORY

IN CONJUNCTION with a speech delivered by President Barack Obama at the annual meeting of the National Academy of Sciences on April 27, 2009, the White House announced Washington University in St. Louis would be home to one of 46 Energy Frontier Research Centers (EFRCs) at universities, national laboratories, nonprofit organizations, and private firms. Washington University's five-year, $20 million award is the largest in the history of the Danforth Campus.

EFRC work at Washington University takes place in the Photosynthetic Antenna Research Center (PARC), which includes three School of Engineering & Applied Science faculty members working to understand light harvesting and energy funneling as applied to natural photosynthetic, biohybrid, and bioinspired antenna systems.

Photosynthetic organisms — such as bacteria, algae, and plants — use antenna systems to capture light energy and transfer the energy to reaction centers, where the chemistry that creates energy takes place.

PARC researchers are trying to understand the basic scientific principles that underlie the efficient functioning of natural photosynthetic antenna systems and how those principles can be translated into concepts that will form the basis for next-generation systems for solar energy conversion.

"We are delighted that DOE selected Washington U. as the site of one of the Energy Frontier Research Centers," says Robert E. Blankenship, Ph.D., the Lucille P. Markey Distinguished Professor in the departments of Biology and Chemistry and Director of PARC.

"We are excited about the research that is taking place in PARC, which will eventually contribute toward providing clean energy resources for the world."

Blankenship leads a group of 17 scientists in PARC, including five from Washington University and five from Oak Ridge, Sandia, and Los Alamos National Laboratories. In addition, there are six other scientists from universities in the United States and the United Kingdom and one from the Donald Danforth Plant Science Center, which also received an Energy Frontier Research Center award from the Department of Energy.

"For the St. Louis region to receive two Department of Energy awards represents a great opportunity to advance bioenergy research," says Chancellor Mark S. Wrighton. "These awards are in recognition of the leadership roles that Washington University and the Donald Danforth Plant Science Center are playing in the development of new energy sources."

The 46 Energy Frontier Research Centers were selected from a pool of approximately 260 applications received in response to a solicitation issued by the DOE Office of Science in 2008. Selection was based on a rigorous merit review process using outside panels comprising scientific experts.

"As global energy demand grows over this century, there is an urgent need to reduce our dependence on fossil fuels and imported oil and curtail greenhouse gas emissions," Secretary of Energy Steven Chu, Ph.D., says. "Meeting this challenge will require significant scientific advances. These centers will mobilize the enormous talents and skills of our nation's scientific workforce in pursuit of the breakthroughs that are essential to make alternative and renewable energy truly viable as large-scale replacements for fossil fuels."

WASHINGTON UNIVERSITY FACULTY MEMBERS WORKING IN PARC:

ROBERT E. BLANKENSHIP, PH.D.

The Lucille P. Markey Distinguished Professor in the departments of Biology and Chemistry and PARC Director

HIMADRI B. PAKRASI, PH.D.

The George William and Irene Koechig Freiberg Professor of Biology, Professor of Energy in the School of Engineering & Applied Science, and Director of the WUSTL International Center for Advanced Renewable Energy and Sustainability (I-CARES)

Photos by GEOFF STORY ▸ WUSTL PHOTOS

DEWEY HOLTEN, PH.D.

Professor of Chemistry and PARC Associate Director

PRATIM BISWAS, PH.D.

The Stifel & Quinette Jens Professor of Environmental Engineering Science and Chair of the Department of Energy, Environmental & Chemical Engineering

CYNTHIA LO, PH.D.

Assistant Professor in the Department of Energy, Environmental & Chemical Engineering

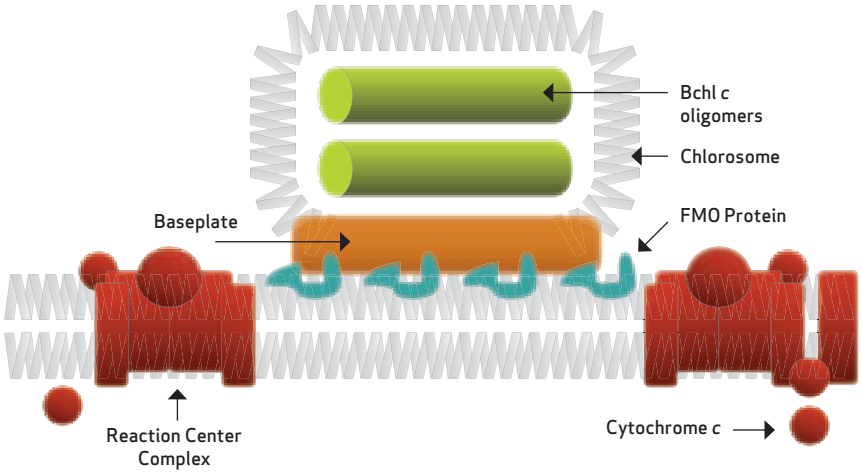
Research Themes:

1. Natural Antennas: Structure & Efficiency

TEAM LEADER
Himadri Pakrasi

RESEARCH TEAM
Robert Blankenship
Richard Cogdell
Neil Hunter
Cynthia Lo
Gabriel Montano
Dean Myles
Richard Sayre
Andrew Shreve
Jeri Timlin
Volker Urban

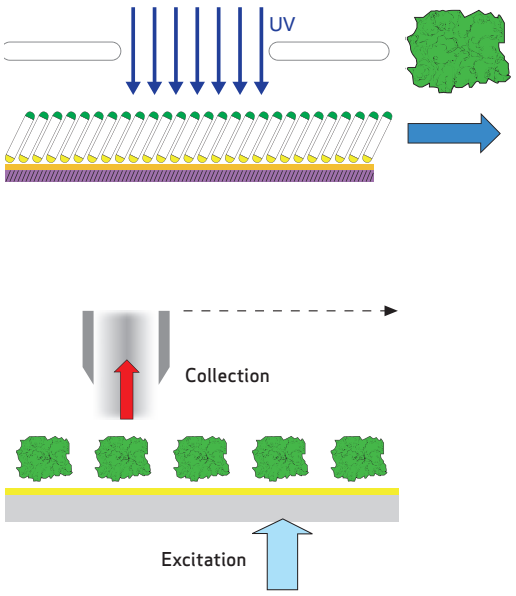
Manipulating the size of antenna systems in cyanobacteria and green algae to see whether the efficiency of photosynthesis-based bioenergy conversion systems will be increased if the size of the light-gathering antenna is reduced by creating small antenna mutants, in which photochemistry is not light-saturated even at high light intensities.



