

I am very pleased to share with you the inaugural issue of *from the Dean*. This is my effort to keep you well apprised of important developments in our academic and research programs here in the College of Engineering. We have several exciting happenings to share with you that indicate the College is indeed moving forward with a lot of positive momentum.

Professor **Ahsan Kareem**, the Robert M. Moran Professor of Civil Engineering and Geological Sciences and Director of the NatHaz Modeling Laboratory, was elected to the National Academy of Engineering this past spring. This is the highest national honor awarded to an engineer and the first time in many years one of our faculty has been so honored. We describe this outstanding accomplishment on page 1.

This coming fall, the College of Engineering and the College of Science, in conjunction with the Mendoza College of Business, will launch the first ever interdisciplinary graduate program in the history of Notre Dame: a professional master's degree in Engineering, Science, and Technology Entrepreneurship Excellence (ESTEEM). We have received nearly 60 applicants for this program and will enroll approximately 30. All of the students have bachelor's degrees in engineering, science, or math and will be intensively learning the details of how to launch a high-tech business venture. **Gregory** P. Crawford, the William K. Warren Foundation Dean of the College of

Science, and I believe this innovative new program will set the standard for engineering and science entrepreneurship and should help prepare a generation of new young people to develop the human and intellectual capital of our country in high-tech economic development.

As I believe you all know, last spring the college and University were awarded the Midwest Institute for Nanoelectronics Discovery (MIND), a new Semiconductor Research Corporation-Nanoelectronics Research Initiative (SRC-NRI) national center. This exciting new center is pioneering new device applications as candidates to replace CMOS transistors and usher in a new era of nanoelectronic devices. Stay tuned as our researchers race those at the University of California at Berkeley, Stanford University, Massachusetts Institute of Technology, and elsewhere to be the first nationally to demonstrate some of these devices.

I am also pleased to announce the awarding of a new *Energy Frontier Research Center (EFRC) on Actinide Materials* to a group headed by **Peter Burns**, the Henry J. Massman Chair of Civil Engineering and Geosciences. The group, which includes researchers from the University of California at Davis, the University of Michigan, George Washington University, and Rennselaer Polytechnic Institute, as well as from Sandia, Savannah River, and Pacific Northwest national laboratories, will develop new states of matter based on nanostructured forms of actinides and actinide complexes as potential fuel and waste forms for next-generation nuclear energy generation. The EFRCs are the signature basic research programs recently announced by the Department of Energy.

We describe in *from the Dean* a variety of other significant recent accomplishments and recognitions. I am very pleased to share these with you. I hope you will enjoy learning more about our programs, and we look forward to interacting fruitfully with you in the fall.

Sincerely,

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Peter Kilpatrick

CONTACT

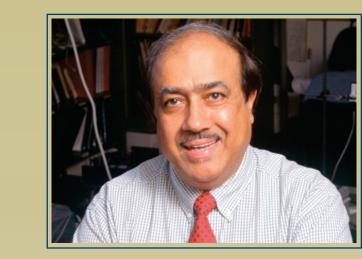
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Kareem Named to National Academy of Engineering



Ahsan Kareem, the Robert M. Moran Professor of Civil Engineering and Geological Sciences and Director of the NatHaz Modeling Laboratory at Notre Dame, has been elected a member of the National Academy of Engineering (NAE) for contributions to "analyses and designs to account for wind effects on tall buildings, long-span bridges, and other structures."

A faculty member since 1990, Kareem specializes in probabilistic structural dynamics, fluid-structure interactions, structural safety, and the mitigation of natural hazards. He has served in the administration, management, and organization of numerous professional societies, including the American Society of Civil Engineers (ASCE), as well as committees of the National Research Council, NAE, and the American Association for Wind Engineering. He also has served as a senior consultant to several major oil, insurance, and consulting engineering companies and the United Nations.

Among his most recent honors are ASCE's State-of-the-Art award for scholarly contributions to full-scale monitoring of tall buildings (a joint honor with Associate Professor Tracy Kijewski-Correa), an appointment as an advisory professor at Tongji University in Shanghai, and selection as the inaugural recipient of the Alan G. Davenport Medal, presented by the International Association for Wind Engineering in recognition of his distinguished achievement in dynamic wind effects on structures. He has also received the Robert H. Scanlan Medal for outstanding original contributions to the study of wind-load effects on structural design and the Jack E. Cermak Medal in recognition of his contributions to the study of wind effects on structures. His receipt of the Davenport, Scanlan, and Cermak medals is an unmatched recognition in this field.

