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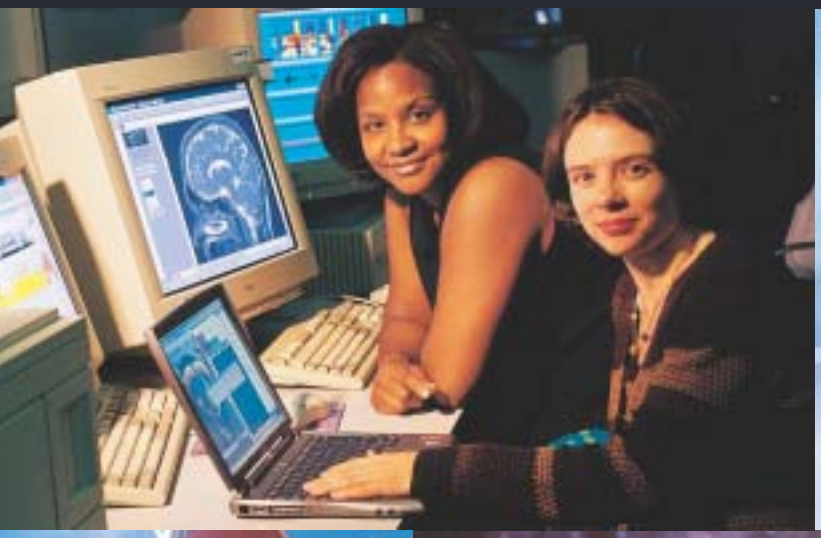
E@M

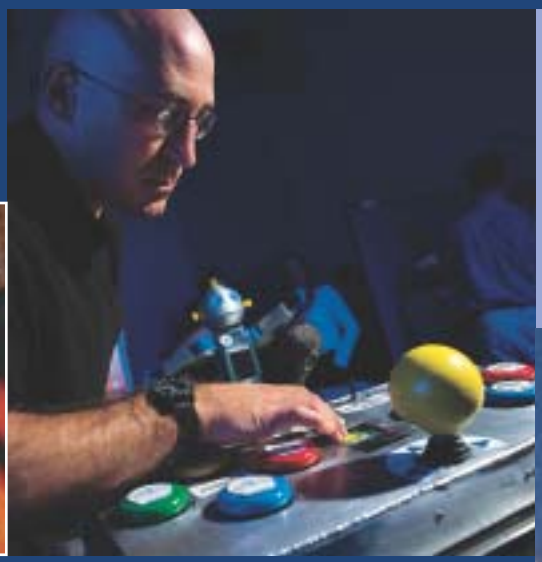
ENGINEERING @ MARYLAND

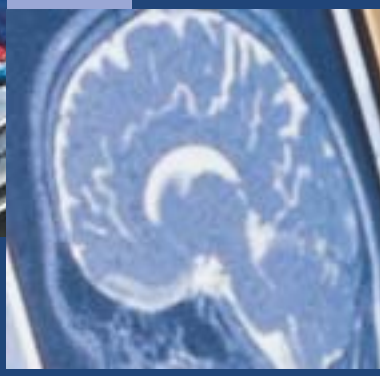


Information Technology: Setting the Pace for the Future

INSIDE

A. JAMES CLARK SCHOOL OF ENGINEERING ▪ University of Maryland





STORIES

DEPARTMENTS

Dear Alumni and Friends:

TECHNOLOGICAL ADVANCES FREQUENTLY ARISE from opportunities to address and solve life's challenges. Today's headlines speak to the necessity for technological improvements, particularly security related, in response to unprecedented concerns for homeland security. This demand is further fueled by sophisticated and ambitious consumers calling for the most up-to-date technological innovations and efficiencies, despite an uncertain economy and the downturn of many of yesterday's successful technology firms. Historically, it is at this juncture, that engineers play a vital role. For it is the innovations arising from engineering research that fuel tomorrow's economic growth and make fundamental contributions to a better way of living.

The Clark School of Engineering is addressing these challenges and taking a leadership role in the development of technologies in four emerging areas of information technology. In this issue of *Engineering@Maryland*, you will read how these four areas will create greater efficiencies in our homes and security in the world.