2.

TEAM LEADER
Neil Hunter

RESEARCH TEAM
Pratim Biswas
Robert Blankenship
Dewey Holten
Cynthia Lo
Gabriel Montano
Dean Myles
Jeri Timlin
Volker Urban

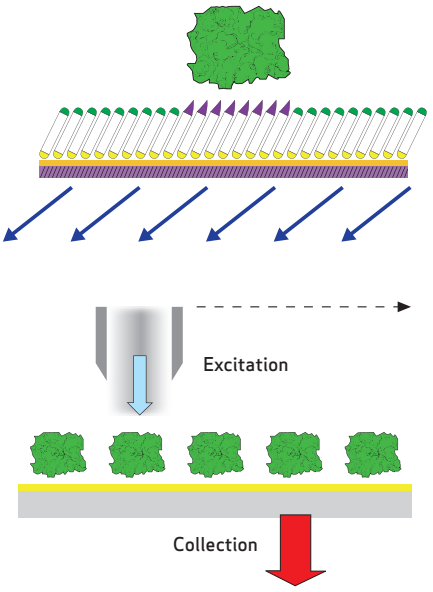


PARC proposes *a program in basic scientific research aimed at understanding the principles of light harvesting and energy funneling as applied to natural photosynthetic, biohybrid, and bioinspired antenna systems.*

The goal of this work is to elucidate the basic scientific principles that underlie the efficient functioning of natural photosynthetic antenna systems and how those principles can be translated into concepts that will form the basis for next-generation systems for solar energy conversion.

Biohybrid Antennas: Organization & Implementation

Controlling light absorption and energy migration at the nanoscale to advance the understanding of how natural light-harvesting systems work and how to apply the lessons learned to design proof-of-principle biohybrid architectures for energy collection and storage.



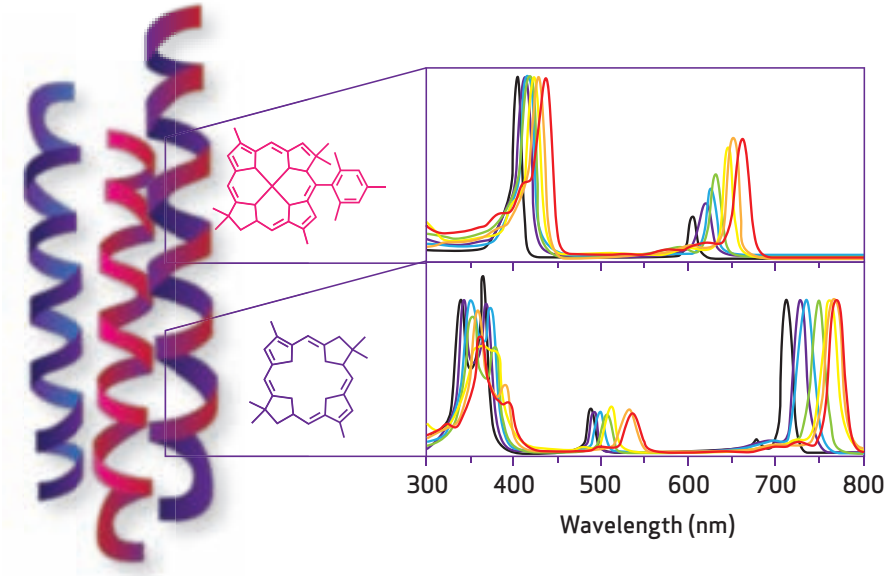
3.

Bioinspired Antennas: Design & Characterization

TEAM LEADER
Dewey Holten

RESEARCH TEAM
Pratim Biswas
David Bocian
P. Leslie Dutton
Jonathan Lindsey
Christopher Moser
Andrew Shreve

Working to create simple, robust light-harvesting systems with efficiencies equal to or better than the native photosynthetic antenna that will contribute to revolutionary advances in artificial systems for solar energy conversion.



Opening Doors to the FUTURE

Washington University in St. Louis is known as a destination for the most academically gifted, creative, and imaginative students our nation — and the world — has to offer. The University is committed to enrolling promising students from all economic, ethnic, and social backgrounds to strengthen the educational environment for all, and achievement in this area will set Washington University apart from other research universities.

WUSTL PHOTO

That is why we, who are following the previous generations who helped establish Washington University's financial security, must now add to it; in this case, to build the financial resources needed to attract and retain the most promising students.

In fall 2009, Washington University announced a fundraising initiative to increase support for students. **Opening Doors to the Future: The Scholarship Initiative for Washington University** has a goal of raising $150 million, including $15 million for School of Engineering & Applied Science students, to support scholarships and fellowships.

The effort will last until June 30, 2014.

WUSTL PHOTO

"For many Washington University alumni and students, their time of learning was directly subsidized by scholarship funds, and gifts from alumni and friends that enable the University to enroll the finest and most promising young people to be found anywhere, regardless of their financial circumstances," says Chancellor Mark S. Wrighton.

WUSTL PHOTO

Robert L. Virgil, DBA, executive chair of the scholarship initiative, says, "Scholarships transform lives. Many deserving students just need an opportunity to turn their extraordinary potential into achievement."

ROBERT GREGORY SCHOLARS

From left, Joshua Lykes, B.S. '09, Zeynip Esin and Skyler Wills, both members of the Class of 2011. Joshua majored in chemical engineering; Zeynip is a systems science major; and Skyler is majoring in electrical engineering. Dr. and Mrs. Santanu Das, M.S. '73, D.Sc. '73, established the Robert Gregory Endowed Scholarship in honor of Professor Gregory. Dr. Das received a scholarship to attend Washington University.

Virgil says, "Their future is our future — and a scholarship is an investment that benefits us all for years to come."

Virgil is a trustee of the University, former dean of the Olin Business School, and retired partner in the St. Louis-based investment firm of Edward Jones.