Notre Dame Lands MIND

The University of Notre Dame is now home to the Midwest Institute for Nanoelectronics Discovery (MIND), one of only four nanoelectronics research centers funded by the Semiconductor Research Corporation's Nanoelectronics Research Initiative (SRC-NRI). Each of the other centers — at the University of Texas, the University of California at Los Angeles, and the State University of New York at Albany — is also located on a university campus. And, each is pursuing the same goal: to enable future breakthroughs in semiconductor technology via nanoelectronics by developing advanced devices, circuits, and nanosystems with performance capabilities beyond conventional devices.

The other centers have already led to economic growth in their communities, particularly in expanded technology investment and job creation. Over



funding via federal grant applications through the National Nanotechnology Initiative.

MIND, while led by Notre Dame researchers, is a consortium that includes Cornell University, the Georgia Institute of Technology, Purdue University, the University of Illinois, Pennsylvania State University, the University of Michigan, the University of Texas at Dallas, Argonne National Laboratory, the National Institute of Standards and



the next three years MIND will spend \$20 million on consortium projects. The state of Indiana has promised \$12 million, the SRC-NRI \$3 million, and the city of South Bend \$1 million. In addition, IBM is providing \$2 million in equipment, and the five universities in the consortium are contributing matching funds totalling close to \$3 million. MIND organizers anticipate supplemental



Technology, and the National High Magnetic Field Laboratory. Because central themes of the consortium encompass energy-efficient devices and systems, all MIND researchers will focus on topics not covered by the other SRC-NRI centers. Specific projects include lateral fieldeffect tunnel transistors, extremely scaled gated tunnel transistors,





Nanoelectronics • Architectures

MIDWEST INSTITUTE FOR NANOELECTRONICS DISCOVERY

energy dissipation in nonequilibrium systems, nanomagnet logic devices, and circuit design and architectures for emerging devices. With its history in nanotechnology, particularly in nanoelectronics, Notre Dame is confident in its pursuit of these directions.

MIND also closely ties Notre Dame to the economic development initiatives of Indiana and South Bend. It is anticipated that related

commercialization activities will occur in the new Innovation Park at Notre Dame and that nanoelectronics commercialization and manufacturing facilities will spring up in the research facility the city is developing to support new jobs and investment associated with MIND and other advances made at the University.

FACULTY HIGHLIGHT



Kogge Leads ExaScale Study

Peter M. Kogge, the Ted H. McCourtney Professor of Computer Science and Engineering, was chosen by the Defense Advanced Research Projects Agency to lead the study. He also selected the study participants and served as its editor. In an interview with IEEE Spectrum (which can be found at http:// www.ieee.org/netstorage/spectrum/ radio/mp3/1208kogge.mp3), Kogge discussed study results

"Our goal," he says, "was not to provide solutions or specific designs for computers in 2015. It was to develop a deep understanding of the technological challenges that could prohibit such a large increase in computing capabilities for data center-sized systems [supercomputers], departmental-sized systems, and embedded systems." In the end, all study members agreed on two things: If a 1,000X increase were to be achieved, it would be in a way that does not currently exist and that any such achievement would come through an interdisciplinary approach.

An expert in advanced computer architectures, Kogge is the author of two books and holder of 20 patents. He is also an IBM fellow, as well as a fellow of the Institute of Electrical and Electronics Engineers. Kogge is a graduate of the University.

DOE Awards EFRC to Notre Dame

On April 27, 2009, at the annual meeting of the National Academy of Sciences, the White House announced that Notre Dame will be home to one of 46 new multi-million-dollar Energy Frontier Research Centers (EFRCs). These centers, which will pursue advanced scientific research on energy, are being established by the U.S. Department of Energy (DOE) Office of Science at universities, national laboratories, nonprofit organizations and private firms across the nation. Notre Dame's EFRC, which will be titled "Materials Science of Actinides," is one of 16 to be funded by President Obama's American Recovery and Reinvestment Act.