You also will read about the development of exciting new programs and partnerships that are transforming the Clark School into a powerhouse of research and education. The proliferation of these activities and expansion of collaborative efforts is not only a significant contributor to the economy in Maryland and the nation, but it also provides unique opportunities for our students. In fact, responding to the region's growing demand for highly qualified employees in bioengineering, we have established a new master's and doctoral program in bioengineering, as well as the nation's first biomolecular graduate certificate program that begins this fall.

What greater commitment to our mission could we undertake than to ensure that young talented students have opportunities in the classroom and in the laboratory that not only advance their knowledge but also fosters their pioneering and entrepreneurial spirit. The funding for two new National Science Foundation Research Experiences for Undergraduates Sites further strengthens undergraduate research opportunities in molecular and cellular bioengineering, and in telecommunications.

Our dedication to excellence in education is backed by our commitment to attract exceptionally qualified and gifted faculty. Our strength in transportation systems will be further advanced under the leadership of Professor Hani S. Mahmassani, who joins the Clark School as the Charles A. Irish, Sr. Chair in Civil Engineering and director of the newly formed Maryland Transportation Initiative. Noted alumnus and entrepreneur Dr. Jeong Kim also joined us this year as Professor of the Practice. His expertise in telecommunications and insight in market trends makes him an excellent role model for Clark School students.

I hope this issue of E@M connects you with the activities and energy here in engineering at Maryland. As a leader in engineering education and a powerhouse of research, we are well-positioned to drive the next generation of technological advances. Our success will be further strengthened by the contributions and involvement of our alumni and friends. There are several ways you can become involved. First, you can join the Engineering Chapter of the Alumni Association (visit **www.eng.umd.edu/alumni** for more information) and participate in University activities. Second, during the Annual Fund drive this October, your participation is of great value as we strive to bring our performance in line with our peers. I urge you to support our critical mission and important endeavors.

Nariman Farvardin, *Professor and Dean*

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NASA Selects Clark School Faculty to Develop Future Access to Space

Faculty from the Clark School received a major award from NASA to establish one of seven NASA University Research, Engineering and Technology Institutes (URETI). The Clark School is leading the research and development related to third generation reusable launch vehicles, an area of long-term strategic interest to NASA.

"With the workforce shortage of the future staring us in the face, we are expanding our connection with the university community to perform research and development and to become a source of engineers and scientists interested in NASA career possibilities," says Michael Reischman, a former engineering school associate dean at Pennsylvania State University who now heads URETI efforts for NASA's Office of Aerospace Technology. "These grants demonstrate the level at which NASA wants to engage universities across the country in state-of-the-art research and development, recognizing that enhancing educational experiences of future researchers are as important to NASA as the research itself," he adds.

The primary role of each of the seven university-based institutes is to perform research and development while moving fundamental advances from scientific discovery to basic technology. The institutes also will provide support for undergraduate and graduate students, curriculum development, personnel exchange, and learning opportunities and training in advanced scientific and engineering concepts for the aerospace workforce.

First generation vehicles, the rockets now used to power the space shuttles, remain in current use by NASA, and second generation research is now underway. "We are looking to the Clark School to generate higher level thinking and to develop concepts that could lead us to the third generation of vehicles some 25 or more years from now," says Reischman.

The Clark School team is led by Mark Lewis, professor of aerospace engineering. His team members include department colleagues David Akin, Christopher Cadou, Darryll Pines, Norman Wereley and Kenneth Yu. Joining the team are mechanical engineering faculty Steven Buckley and Ashwani Gupta, Andre Marshall, fire protection engineering, and Carol Smidts, material and nuclear engineering.

"The institutes will stimulate lots of activities on campuses and will open a number of doors," says Reischman. "Students and faculty from different departments and even from different campuses may have the opportunity to work together in closer collaboration. We look to the institutes to generate a great deal of student excitement and to develop a framework for students to consider a future with NASA," he adds.

Each institute is initially funded with a $3 million annual budget over five years for a maximum of 10 years. Other academic institutions participating in the University of Maryland URETI include University of Michigan, University of Washington, North Carolina A&T and Johns Hopkins University Applied Physics Laboratory. ■

PHOTO COURTESY OF NASA

Clark School faculty will help develop the third generation of launch vehicles for NASA.