Opening Doors to the Future will help create more scholarships for both undergraduate and graduate students. The initiative will encourage contributions of both endowed and expendable scholarship funds. In addition, it will promote support for stipends and financial aid for students pursuing internships, summer research opportunities, and study-abroad programs.

Today, more than half of WUSTL's undergraduate students receive some kind of financial assistance, which may include grants, loans, and work-study. Almost 22 percent of those students qualified for assistance totaling more than the cost of tuition.

Last year, undergraduate students were awarded approximately $70 million in financial assistance. Income from the University's endowment provided only 17.6 percent of that amount, and the rest came from expendable gifts and other University resources.

More than 1,300 endowed scholarship and fellowship funds already have been established, but many more are needed to enable the University to continue to recruit talented students from a wide range of backgrounds.

A significant aspect of the scholarship initiative is a $2 million challenge grant, intended to encourage new and increased annual scholarships for undergraduate and graduate students from alumni, parents, and friends.

It was established by John F. McDonnell, former chairman and now vice chairman of the Board of Trustees, member of the Engineering National Council, and retired chairman of the board of McDonnell Douglas Corporation.

COURTESY PHOTO

The McDonnell Challenge encourages donors to establish new annual scholarships or to increase their current annual scholarship gifts. A minimum gift of $5,000 will establish a named annual scholarship.

"Washington University students all share extraordinary potential to make a difference in the world, and I am happy to support their efforts," McDonnell says.

Gifts of more than $5,000 can provide support to students who may have needs that range from $5,000 to full tuition, room and board, and other expenses; these gifts can also support multiple students.

To qualify for the match, a gift must meet certain criteria, which are available from the Office of Alumni and Development Programs.

The challenge will continue until June 30, 2014, or until all of the matching funds have been expended.

"Washington University students all share extraordinary potential to make a difference in the world, and I am happy to support their efforts," McDonnell says.

› Engineering's Initiative

The School of Engineering & Applied Science created its scholarship program in 1974, the first school at Washington University to create such a program, under the visionary leadership of Dr. James M. McKelvey, dean from 1964 to 1991, and Dr. William K.Y. Tao, a distinguished alumnus and member of the Engineering National Council.

Photo by GEOFF STORY

COURTESY PHOTO

McKelvey and Tao are once again lending their support for engineering scholarships. McKelvey is serving as co-chair of the School's Scholarship Initiative Committee, and Tao is serving as the chair emeritus. Peter Leemputte, an alumnus and member of the Engineering National Council, is also serving as co-chair.

The $15 million for engineering students that McKelvey, Tao, Leemputte, and others are raising will support undergraduate scholarships, graduate fellowships, study-abroad scholarships, and McKelvey undergraduate research fellowships for students like Jessica Stigile, Reed Essick, Lauren Shuler, Paul Northrop, and Alice Ndikumana.

JESSICA STIGILE

Jessica, who enrolled at Washington University at the age of 16, is a systems science and engineering student from Silver Spring, Maryland, and she is the Elvira Jubel Scholar. Jessica is the first in her family to pursue a four-year degree, and she hopes to be able to give back one day and inspire other women and students from disadvantaged backgrounds to enter technical fields.

"Receiving a scholarship has given me so much more than the opportunity to pursue higher education; it has let me experience an environment that fosters well-rounded, open-minded thinking. Being part of the Washington University community has encouraged me to take an interest in those around me, to become a leader among my peers, and to effect change in my community."

Photo by GEOFF STORY

“This unique opportunity has inspired me to work across

Photos by GEOFF STORY

REED ESSICK

Reed is a National Merit Scholar and a mechanical engineering student from Glen Ellyn, Illinois. He is also a recipient of the Calvin M. Woodward Fellowship, a merit-based award named after the School’s first dean and created to attract the top students to Washington University.

“My scholarship allowed me to attend Washington University and follow my passion of studying engineering with other interests like physics and economics. Washington U. has so many options for students to combine studies and cross boundaries, but without scholarships, many students like me wouldn’t be able to attend this great university.”

LAUREN SHULER

Lauren is a civil engineering student from Washington, D.C., and she is the recipient of the Gloria & Rubin Feldman Family Study Abroad Scholarship, which enabled her to visit Korea as part of the Department of Energy, Environmental & Chemical Engineering international experience trip in summer 2009.

“Because of my scholarship, I was able to experience a new culture and create a goal of working on issues related to water quality and wastewater treatment.”

PAUL NORTHROP

Paul, who was a National Merit Scholar and a Calvin M. Woodward Scholar as an undergraduate student at Washington University, is currently a graduate student in the Department of Energy, Environmental & Chemical Engineering from Spring, Texas.

“I am grateful for my Sproul Family Graduate Fellowship so I can focus on my coursework and research, instead of worrying about finances and working outside of Washington U.”

disciplines to make a difference for our world."

— ALICE NDIKUMANA

Photo by CAMPUS IN FOCUS

ALICE NDIKUMANA

Alice is a biomedical engineering student from Amherst, Massachusetts, and she is a James M. McKelvey Undergraduate Research Scholar, a unique program that provides undergraduate students the opportunity to conduct research with faculty from engineering, medicine, or the sciences to solve grand challenges, like heart disease.

"I'm thankful my scholarship provided me with the opportunity to conduct undergraduate research in Professor Igor Efimov's lab. We focused on cardiac bioelectricity, with the hope of understanding heart disease and designing more effective and reliable therapies. This unique opportunity has inspired me to work across disciplines to make a difference for our world."

scholarshipinitiative.wustl.edu

Scholarship Initiative Committee

Mr. William Abbott
San Francisco Committee

Dr. Lilia Abron
Washington, D.C. Committee

Mr. Charles Buescher, Jr.