According to **Peter C**. **Burns,** the Henry J. Massman Chair of the Department of Civil Engineering and Geological Sciences and director of the new center, "This is a unique and important opportunity for scholars at Notre Dame and partner institutions to impact future energy challenges facing the nation and the world."

The focus of this center, which includes participants from several other universities and national laboratories, is the elements that are the basis of nuclear energy (uranium, plutonium, and other actinides). Research in the center seeks to understand and control materials that contain actinides at the nanoscale and to lay the scientific foundation for advanced nuclear energy systems that may provide much more energy while creating less nuclear waste.

Students and faculty in the Energy Frontier Research Center will focus on specific actinides in order to lay the foundation for advanced nuclear energy systems that would provide more energy while creating less nuclear waste.

Notre Dame EFRC researchers will take advantage of new capabilities in nanotechnology, high-intensity light sources, neutron scattering sources, supercomputing, and other advanced instrumentation, much of it developed with DOE Office of Science support over the past decade, in an effort to lay the scientific groundwork for fundamental advances in solar energy, biofuels, transportation,

> energy efficiency, electricity storage and transmission, clean coal and carbon capture and sequestration, and nuclear energy.

Engineering, Science, and Technology Entrepreneurship (ESTEEM) to Drive Our Nation's Economy

The 2007 book published by the National Academies of Science and Engineering, "Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future," makes a compelling case that our nation's future prosperity hinges on dramatically improving our commitment to science, technology, engineering, and mathematics education and research, in order to ensure that the United States is the premier place in the world for innovation. A key challenge is that most science, engineering, and mathematics students are never exposed to the innovation process and to the utilization of intellectual property to create vibrant new companies and enterprises.

The colleges of engineering and science, in collaboration with the Mendoza College of Business, are pleased to launch the ESTEEM (Engineering, Science, and Technology Entrepreneurship Excellence Masters) M.S. degree program, the first interdisciplinary, inter-college graduate degree program in the history of the University. Available only to bachelor's degree holders in specific disciplines (engineering, science, technology, and mathematics), the goal of ESTEEM is to train the next generation of high-tech entrepreneurs in order to fuel economic development. A total of 30 students will participate in the pilot program, which begins this fall. More than 60 have already applied.

The University believes ESTEEM fills a unique need in the educational and industrial marketplaces. Consider that a key characteristic sought by today's employers is the ability of the engineers and scientists they hire to take innovative ideas from concept to product to market. This requires great intellectual capacity, not only to lead the technological aspects of the process but also to successfully integrate marketing and management skills as a product or process is rolled out to end-users. Because it is an interdisciplinary program, ESTEEM prepares students who have the technological backgrounds to anticipate emerging opportunities, exploit value from embryonic ideas, and assume leadership roles in businesses ... from small start-up companies to Fortune 500 corporations.

At the end of the 12-month, 30-credit-hour program, students will receive a Master of Science in Engineering, Science, and Technology Entrepreneurship. It breaks down this way: ESTEEM requires 12 hours of basic and advanced business fundamentals (finance, supply chain management, strategy, operations, etc.). Another six hours of technical electives are required, along with a 12-credit-hour project. The project, where the student works with a faculty mentor, is to develop a business plan for a high-tech start-up company from a piece of intellectual property, such as a patent or patent application.

The ESTEEM degree, once complete will compare to similar degrees awarded at institutions such as Duke University, Dartmouth College, and Brown University. In short, ESTEEM helps better prepare an elite group of students for a future where they will lead technological advancements.



University of Notre Dame College of Engineering from the Dean



STUDENT SPOTLIGHT

June 2009



Colón Receives Fulbright Award

Yamil Colón, a senior in the Department of Chemical and Biomolecular Engineering, has been awarded a scholarship for graduate study from the Fulbright Program. Created by Congress in 1946, the Fulbright Program is the U.S. government's premier scholarship program, designed to foster mutual understanding among nations through educational and cultural exchanges.

Colón will be working as part of the Separation Processes and Phase Equilibra group at the University of Santiago de Compostela in Spain. The group, led by Professor Alberto Arce and Associate Professor Ana **Soto**, is internationally recognized for its work with vapor-liquid equilibria (VLE) and ionic liquid (IL) research.