Gessow Rotorcraft Center Honored

The Alfred Gessow Rotorcraft Center received this year's Grover E. Bell Award from the American Helicopter Society for its pioneering contributions in smart structure technologies that successfully transitioned into full-scale helicopter systems. The Bell Award recognizes outstanding contributions to the field and fosters and encourages research and experimentation in helicopter development.

This year's award recognizes the successful completion of two major smart structures programs funded through the Department of Defense. Team members from the Clark School of Engineering's aerospace, mechanical engineering, materials engineering and electrical engineering departments along with faculty from the mechanical engineering department of University of Maryland Baltimore County were honored for their participation in a University Research Initiative (URI) grant from 1991 to 1996. From 1996 through this year, team members from the Clark School's aerospace and mechanical engineering departments, Pennsylvania State University and Cornell University successfully collaborated on a Multidisciplinary University Research Initiative (MURI) grant.

Both projects were sponsored by the Army Research Office and spurred an enormous growth of smart structure activities on the University of Maryland campus. ■

Transportation Center Director Garners Field's Highest Honor

PHILIP TARNOFF

PHILIP TARNOFF, director of the Center for Advanced Transportation Technology, has received the Theodore M. Matson Award for his significant contributions to the transportation profession.

The Matson Award is named in honor of Theodore M. Matson, a former director of the Bureau of Highway Traffic at Yale University and a vice president of the Institute of Transportation Engineers, which he co-founded. The award, made annually since 1957, recognizes outstanding contributions to the field of traffic engineering.

Tarnoff is currently conducting research in distance learning and intelligent transport systems and provides support to the Maryland State Highway Administration for their advanced traffic management system. He is also working on the development of a digital wireless network for the Washington, DC region for communications between law enforcement, emergency medical services and transportation vehicles and agencies.

Prior to joining the Clark School, he was president and founder of PB Farradyne Inc., overseeing many advanced technology projects including the development of an advanced traffic signal control system and the TRANSMIT system, a toll-tag based traffic surveillance system. ■

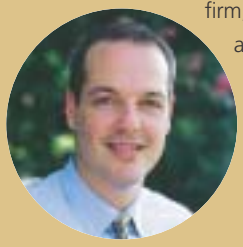
Clark School Names New Development Officers

LESLIE FORD WEBER

The External Relations Team of the Clark School recently named Leslie Ford Weber as director of development for strategic initiatives and Nelson G. Marban as director of development for individual giving.

Weber is coordinating the Clark School's corporate partnerships with a focus on securing funding for the Clark School's research initiatives identified within its strategic plan.

Most recently, Weber was a vice president and senior consulting associate for Grenzebach, Glier & Associates, a national fundraising consulting firm, where she advised clients in campaign planning and development activities. She received her bachelor's degree in communication from the University of Michigan and her master's degree in public policy from Georgetown.



NELSON G. MARBAN

Marban is focusing his efforts on solidifying and building relationships with alumni and friends of the Clark School. He will forge connections with many of the school's alumni and friends, encouraging their personal and professional involvement with the school and assisting them with their philanthropic goals.

Before joining the Clark School, Marban was director of development for the United Way of Miami-Dade in Miami, Florida, where he implemented $18 million in fundraising initiatives through major gifts and special events. He received his bachelor's degree in liberal studies from Barry University.

Ben Dyer Centennial Chair in Civil Engineering

Ben Dyer is well remembered by many engineering alumni and friends, not just as a great host for his annual Hickory Farm Bull Roast, but for his lifelong commitment to excellence as a professional civil engineer and for his support of the Urban Land Institute.

In 1990, through a series of gifts in the form of real estate including residences in Maryland and Florida, Ben and his wife, Nancy, established the Ben Dyer Centennial Chair in Civil Engineering. Through this life-estate planned gift, they were still able to maintain use of the residences during their lifetime.

BEN AND NANCY DYER

Ben died in 1995 and Nancy recently passed away. The proceeds of their gifts will now be transferred to the endowment to provide financial support for a distinguished professor of civil engineering.