Dr. Paul Chandeysson
Washington, D.C. Committee

Mrs. Ruth Chandeysson
Washington, D.C. Committee

Mrs. Anne Chivetta

Mr. William Coad

Mr. Marc Cohen
New York Committee

Mr. Gaines Coleman
Los Angeles Committee

Mr. Marshall Curtis
Washington, D.C. Committee

Mr. Thomas Feichtinger
Detroit Committee

Mr. Michael Franke
Chicago Committee

Mr. Robert Heider

Mr. R. Joseph Kannapell

Mr. Craig Kaufman
Atlanta Committee

Mr. Steven Kramer

Dr. Harold Y.H. Law

Mr. Peter Leemputte
Co-Chair

Mrs. Ellen Leemputte
Chicago Committee

Mr. Steven Lowy

Dr. Richard Mattione
Boston Committee

Dr. James McKelvey
Co-Chair

Dr. Anna Patterson
San Francisco Committee

Dr. Stanley Proctor, Jr.
Past Chair

Mr. Stephen Sands
New York Committee

Mr. Robert Scharringhausen

Mr. Harold (Hank) Schreimann

Mr. Sanford Silverstein

Mr. Charles Simmons
San Francisco Committee

Dr. William K.Y. Tao
Chair Emeritus

Dr. John Tomich
Houston Committee

Mr. Peter L. Young
International Committee

SCHOLARSHIP & Opportunity

Written by **JULIA EVANGELOU STRAIT** *Photo by* **GEOFF STORY**

From product development to finance, one alumnus's engineering degree meant a door open wide to opportunity.
Now he hopes to open that door for others.

PETER LEEMPUTTE loves a good challenge. After receiving his chemical engineering degree from Washington University in 1979, his first job was in product development for Procter & Gamble. There, he worked to build a better diaper. First working on a brand designed for adults and specific populations, such as the handicapped, he liked the idea that he was helping people. Later, he worked on Pampers. "My job was to improve diaper containment for breastfed newborns," he says with a laugh.

But the product development challenge also carried a business constraint — designing new diapers that could be made with the company's existing manufacturing assets. After two years at Procter & Gamble, Leemputte switched gears and went to business school, earning an MBA from the University of Chicago's Graduate School of Business.

Today, he serves as senior vice president and chief financial officer of Mead Johnson Nutrition Company, a multibillion-dollar global business that makes and sells pediatric nutrition products, including the Enfamil infant formula brand. From diapers to infant formula, his long career seems to have brought him full circle. "I'm just working on the input side now, not the output," he says with a laugh.

After business school, Leemputte held positions in finance and consulting across a wide range of industries. "I love the diversity of trying something new and learning a new business. The technical skills that you need to be a CFO can apply to almost any industry," he says.

Indeed, his first financial positions included stints at BP Amoco, an oil company; FMC Corporation, a chemical company; and Armco Inc., a steel producer.

"At FMC, I was the financial director for their agricultural chemical business. It was a fun job because I could use my chemistry background and I understood the product," Leemputte says.

After Armco, he moved to Mercer Management Consulting, where he helped clients improve their business practices. Next, he served as CFO at Chicago Title Corporation.

There, he orchestrated his first initial public offering, or IPO, taking Chicago Title public on the New York Stock Exchange.

In working hard to tackle big challenges, Leemputte also knows the value of education. One of the first in his family to go to college, he is grateful for the scholarships he received from Washington University.

1979 ›

Leemputte receives his Bachelor of Science in Chemical Engineering from

Washington University in St. Louis.

1979–81 ›

After graduating, he becomes a product development engineer for

Procter & Gamble.

The assignment: to build a better diaper.

1981–83 ›

Leemputte leaves Procter & Gamble to pursue an MBA from the

University of Chicago's School of Business.

1983–96 ›

Upon completing his master's degree, he holds

financial positions

with BP Amoco, FMC Corporation, and Armco Inc.

>> Leemputte is the co-chair of the School's $15 million scholarship initiative.

His last position before Mead Johnson was senior vice president and chief financial officer of Brunswick Corporation, a company famous for its leisure-time products, including recreational boats, yachts, pool tables, and bowling alleys.

Leemputte's broad finance experience led Mead Johnson to recruit him to manage its own transition into a standalone, independent company. Until February 2009, Mead Johnson was a division of Bristol-Myers Squibb, the pharmaceutical maker. "When you're taking a company onto the New York Stock Exchange for the first time, you end up in a teaching role," he says. "You spend a lot of time helping potential shareholders understand what drives the business." The IPO proved to be one of the most successful of 2009, and Mead Johnson's stock price has almost doubled over the past year.

While his career may be in finance, Leemputte credits his chemical engineering education with giving him skills in problem solving, an ability to work well with people, and experience in specific industries that have helped him along the way.

"The engineering degree developed my analytical skills better than any other undergraduate curriculum ever could have," he says. "Even in my finance job, the skill of looking at a problem and breaking it down into manageable pieces is a necessity.

"I learned that skill at Washington University and it has served me well throughout my career. I could have gotten a finance undergraduate degree, and I don't think I would be as successful as I've been as a chief financial officer. Engineering taught me a certain discipline to problem solving."

COURTESY PHOTO

LEEMPUTTE FAMILY
Left to right: Danny (16), John (18), Peter (20), Mary (24), Ellen, and Peter.

1996–98

Working as a

consultant,

Leemputte helps clients improve their business practices at Mercer Management Consulting.

1998–2000

Earns a leadership role at Chicago Title Corporation, where he

takes the company public

on the New York Stock Exchange.

2000–08

Works as senior vice president and CFO of

Brunswick Corporation,

whose product offerings include recreational boats, yachts, pool tables, and bowling alleys.

2008–today

Leemputte currently serves as the senior vice president and CFO of

Mead Johnson Nutrition,

a company that creates pediatric nutrition products.

From his early years working weekends and summers to pay the tuition at his Jesuit high school in Chicago, to studying hard throughout the chemical engineering program at Washington University, to taking Mead Johnson public on the New York Stock Exchange, Leemputte knows the rewards of hard work.

And in working hard to tackle big challenges, Leemputte also knows the value of education. One of the first in his family to go to college, he is grateful for the scholarships he received from Washington University.

"Washington University was very good to me," he says, and now, he wants to give back and help current and future students receive their own opportunities.

Today, in addition to serving on the School of Engineering & Applied Science's National Council, Leemputte is the co-chair of the School's $15 million scholarship initiative. Along with his wife, Ellen, who also serves on the initiative's committee, he is working to help extend the same educational opportunities to more students.