Colón will be studying VLE phases and measuring physical properties of ILs deemed pertinent for industrial applications, including the removal of metal and other contaminants from water, carbon dioxide capture, and the removal of sulfur compounds from diesel fuel.

He was most recently a 2008 Vincent P. Slatt Fellow under the auspices of the Notre Dame Energy Center, where he evaluated the potential use of specific ILs based on their thermophysical properties in varying compositions of ethanol.

IAS Appoints Porod Hans Fischer Senior Fellow



The Institute for Advanced Study (IAS) at the Technische Universität München

(TUM) has selected Wolfgang Porod, the Frank M. Freimann Professor of Electrical Engineering, as a Hans Fischer Senior Fellow. The fellowship is named in honor of a TUM professor (Hans Fischer) who was awarded the 1930 Nobel Prize in chemistry for his pioneering efforts in hemoglobin.

Porod, like the other senior fellows, will pursue research activities following the motto "High Risk, High Reward," as the IAS is concerned with impact on advanced research fields in the long run, supporting top-level research without the burden of bureaucratic requirements. An expert in the area of nanoelectronics and quantum devices, he will continue to exploit new physical phenomena at the nanoscale for novel information processing devices and systems while at IAS.

A faculty member since 1986, Porod's research focuses on solid state physics and its application to electronics; device reliability, degradation, and breakdown; quantum devices and architectures for nanoelectronics; and the limits imposed by the laws of physics on computation. He is the co-inventor of Ouantum-dot Cellular Automata, a transistorless approach to computing, and serves as director of the Center for Nano Science and Technology.

Porod is a fellow of IEEE and has authored more than 300 publications and presentations. He serves on the advisory and program committees of several international meetings and is a reviewer of proposals to the National Science Foundation, NASA, and several technical journals. He is also active in several professional societies and serves as a speaker in IEEE Distinguished Lecturer programs.

Merz Elected Fellow of **Materials Research Society**

Cited for his "outstanding achievements in electronic materials, particularly compound semiconductors ... and for intellectual leadership in advancing materials research in the U.S. and internationally," James L. Merz, the Frank M. Freimann Professor of Electrical Engineering, has been named a fellow of the Materials Research Society.

An internationally recognized scholar in the field of optoelectronic materials and devices, Merz most recently served the University as interim dean of the College of

Engineering and vice president for graduate studies and research. A Notre Dame alumnus, Merz returned to the University in 1994 to direct a team of researchers investigating Quantum Cellular Automata, sometimes called Notre Dame logic.

He is a fellow of the American Association for the Advancement of Science, the American Physical Society, and the Institute of Electrical and Electronic Engineers. Merz is also a member of the Society for Values in Higher Education. He has published more than 400 papers, holds five patents, and is the recipient of an Alexander von Humboldt Research Award in recognition of lifetime achievements in science and engineering and an honorary doctorate from Linköping University in Sweden.



NASA Taps Neal for Lunar Science Institute

NASA has named **Clive** R. Neal, professor of civil engineer-

ing and geological sciences, to a select team of scientists tasked with growing the nation's technical capabilities in lunar science and developing educational opportunities in space science. Initial members of the newly formed Lunar Science Institute represent Notre Dame; the Lunar & Planetary Institute; the universities of Arizona, Houston, and Maryland; Rice University; Southwest Research Institute; and the National Institute of Polar Research. They will investigate if the Earth and moon were resurfaced by asteroids and comets billions of years ago and how such heavy bombardment influenced the evolution of life on earth.

In his role on LSI, Neal is part of a team that will be studying breccias (rocks) collected at all of the Apollo landing sites that are believed to be on the order of 4 billion years old. His team will analyze the rocks via optical and electron microscopy to more conclusively determine the age of the breccias and the veracity of the lunar cataclysm hypothesis, as well as its probable effect on the inner solar system.

Neal is a member of the Mineralogical Society of America, Geological Society of America, American Geophysical Union, American Association for the Advancement of Science, and National Association of Geoscience Teachers. He currently is chair of NASA's Lunar Exploration Analysis Group and the Science and Technology Panel of the Integrated Ocean Drilling Program.