Dyer received his bachelor of science degree from Maryland in civil engineering in 1931. ■

Faculty Secure Competitive Grants

Clark School faculty members successfully secured a number of highly competitive grants from the Department of Defense Multidisciplinary University Research Initiative (MURI) and the Multidisciplinary Research Initiative (MRI) Programs.

STUART MILNER, senior research scientist in the Institute for Systems Research, and professors of electrical and computer engineering Christopher Davis, Mark Shayman and Ray Liu, also of the Institute for Systems Research, received a $4.3 million Air Force MURI for Scalable Multilayer Control of Joint Battlespace Networks. This grant involves both hardware and software research aimed at building reliable, high-performance mobile wireless networks for industry. Cornell University and University of Illinois, Urbana-Champaign are collaborating on the project.

PATRICK O'SHEA, associate professor of electrical and computer engineering and director of the Institute for Research in Electronics and Applied Physics, has received $1.25 million per year for up to five years for his research in high-power, short pulse free-electron lasers. The grant, led by the Clark School in collaboration with the Naval Postgraduate School and the Science Applications International Corporation, is part of the High Energy Laser MRI. Sponsored by the Office of the Deputy Under Secretary of Defense for Science and Technology, the grant furthers basic science and engineering research and related education in lasers and optics.

GREG JACKSON, assistant professor of mechanical engineering, and Bryan Eichhorn, professor of chemistry and biochemistry, are the investigators for a MURI on Fundamental Chemistry and Physics of Direct-Electrochemical Oxidation (DECO) in Solid-Oxide Fuel Cells (SOFC). DECOs of hydrocarbons can potentially achieve many advantages of more conventional hydrogen-based fuel cell systems, including very high efficiencies and ultra-low emissions. The Colorado School of Mines and CalTech are collaborating on the project.

WILLIAM FOURNEY, professor and chair of aerospace engineering, and Jamie Cardena-Garcia, visiting professor of mechanical engineering, are the investigators in a MURI on Multifunctional Materials. Experimental tests will be conducted at the Clark School to determine both the structural properties of developed materials as well as the energetic output of the materials. The lead institution is Georgia Technical University.

RAMA CHELLAPPA, professor of electrical and computer engineering and Institute for Advanced Computer Studies, is the Clark School's principal investigator for a new Army Research Laboratory MURI on the Science of Land Target Spectral Signatures. The five-year, $5 million project will advance the understanding of the physics of hyperspectral signatures and discriminants for object detection and recognition. ■

Creating Research Experiences for Undergraduates

THE NATIONAL SCIENCE FOUNDATION has awarded two new Research Experiences for Undergraduates (REU) Sites to the Clark School of Engineering. The addition of these two programs complements the Clark School's already strong undergraduate research activities.

The Department of Chemical Engineering received $500,000 to establish an REU site in the area of molecular and cellular bioengineering with Timothy Barbari, professor and chairman of the department, serving as principal investigator and William Bentley, director, Engineering Research Center, serving as co-principal investigator.

The Department of Electrical and Computer Engineering received $1 million over five years to establish an REU site in telecommunications with Steve Marcus, professor and chairman of the department, serving as principal investigator and Ray Liu, professor, serving as co-principal investigator.

Through the REU sites, students learn first-hand how basic research is conducted. They participate in team-based, cross-disciplinary research that prepares them for graduate studies or professional careers. Each site welcomes up to 10 undergraduates from around the country who are assigned to specific research projects and work closely with faculty, post-doctoral fellows and graduate students.