"It used to be that you could go to college and work during the summer and save enough money to help cover a respectable amount of the cost of the education for the year. That's impossible now for most people," he says. This scholarship initiative, Leemputte says, will give Washington University students the ability to get an excellent education that will serve them well throughout life.

Alumni Achievement Awards

>> The School of Engineering & Applied Science held its annual Alumni Achievement Awards dinner February 18, 2010.

PANGANAMALA RAMANA KUMAR

DScSSM '78, MSSSM '77

Kumar is the Franklin W. Woeltge Professor of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign, a research professor in the Coordinated Science Laboratory and the Information Trust Institute, and affiliate professor of computer science.

Kumar is a member of the U.S. National Academy of Engineering, an Institute of Electrical and Electronics Engineers (IEEE) Fellow, the recipient of the Donald P. Eckman Award of the American Automatic Control Council, the IEEE Field Award, and the Fred W. Ellersick Prize of the IEEE Communications Society.

WILLIAM EATHERTON

MSEE '99

YOUNG ALUMNI AWARD

Eatherton is a distinguished engineer and director of engineering at Cisco Systems Inc. He leads engineering for the ASR 1000 router at Cisco Systems, a project that bridges seven sites worldwide and involves hundreds of engineers. His technical innovations have earned him more than 25 patents, many before the age of 30.

MARIJA ILIC

DScSSM '79, MSSM '79

Ilic is a professor at Carnegie Mellon University. She also is the Honorary Chaired Professor for Control of Future Electricity Network Operations at Delft University of Technology in Delft, the Netherlands.

Her main interest is in the systems aspects of operations, planning, and economics of the electric power industry. She has co-authored several books in her field of interest and is an IEEE Fellow.

Photos by **ADAM FISCHER**

CHRISTOPHER CHIVETTA

BSME '84, MBA '86

Chivetta is president of Hastings & Chivetta Architects Inc. and managing partner of 8760 Engineering LLC, a firm specializing in energy conservation and sustainable design.

As president of Hastings & Chivetta, he is credited with expanding the firm's national reputation and design studios to meet the needs of educational clients.

Chivetta and his wife, Anne, fund an engineering undergraduate student scholarship.

JANET HOLLOWAY

MSAMCS '83

Holloway is senior vice president and chief of staff for Monsanto Co., managing the office of the chairman and CEO. She is a 26-year veteran of the company and also provides executive oversight for Monsanto's community relations activities, corporate facilities, and business services.

In addition to her services as a member of the School of Engineering & Applied Science's National Council, Holloway also supports the James M. McKelvey Undergraduate Research Scholars Program.

JACK BODINE

BSIE '49, MBA '55

DEAN'S AWARD

Bodine retired in 1990 as executive vice president and co-owner of Bodine Aluminum Inc., a manufacturer of sand and permanent mold aluminum castings headquartered in St. Louis.

Bodine has played leadership roles in the St. Louis chapters of the Non-Ferrous Founder's Society, the American Foundrymen's Society, and the American Association of Industrial Management.

A devoted member of the School of Engineering & Applied Science Alumni Advisory Council, Bodine served as president in 1996. A lifetime member of the William Greenleaf Eliot Society and sponsor of a term-endowed scholarship, he also is an active member of Engineering's National Council, the Eliot Society, and scholarship committees.

ZACHARY LEMNIOS *(Not Pictured)*

MSEE '79

Lemnios is the director of defense research and engineering for the U.S. Department of Defense. He serves as the chief technology officer for the Defense Department and is charged with the development and oversight of technology strategy. The goal of his position is to extend the capabilities of current war-fighting systems, develop breakthrough capabilities, and hedge against an uncertain future through a set of scientific and engineering options and counter-strategic surprise. Previously, Lemnios was the chief technology officer of Massachusetts Institute of Technology's Lincoln Laboratory.

NEW SCHOLARSHIPS IN 2009

Boeing FIRST Robotics Scholarship

Steve & Kim Carlson Scholarship

Chin Family Scholarship (Kevin Chin)

Demsky/Rohan Family Endowed Scholarship (Howard & Jamie Demsky)

Fenner Dunlop Americas Scholarship

Gloriod Family Study Abroad Scholarship (Terry & Jean Gloriod)

Kitty & Hanford Gross Scholarship

Robert F. Henry Memorial Endowed Scholarship (Anthony Thompson)

Ishida/Stout Endowed Scholarship (Calvin Ishida)

Olin W. & LaVerne C. Kriege Endowed Scholarships

Peter & Ellen Leemputte Scholarship

W. Garnett Maddox Endowed Scholarship (Marjorie Patton)

Robert D. McClure Memorial Endowed Scholarship

McKelvey Undergraduate Research Award sponsored by Janet & James Holloway

McKelvey Undergraduate Research Award sponsored by the Isaac I. Foundation

James I. & Cora Swift Miller Scholarship

MiTek Industries Engineering/ MBA Scholarship (Joseph & Carol Kannapell)

Anthony L. Olasov Memorial Scholarship (William & Christine Olasov and Friends of Anthony Olasov)

Ononye Family Scholarship (Ike & Gloria Ononye)

Mr. & Mrs. Elmer Payne Endowed Scholarship

Professor Ervin Y. Rodin Endowed Scholarship (Rich & Yasuko Mattione and friends of Dr. Rodin)

David Rossetti & Jan Avent Merit Scholarship

Stephen & Maxine Sands Scholarship

Simmons Family Study Abroad Scholarship in Electrical & Systems Engineering (Charles & Julie Simmons)

Ude Family Scholarship (Roland & Melody Ude)

Carl F.H. & Shirley C. Ullmann Endowed Scholarship

William R. Watts Foundation Scholarship

Frank & Grace Yin Graduate Fellowship in Biomedical Engineering

Young Family Study Abroad Scholarship in Biomedical Engineering (Peter & Lin Young)

THE OLIN W. & LAVERNE C. KRIEGE ENDOWED ENGINEERING SCHOLARSHIP

The Olin W. & LaVerne C. Kriege Endowed Engineering Scholarship was established through an estate gift by Olin Kriege, a 1936 alumnus, and LaVerne Kriege. The gift of more than $975,000 established undergraduate scholarships and graduate fellowships in biomedical engineering and environmental engineering.