Young Faculty Awards: CAREER and AFSOR

NSF CAREER AWARDS

Vijay Gupta and Huili (Grace) Xing, assistant professors in the Department of Electrical Engineering at the University of Notre Dame, were named 2009 National Science Foundation (NSF) Early Career Development (CAREER) Award recipients. The award is the highest honor given by the U.S. government to young faculty in engineering and science.



Gupta's CAREER project, titled "Scalable

and Optimal Co-design of Control and Communication Protocols in Cyber-physical Systems," explores the next generation of engineering systems composed of multiple complex dynamical systems interacting across communication networks. He proposes a scalable and efficient approach for designing the communication and control algorithms for such systems. The project also includes the development of an interdisciplinary graduate course, projects for the department's senior thesis course, and a high school outreach program to motivate students, particularly minorities and women, to pursue engineering.

Xing's project, titled "Graphene and Graphene Nanoribbon Optoelectronic Properties and Devices," focuses on developing and demonstrating a series of optoelectronic device concepts based on graphene and graphene nanoribbons (GNRs) and then using those devices as vehicles to extract the optoelectronic properties of graphene and GNRs. This research will deepen the understanding of electron excitation-relaxation dynamics, minority carrier lifetime, external electrostatic gating and wave guiding, and dielectric effects. The educational component of her project involves undergraduates and middle school teachers and students — especially young girls — via the University's "Expanding Your Horizons" workshops, the participation of female students from Saint Mary's College in the dual-

Batill Named Fulbright Scholar



process in the Product Innovation Management Department at Delft University of Technology in-residence at IDEO design consultancy in Palo Alto, Calif.

An associate fellow of the American Institute of Aeronautics and Astronautics, Batill is also a member of the American Society for Engineering Education and of the American Society of Mechanical Engineers. He is a Triple Domer.





Vijay Gupta



Huili (Grace) Xing



June 2009

Vikas Tomar

degree program in engineering, and a summer research opportunities program for women faculty from the college.

AFSOR AWARDS

Vikas Tomar, assistant professor of aerospace and mechanical engineering, and Xing were two of the 39 researchers selected by the Air Force Office of Scientific Research as part of the 2008 Young Investigator Program (YIP). The program is open only to engineers and scientists at U.S. research institutions who have received a doctoral degree within the last five years and show "exceptional ability and promise for conducting basic research." YIP honorees for 2008 share approximately \$12.1 million for their research efforts. Competition for the award was intense, with the AFSOR receiving 210 proposals encompassing a broad range of areas, including aerospace, chemical and materials sciences, physics and electronics, mathematics, information technologies, and life sciences.

Tomar is investigating nanoscale thermal conduction and mechanical strength correlation in high-temperature ceramics.

Xing's YIP focuses on the quantum limits of nitride RF high-electron mobility transistors. She is investigating the physical origins of the upper limit of speed and powerhandling capabilities in gallium-nitride based semiconductor transistors.

Stephen M. Batill, professor of aerospace and mechanical engineering, was named a 2008-09 Fulbright Scholar. During his appointment, which runs from January through August 2009, he will be lecturing and conducting research on monitoring and enhancing the product design

in the Netherlands. Immediately preceding his Fulbright term, he served a semester as a scholar-

Apprentice Program: Preparing Instructors and Students

The First Year Engineering Teaching Apprentices Program (FYETAP), which began during spring semester 2009, has proven an excellent opportunity for both the graduate students considering a career in academia and for the undergraduates benefiting from their experience. Four graduate students -Josh Enszer, chemical and biomolecular engineering; Thomas Estrada, electrical engineering; Rachel Getman, chemical and biomolecular engineering; and Mark Ross, aerospace and mechanical engineering — are leading two sections of the first-year engineering course Introduction to Engineering Systems II.

FYETAP students work closely with engineering undergraduates in a collaborative environment. They mentor the students, providing council and encouragement to the undergraduates as many are still making the adjustment from high school to university life. As important, they offer insights to help the undergraduates choose an engineering discipline to pursue. (All students entering the University begin in the First Year of Studies; they do not choose a major or officially enter a program of study until the end of the second semester of their first year.) The benefit to undergraduates is obvious: they are able to see firsthand that hard

work and commitment pay off, and they can learn from the successes and challenges the FYETAP mentors have already experienced.