Molecular and Cellular Bioengineering REU

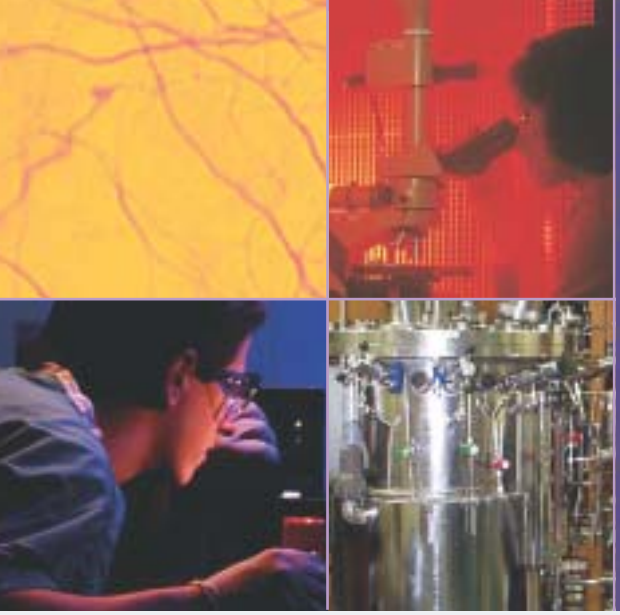
The REU site in molecular and cellular bioengineering involves a number of faculty members within the chemical engineering department as well as faculty in materials science, chemistry and biochemistry, mechanical engineering, electrical engineering, and the Center of Agricultural Biotechnology.

The Clark School's close proximity to the center of the biotechnology industry of Maryland and the willingness of many biotechnology companies to accept summer interns at their locations make the Clark School a particularly attractive location for an REU site. Students are exposed to state-of-the-art research, multidisciplinary research laboratories, research group meetings, and scientists/engineers from local industry and nearby institutions such as the National Institutes of Health and the Food and Drug Administration. To foster the connection between university research and industry, students visit two nearby biotechnology companies.

Telecommunications REU

Through the REU site in telecommunications, students participate with ongoing department research activities in wireless communications, broadband networking, multimedia, and signal processing. Students also attend weekly technical seminars and field trips to nearby companies and government facilities.

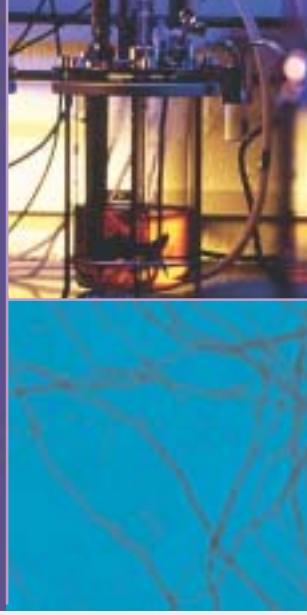
Students benefit from the Department of Electrical and Computer Engineering's strong research program and internationally recognized faculty in the broad field of telecommunications, including communication systems and theory, networking, signal processing, multimedia, information security, and neuromorphic engineering. ■



Nation's First Biomolecular Engineering Graduate Certificate

The Clark School of Engineering is launching the nation's first Biomolecular Engineering Graduate Certificate program this fall. Designed for scientists and engineers working in the biotechnology sector, the program is endorsed by many industry executives and manufacturing managers who foresee a growing demand for bioengineers.

This 12-credit graduate program focuses on applying engineering principles to biotechnology. Courses cover cellular and molecular bioengineering, advanced topics and experiments in biomolecular systems and bioseparation technology. For more information, go to www.enpm.umd.edu ■



Investigating the World Trade Center Collapse: An Update

A team of 25 of the nation's leading structural and fire protection engineers, including James A. Milke, associate professor of fire protection engineering, has concluded its investigation, and suggested that the World Trade Center (WTC) Towers could have remained standing indefinitely if a fire had not overwhelmed weakened structures. Representatives from the American Society of Civil Engineers and the Federal Emergency Management Agency completed the analysis this spring as part of a report on the collapse of the World Trade Centers.

According to the report, much of the jet fuel on board the hijacked planes that plowed into the Towers burned off in fireballs outside the buildings. Instead of causing the fires to burn at extremely high temperatures, as was widely speculated, the report suggests the role of the jet fuel was to ignite other combustible materials over several floors simultaneously. Those fires eventually weakened the structural steel, leading to the Towers' collapse.

"In early discussions, the thinking was the fires were ignited by the jet fuel. In reality, the jet fuel was consumed in the first few minutes following the plane crashes, but it served as an igniter of office furnishings, computers and other combustible materials, which ignited serious fires on several floors at the same time," says Milke.