R. JOSEPH KANNAPELL & CAROL J. KANNAPELL

In celebration of the Washington University Scholarship Initiative, Joe and Carol Kannapell established a new scholarship to support engineering students seeking an MBA from Washington University. "Carol and I have been blessed by Washington University — not only via the generous scholarships we received, but most notably by having found each other," says Joe Kannapell. Together, Joe and Carol have supported an annual scholarship for engineering students for more than six years in the name of MiTek Industries, where Joe serves as senior vice president.

STEVEN R. LOWY

More than 35 years ago, Steve Lowy joined William K.Y. Tao and Dean Jim McKelvey when the School launched the Engineers' Scholarship Program. "This is an excellent program that warrants the support of all alumni and provides great personal satisfaction for those who participate," he says. Today, Lowy supports endowed and annual scholarships for students studying computer science and engineering, biomedical engineering, and chemical engineering.

GAINES COLEMAN

Recently retired from St. Jude Medical, Gaines Coleman has worked in the medical technology industry for more than 20 years. In 2004, he established an annual fund scholarship for a deserving engineering student. Gaines took his passion to support students with financial need to the next level when he began funding an endowed scholarship in 2009.

2009 Engineering Open

GOLF SCRAMBLE & SCHOLARSHIP INITIATIVE

>> On October 5, 2009, alumni, students, and friends participated in the Engineering Open Golf Scramble, which raised funds for engineering scholarships.

Planning Committee:

Walter May

Christopher Chivetta

Donald Jubel

Daniel Logan

Jennifer Markwardt

Event Sponsors:

DINNER SPONSOR:

McEagle Properties, Paul McKee

PLATINUM SPONSORS:

Hastings & Chivetta Architects, Christopher Chivetta

Spartan Light Metal Processing, Donald Jubel

GOLD SPONSOR:

McCarthy Building Companies, Paul Hartwig

SILVER SPONSORS:

Guarantee Electrical Company, Rick Oertli

The Kwame Building Group, Anthony Thompson

BRONZE SPONSORS:

SiGNa Chemistry, Michael Lefenfeld

William Tao & Associates, Richard Janis

BEVERAGE CART SPONSORS:

Fred Weber Inc., Thomas Dunne

Husch Blackwell Sanders LLP, John McNearney

McClure Engineering, Eric Schactman

PLAYER SPONSORS:

Castle Contracting, Richard Ledbetter

Carrollton Bank, Thomas Hough

Benefactors:

Engineering Dynamics Intl., Tic Weissenberger

Tarlton Corporation, Robert Elsperman

Jerry Brasch

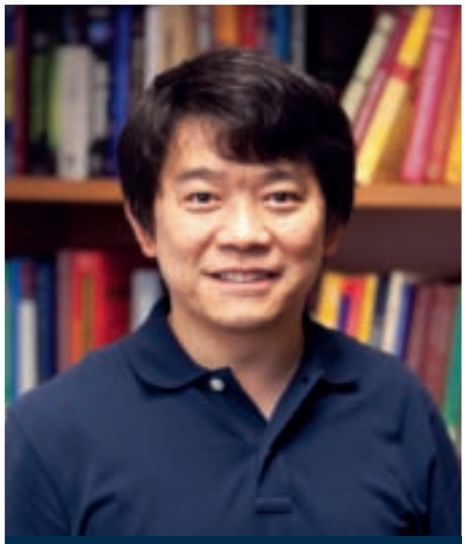
Robert Stupp

New Faculty

JUNG-TSUNG SHEN, PH.D.

Assistant Professor, Department of Electrical & Systems Engineering

J.T. Shen joined the faculty in fall 2009, after completing a postdoctoral fellowship at Stanford University. His primary research interests are in exploiting device potential and new material concepts enabled by the capability of manipulating light at subwavelength scales. He received his Ph.D. from the Massachusetts Institute of Technology in 2003.



SHEN

JOHN CUNNINGHAM, PH.D.

Assistant Professor, Department of Biomedical Engineering

John Cunningham will join the faculty after he completes his postdoctoral training under Professor Zoubin Ghahramani and Professor Carl Rasmussen in the Computational & Biological Learning Lab at the University of Cambridge. His research interests are in neural engineering and machine learning, with a specific focus on applications of brain-computer interfaces. He received his Ph.D. from Stanford University in 2009.

COURTESY PHOTO

CUNNINGHAM

KUNAL AGRAWAL, PH.D.

Assistant Professor, Department of Computer Science & Engineering

Kunal Agrawal joined the faculty in fall 2009. Her research interests include both theoretical and practical aspects of parallel computing, and she has worked on various topics, such as scheduling, resource allocation, transactional memory, and cache-aware and cache-oblivious streaming. She received her Ph.D. from the Massachusetts Institute of Technology in 2009.

Photo by CAMPUS IN FOCUS

AGRAWAL

RAMAN

BARANIDHARAN RAMAN, PH.D.

Assistant Professor, Department of Biomedical Engineering

Barani Raman joined the faculty in 2010, after completing a joint postdoctoral fellowship at the National Institutes of Health and the National Institute of Standards and Technology. His research interests include computational and systems neuroscience, pattern recognition, sensor-based machine olfaction and bioinspired intelligent systems. He received his Ph.D. from Texas A&M University in 2005.

Photos by **GEOFF STORY**

New Faculty

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SUBRAMANIAN

VENKAT SUBRAMANIAN, PH.D.

Associate Professor,
Department of Energy, Environmental & Chemical Engineering

Venkat Subramanian joined the faculty in fall 2009. His research interests include modeling and simulation of electrochemical power sources. Specifically, he is interested in energy-systems engineering, electrochemical engineering, computationally efficient algorithms (CPU time < 50 ms) for state of charge (SOC) and state of health (SOH) estimation of lithium-ion batteries, multiscale simulation and design of energetic materials (batteries and fuel cells), electrochemical conversion of carbon dioxide, kinetic Monte Carlo methods, and non-linear model predictive control. Since 2003, his research group has received more than $2 million in research awards. He received his Ph.D. from the University of South Carolina in 2001.