But the graduate students also benefit. In addition to working closely with Kerry Meyers, the course coordinator for the first year program, the FYETAP students receive guided feedback on their instructional skills from educational specialists in the Kaneb Center for Teaching and Learning. They also have the opportunity to participate in seminars with experts in engineering education from on and off-campus.

Undergraduates Receive NSF Graduate Fellowships

Three College of Engineering seniors have been awarded 2009 National Science Foundation (NSF) graduate fellowships: Christopher Fallin, Rachel Paietta, and Claire VerHulst. The NSF Graduate Fellowship Program supports outstanding graduate students in engineering, mathematics, science, and technology, who are pursuing research based master's and doctoral degrees.

Interested in multicore systems and the interaction between hardware and software, Fallin's NSF proposal outlined a vertical approach — from compilers and systems software down to microarchitecture - to address the reliability and performance problems that will most likely attack future parallel and multicore systems. This fall he will be studying electrical and computer engineering

and will be part of the Computer Architecture Lab at Carnegie Mellon University. Fallin is a computer engineering major from Beaverton, Ore. His project adviser was Patrick Flynn, professor of computer science and engineering.

A native of Dayton, Ohio, Paietta is pursuing



Fallin



Paietta

her doctorate in mechanical engineering. She is studying the biomechanics and structure of the interface between bone and intervertebral discs in the spine at the University of Colorado at Boulder. Her research adviser was Glen Niebur, associate professor of aerospace and mechanical engineering.

VerHulst will be pursuing a doctorate in mechanical engineering at The Johns Hopkins University. She has been working in University's new Transonic Axial Trubine Facility with Scott Morris, associate professor of aerospace and mechanical engineering, and completed an internship with GE Aviation this past summer. Her research proposal for the NSF fellowship discussed pros and cons of a return to old propeller-driven designs as a way to counter rising fuel costs. Engines with propellers provide better fuel economy but are substantially louder, which is why a significant effort has been mounted over the last decade to reduce propeller noise. VerHulst is a native of Brighton, Mich.

Faculty Appointments & New Hires

The following engineering faculty have been promoted:



To Emeritus

James L. Merz Electrical Engineering Albert E. Miller

Chemical and Biomolecular Engineering

Steven B. Skaar Aerospace and Mechanical Engineering

To Department Chair John E. Renaud Aerospace and Mechanical Engineering

To Professor Patrick J. Fay Electrical Engineering Xiaobo Sharon Hu Computer Science and Engineering Joseph M. Powers

William F. Schneider Chemical and Biomolecular Engineering

To Associate Professor **Debdeep Jena Electrical Engineering** Tracv L. Kijewski-Correa Civil Engineering and **Geological Sciences**

J. Nicholas Laneman **Electrical Engineering**

Joining the College of Engineering this academic year were:



Thomas E. Albrecht-Schmitt, professor Civil Engineering and **Geological Sciences**

Basar Bilgiçer, assistant professor Chemical and Biomolecular Engineering

David Go, assistant professor Aerospace and Mechanical Engineering

Chengti Huang, visiting scholar Electrical Engineering

Kapil Khandelwal, assistant professor Civil Engineering and Geological Sciences

Joseph Nahas, visiting professor Computer Science and Engineering

Thomas Pratt, research associate professor Electrical Engineering



June 2009

Aerospace and Mechanical Engineering

Scott Morris Aerospace and Mechanical Engineering

Aaron Striegel Computer Science and Engineering

Yingxi (Elaine) Zhu Chemical and Biomolecular Engineering

To Assistant Professor Michael Niemier Computer Science and Engineering

To Research Professor Alexander Mintairov Electrical Engineering

> Alexei Orlov Electrical Engineering











Elizabeth Kerr, assistant professional specialist Civil Engineering and **Geological Sciences**

James Schmiedeler, associate professor Aerospace and Mechanical Engineering

Antonio Simonetti, research associate professor Civil Engineering and **Geological Sciences**

Philippe Sucosky, assistant professor Aerospace and Mechanical Engineering

Alexandros Taflanidis, assistant professor Civil Engineering and **Geological Sciences**