The study also showed that adjacent WTC Building 7, which sustained no significant structural damage but collapsed on September 11 after burning uncontrolled for seven hours, was the first protected steel structure ever known to collapse solely due to fire. The team also found that some connections between the structural steel beams failed in the fires. This was most apparent in WTC Building 5, in the Twin Towers complex.

Coupled with the preliminary study, subsequent research could have long-term implications for high-rise design and construction, "This may signal a change in the industry," says Milke. He notes, "It may be that for every project we identify the 10 critical structural elements that are needed for the building to maintain the ability to support its load, recognizing that if one single structural element fails, such as a connection, it should not bring the entire building down."

Work will continue at the National Institute of Standards and Technology (NIST) and has prompted the introduction of legislation to accelerate the investigation of fires and other catastrophic events by providing the NIST with the coordination, oversight, research and evaluation responsibilities for such investigations. Once NIST finalizes a federal plan, the institute will launch a formal, two-year investigation of how the buildings performed.

"What we accomplished with our study relied largely on volunteer efforts," says Milke. "To properly understand what happens in a particular event, we need immediate access and the necessary financial resources to ensure a more timely and responsive review."

Frederick Mowrer, associate professor of fire protection engineering, also was involved in a study of the collapse of the Twin Towers. His study was supported by the National Science Foundation. Much of his effort studied the fireproofing of the steel bar joists supporting the floor. He has indicated that the fireproofing thickness of the joists should have been sufficient to support up to three hours of resistance. ■

PHOTO BY ANDREA BOOHER/ FEMA NEWS PHOTO

Five NSF Early CAREER Award Recipients Named

THIS PAST SPRING, FIVE JUNIOR FACULTY were recognized for their research through the prestigious Early CAREER Award from the National Science Foundation (NSF). The award is presented annually to junior faculty members who show promise in their research activities and demonstrate innovative ideas for education. Those chosen for CAREER Awards receive five years of funding for their research.

"We are fortunate to have attracted so many fine young researchers to the Clark School," says Nariman Farvardin, dean of Maryland's engineering program. "We are honored once again this year with a significant number of CAREER Award recipients."

Clark School of Engineering faculty selected to receive the early CAREER Award include:

- **Rajeev Barua,** assistant professor of electrical and computer engineering who holds a joint appointment with the Institute for Systems Research, for his research on how the design and software of embedded digital processors can be tailored cost effectively for the particular tasks the processor performs.

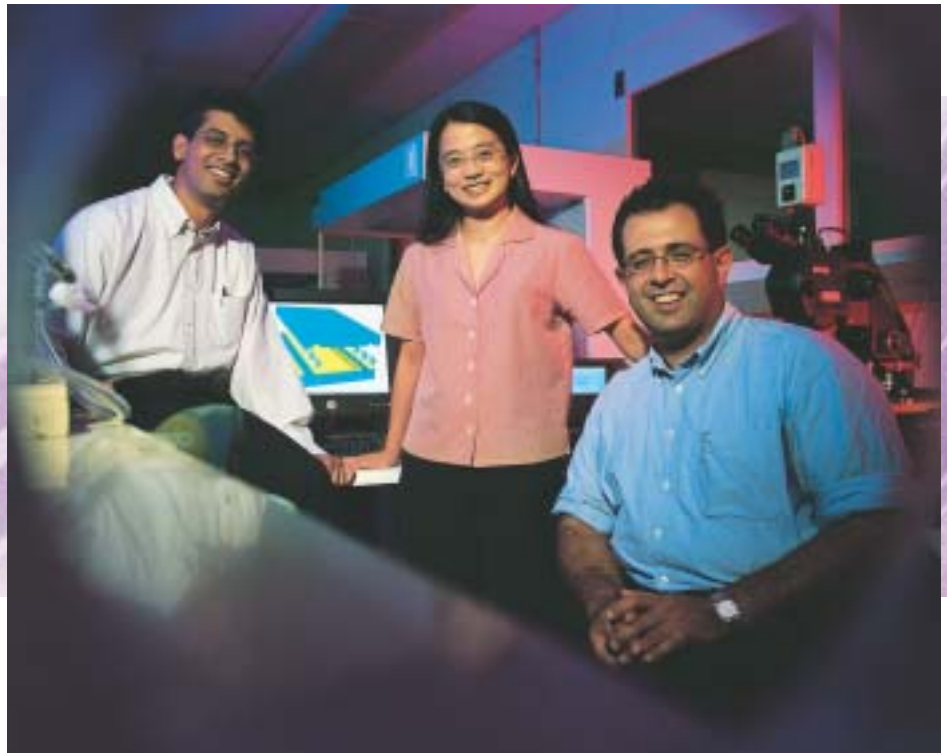
- **Jennifer G. Becker,** assistant professor of biological resources engineering, for her research on understanding competition among tetrachloroethene (PCE)-respiring organisms for energy sources, and how the contaminant itself influences the transformation. This information can be used to design PCE bioremediation strategies that result in the formation of environmentally benign, rather than toxic compounds.