SINGAMANENI

SRIKANTH SINGAMANENI, PH.D.

Assistant Professor,
Department of Mechanical, Aerospace & Structural Engineering

Srikanth Singamaneni joined the faculty in 2010. His research interests include multifunctional materials; nanoscale confinement effects; physical, chemical, and biological sensors; surface-enhanced vibrational spectroscopy; and carbon nanostructure-based nanoelectronics. He received his Ph.D. from the Georgia Institute of Technology in 2009.

WEINBERGER

KILIAN WEINBERGER, PH.D.

Assistant Professor,
Department of Computer Science & Engineering

Kilian Weinberger joined the faculty in 2010, coming from Yahoo! Research, where he developed next-generation spam-filtering algorithms, multimedia search, high-dimensional data analysis, and machine learning with convex optimization. His research interests include multi-task learning, convex optimization, metric learning, dimensionality reduction, manifold learning, and machine-learned ranking. He received his Ph.D. from the University of Pennsylvania in 2007.

Promotions


CUI

JIANMIN CUI, PH.D.

Professor, Department of Biomedical Engineering

Jianmin Cui will become a full professor on July 1, 2010. Cui came to Washington University in 2004 from Case Western Reserve University. His research investigates cell membrane ion channel structure-function relationships in normal physiology and disease, specifically heart contraction and neural activities. He received his Ph.D. from the State University of New York in 1992.

DONALD ELBERT, PH.D.

Associate Professor, Department of Biomedical Engineering


ELBERT

Donald Elbert was promoted from assistant to associate professor on July 1, 2009. Prior to joining Washington University in 2000, he trained as a postdoctoral fellow at ETH Zurich from 1997 to 2000. His research interests are in cell and tissue engineering, proteomics of protein absorption, and drug delivery. His current research is on the development of materials for better vascular grafts and artificial heart valves. He received his Ph.D. from the University of Texas in 1997.


SMART

WILLIAM SMART, PH.D.

Associate Professor, Department of Computer Science & Engineering

William Smart was promoted from assistant to associate professor on October 2, 2009. His research interests are in the areas of mobile robotics, human-robot interaction, technology and the arts, machine learning, and brain-computer interfaces. He received his Ph.D. from Brown University in 2002.


CROWLEY


MORAN

DANIEL MORAN, PH.D.

Associate Professor, Department of Biomedical Engineering

Daniel Moran was promoted from assistant to associate professor on July 1, 2009. Prior to joining Washington University in 2001, he studied motor systems neurophysiology as a junior and associate fellow at the Neurosciences Institute in San Diego, California. His current research focuses on voluntary motor control and neuroprostheses. He is working to understand how the brain controls voluntary upper arm movements and to identify alternative control signals for brain-computer interfaces for patients who have paralysis or neuromuscular disorders. He received his Ph.D. from Arizona State University in 1994.

PATRICK CROWLEY, PH.D.

Associate Professor, Department of Computer Science & Engineering


CHEN

Patrick Crowley was promoted from assistant to associate professor on July 1, 2009. His research interests span several areas at the intersection of computer architecture and networking systems, but his current research projects focus on designing multicore processors and memory systems; building fast, programmable network routers with multicore processors; and building novel networks that use fast, programmable network routers. He received his Ph.D. from the University of Washington in 2003.

DAREN CHEN, PH.D.

Professor, Department of Energy, Environmental & Chemical Engineering

Daren Chen will become a full professor on July 1, 2010. Chen came to Washington University in 2001. His research interests are in particle science and technology. He is currently working on particle sensing and control, as well as particle applications in energy, environmental, and biomedical areas. He received his Ph.D. from the University of Minnesota in 1997.

Photo by GEOFF STORY

RETIREMENT
From left to right, Phillip Gould, Mark Franklin, Ervin Rodin, and Tzyh-Jong Tarn will retire on June 30, 2010.

MARK FRANKLIN, PH.D., the Hugo F. & Ina Champ Urbauer Professor of Engineering in the Department of Computer Science & Engineering, joined Washington University in 1970 and is a nationally recognized researcher in computer architecture, parallel processing, and systems performance evaluation. He founded the Computer and Communications Research Center in 1979 and served as its director until 2001. Franklin led development of the School's Computer Engineering program.

Franklin is an IEEE Fellow and co-founder of Exegy Inc., a technology company located in St. Louis. He is also the co-founder of the Symposium on Architectures for Nanotechnology and Communication Systems

PHILLIP GOULD, PH.D., the Harold D. Jolley Professor of Civil Engineering in the Department of Mechanical, Aerospace & Structural Engineering, joined Washington University in 1966 and served as chair of the Department of Civil Engineering from 1978 to 1998. His research activities have centered on thin-shell structures with applications to finite element analysis, biomedical engineering, earthquake engineering, and the structural design of thin-shell structures. Gould is an internationally recognized authority on the design of hyperbolic cooling towers.

The development of accurate methods for the dynamic analysis of these enormous structures remains an enduring achievement of Gould and his students.

ERVIN RODIN, PH.D., Professor of Systems Science and Mathematics in the Department of Electrical & Systems Engineering, joined Washington University in 1966. He established the Center for Optimization and Semantic Control. He is also founder and editor-in-chief of three international scientific journals and a scientific book series. His distinguished research career has focused on mathematical modeling and solutions of varieties of real-life problems, including in acoustics, air and water pollution, population growth and health care, and transportation.

TZYH-JONG TARN, PH.D., Professor of Systems Science and Mathematics in the Department of Electrical & Systems Engineering, joined the Washington University faculty in 1969, after receiving his doctoral degree and completing his postdoctoral fellowship, both at Washington University. He is the director of the Center for Robotics and Automation, and he has contributed to seminal works in several fields, including controllability of quantum mechanical systems, robotics and automation, nanotechnology, and systems theory.

ENGINEERING

ENCOUNCIL

IEEE

ENCOUNCIL
2009-2010 EnCouncil Executive Officers: Front row (L to R): Dan Brewster, Stephen Kuhn, Meghan Charochak, and Abi Barbour; Back row (L to R): Jeremy O'Driscoll, Ryan McCombe, and Austin Jones

IEEE
Back row (L to R): Jeremy O'Driscoll, Aaron Mosher, Ari Kahn, and Jeffrey Feiereisen; Front row (L to R): Caroline Fernandez, David Pilla, and Sam Fok

NATIONAL SOCIETY OF BLACK ENGINEERS
(page 39) To explore post-graduate educational opportunities and engage in networking workshops, the Washington University chapter of the National Society of Black Engineers (NSBE) attended the NSBE Regional Conference in Dallas, Texas.

EnCouncil

EnCouncil, the undergraduate student government of the School of Engineering & Applied Science, hosted the Engineering Dean's Forum and continued to promote student involvement in the School. In spring 2009, outgoing President Lee Cordova and current President Dan Brewster led the first Engineering Expo for admitted students to visit campus, which featured department research presentations and a special speaker, alumnus Greg Sullivan.

In fall 2009, EnCouncil's annual Vertigo dance party broke attendance records with over 1,800 attendees.

encouncil.wustl.edu

IEEE

With new leadership, the Institute of Electrical & Electronics Engineers (IEEE) student chapter radically transformed in fall 2009. IEEE collaborated with Engineering World Health students to host the IEEE Defibrillator Tester Kit Building Event. As hospitals in the developing world often have only one defibrillator, likely to be old and malfunctioning, the test kits assembled will allow hospitals to test their defibrillators and be reassured of their capabilities.

ieee.wustl.edu

Formula SAE team, WUracing

(Not Pictured) WUracing provides students with the opportunity to utilize classroom concepts in real-world situations by designing, fabricating, and assembling a formula-style racecar for use at annual competitions against teams from around the world. To achieve a new, innovative,

Around Campus

NATIONAL SOCIETY OF BLACK ENGINEERS

ENGINEERS WITHOUT BORDERS

Photo by JERRY NAUNHEIM JR./WUSTL PHOTO

and "green" design, WUracing deferred their spot in the 2009 competition. The team took a giant leap forward fabricating multiple components to make this engineering feat come true. With a young and passionate team, WUracing will test all their hard work against 79 other university teams at competition in Fontana, California in June 2010.

sae.wustl.edu

National Society of Black Engineers

During the past year, members of the National Society of Black Engineers hosted weekly mentoring sessions with middle school students, an annual weekend for 30 high school students focused on engineering and education, and "A Walk for Education," a day of college preparatory programming for local St. Louis families staffed by NSBE members from all over the country.

nsbe.wustl.edu

Engineers Without Borders

In 2009, Engineers Without Borders worked on a variety of projects in St. Louis and around the world. Members began collaborative work in Haiti with Meds & Foods for Kids, an organization that fights malnutrition in Haiti through production and distribution of a peanut formula. In St. Louis, Engineers Without Borders members continue to work with North Grand Neighborhood Services in rehabbing homes. On campus, students will work to construct a wind turbine to supply energy to a student-run organic farm.

ewbwashu.org

ENGINEERS WITHOUT BORDERS
Dr. Robin L. Shepard (above left), an adjunct instructor of chemical engineering, and Brad Pelz, a senior in electrical engineering, cut tile at a house under construction in St. Louis' North Grand Neighborhood for the WUSTL chapter of Engineers Without Borders Service Project Day February 20. The project, aimed at developing affordable housing, was part of Engineers Week: February 14-20, 2010, the engineering school's week of special events to inspire current and future engineers.

REMEMBERING Chris Byrnes

Written by **DIANA LUTZ**

CHRISTOPHER I. BYRNES, PH.D., dean of the School of Engineering & Applied Science from 1991 to 2006 and the Edward H. and Florence G. Skinner Professor Emeritus of Systems Science and Mathematics, died unexpectedly in February while in Stockholm, Sweden. Byrnes, who was 60 years old, was a distinguished visiting professor at the Royal Institute of Technology at the time of his death.

Byrnes joined the WUSTL faculty in 1989 as professor of systems and control and chair of the Department of Systems Science & Mathematics. He became the eighth dean of the School of Engineering & Applied Science on July 15, 1991, succeeding James M. McKelvey, Ph.D.

He began his academic career at the University of Utah in 1975 and later joined the Harvard University faculty in 1978. He also taught at Arizona State University, where he founded the Center for Systems Engineering Research.

Byrnes was awarded an honorary doctor of technology degree by Sweden's Royal Institute of Technology in 1998. He was an adjunct professor at the institute from 1986 to 1990 and a visiting professor in 1985, 1991, and 2001. In 2001, Byrnes was installed as a foreign member of the Royal Swedish Academy of Engineering Sciences.

Byrnes served on many civic, corporate, and professional boards and worked to develop incubators and technology alliances in the St. Louis area. He chaired both the Center for Emerging Technologies and the Gateway Technology Alliance. He once said of St. Louis, "There is no reason St. Louis can't be as well known for our technology as Singapore," since the city and the nation have comparable populations. While he was dean, 17 companies were formed to commercialize the ideas of the faculty and staff of the School of Engineering & Applied Science.

Byrnes is survived by his wife, Renee; his daughters Kathleen, now studying medicine at Tulane University in New Orleans, Louisiana, and Alison, a student at Duke University in Durham, North Carolina; and a son, Christopher, Jr., who attends Chaminade High School in St. Louis.

COLLEAGUES, FRIENDS, AND FAMILY GATHERED FOR A MEMORIAL SERVICE IN GRAHAM CHAPEL ON MARCH 26.

VIDEOS OF THOSE WHO SHARED MEMORIES AND STORIES ARE AVAILABLE ONLINE:

YOUTUBE.COM/WUSTLENGINEERING.

Two convictions guided him as dean: "The world is becoming more technologically advanced, not less; and the world is becoming more global, not less." With those doctrines in mind, he initiated a strategic planning process for the school to position it for a leadership position in the changing environment.

Byrnes' field of scholarship was systems science and control. He held four U.S. patents and received more than $5 million in competitively awarded grants.

Raised in the Bronx by a stay-at-home mom and city-bus-driver dad, Byrnes earned a bachelor's degree from Manhattan College in 1971. Byrnes earned a master's degree and a doctorate from the University of Massachusetts in Amherst in 1973 and 1975, respectively.

WUSTL PHOTO

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