- **Reza Ghodssi,** assistant professor of electrical and computer engineering with a joint appointment with the Institute for Systems Research, for his research on next-generation optical communication devices capable of wave length-division multiplexed switching that avoid the optical-electronic interconnects that compromise transmission speed. His goal is to establish a multidisciplinary research and educational activity by combining the three technical areas of micro-electro-mechanical systems, opto-electronics and microfabrication of III-V materials to develop an integrated optical microsystem.

- **Hubert Montas,** assistant professor of biological resources engineering, for his work on developing a unified and integrated program of research and teaching in engineering computation applied to biological resources systems. His focus is on unifying stochastic analysis and computation techniques across three biological resources engineering sub-disciplines: bioenvironmental, biomedical and ecological engineering.

- **Min Wu,** assistant professor of electrical and computer engineering who holds a joint appointment with the University of Maryland Institute for Advanced Computer Studies, for her research on the protection of content confidentiality via signal processing based encryption; the problems of multimedia data hiding; and the joint use of encryption and data hiding.

PHOTOGRAPHS BY JOHN T. CONSOLI



(Above) CAREER Award recipients Jennifer Becker and Hubert Montas.

(Right) Rajeev Barua, Min Wu and Reza Ghodssi garnered honors from NSF.

New Faculty

Kelly Clifton will join the faculty of civil and environmental engineering as assistant professor in January 2003. Clifton is currently an assistant professor of urban and regional planning at the University of Iowa. Her research interests are in transportation planning and policy, transportation, land use and urban form community development and food security. She received her Ph.D. in urban planning from the University of Texas at Austin.

Alison Flatau is a visiting associate professor in aerospace engineering. Her research interests include the development of magnetostrictive actuators for use in active vibration control and sonar applications. She received her Ph.D. in mechanical engineering from the University of Utah.

Maria Klapa is assistant professor of chemical engineering. Her research interests are in metabolic engineering, bioinformatics and the modeling of biological networks. Previously, she worked as a post-doctoral fellow at the Institute for Genomic Research in Rockville, Maryland. She received her Ph.D. in chemical engineering, with a specialty in metabolic engineering, from MIT.

Ricardo Medina is assistant professor of civil and environmental engineering. His research interests include earthquake engineering, structural reliability and risk assessment. He received his Ph.D. from Stanford University.

Elise Miller-Hooks is assistant professor of civil and environmental engineering. Her research interests include transportation network optimization, operations research methods and applications in transportation, computer algorithms, probabilistic networks, multiobjective decision-making, real-time route playing, emergency response services and hazardous material routing. She received her Ph.D. from the University of Texas at Austin.

Thomas Murphy is assistant professor of electrical and computer engineering. His primary research interest is in optical communications. He completed his dissertation on design, measurement and fabrication. Most recently, he worked at the MIT Lincoln Laboratory on ultrafast optical communication systems. He received his Ph.D. from MIT.

Ankur Srivastava is assistant professor of computer engineering. His research interests include very large scale integrated (VLSI) design, VLSI computer-aided design, embedded systems and higher level synthesis. He received a Ph.D. from the computer science department at the University of California at Los Angeles. ■

International Transportation Expert Joins the Clark School

DR. HANI S. MAHMASSANI joins the Clark School as the Charles A. Irish, Sr. Chair in Civil Engineering, and director of the newly formed Maryland Transportation Initiative.

Recognized as one of the most eminent academic scholars in the field of transportation systems, Mahmassani has made vital contributions to transportation systems analysis, network modeling, traffic behavior and simulation, advanced technologies and intelligent transportation systems. As the director of the Maryland Transportation Initiative, he will develop a multidisciplinary program that will unify and significantly expand our research and education programs in transportation systems.

"The addition of Dr. Mahmassani to our faculty strengthens our effort to become one of the strongest and most influential transportation systems education and research programs in the country," says Dean Nariman Farvardin.

Mahmassani will continue his research interests in dynamic traffic system management, network modeling and optimization, dynamics of user behavior and telematics, telecommunication-transportation interactions, large scale infrastructure systems, and real-time operation of logistics and distribution systems.

Prior to joining the University of Maryland, Mahmassani was the Adnan Abu-Ayyash Centennial Professor in Transportation Engineering in the Department of Civil Engineering, Professor of Management Science and Information Systems, and Director of the Advanced Institute of Transportation Infrastructure Engineering and Management at the University of Texas at Austin. With over 120 journal publications to his credit, he also is the immediate past president of the International Association of Travel Behaviour Research and a past president of the Transportation Science Section of the Institute for Operations Research and the Management Sciences.

Mahmassani received his Ph.D. from MIT, a master's from Purdue University and bachelor's from the University of Houston, all in Civil Engineering.

Professional Recognition and Honors

Arthur Bergles, fellow and research professor of mechanical engineering, was honored by the American Society of Heating, Refrigeration and Air Conditioning Engineers with the Louise and Bill Holladay Distinguished Fellow Award in recognition of his outstanding research and contributions to the growth of the society.

Avram Bar-Cohen, professor and chair of mechanical engineering, recently received the Outstanding Sustained Technical Contribution Award from the Components, Packaging and Manufacturing Technology Society for his contributions in the area of thermal management.

Inderjit Chopra, the Alfred Gessow Professor of Aerospace Engineering and director of the Alfred Gessow Rotorcraft Center, received the 2002 American Institute of Aeronautics Structures, Structural Dynamics and Materials Award. The lifetime achievement award honors outstanding technical and scientific contributions to the field.

Carol Espy-Wilson, associate professor of electrical and computer engineering and Institute for Systems Research, is participating in a $1.5 million grant from the National Institutes of Health's National Institute on Deafness and Other Communication Disorders. The grant supports research on Acoustics of Vocal Tract Shapes of Liquids.

James Milke, **Frederick Mowrer** and **Jose Torero**, associate professors of fire protection engineering, received the 2002 Harry C. Bigglestone Award for Excellence in Communication of Fire Protection Concepts.

Reinhard Radermacher, professor of mechanical engineering, received the Distinguished Service Award from the American Society of Heating, Refrigeration and Air Conditioning Engineers for his service to the society.

Jan V. Sengers, a founding member of the Center for Environmental Energy Engineering and research professor of the Institute of Physical Science and Technology, has been elected as academician emeritus of the International Academy of Refrigeration of the Russian Federation.

Norman Wereley, associate professor of aerospace engineering, received an Outstanding Achievement Award from the National Science Foundation for his work on Magneto-Rheological Fluids for Sensor Actuator Systems. ■

Trigen Partnership Explores Future Energy Efficiencies

Trigen-Cinergy Solutions of College Park, LLC has established a $2 million Education Fund to support energy conversion education and research at the Clark School of Engineering. The fund will support two graduate fellowships and up to eight undergraduate scholarships annually.

The graduate fellows will focus on research in energy conversion using both the Center for Environmental Energy Engineering (CEEE) and the Trigen facilities.

Undergraduate students in their junior and senior years will study courses such as Environmental Engineering (Cooling Heating and Power Systems), Alternative Energy Systems, Energy and Environment, and Energy Conversion. Students also will participate in one or more senior-level energy conversion course, and a Trigen Special Project Class that provides additional opportunities to explore current issues in the field.

The University of Maryland, College Park recently entered into a contract with Trigen-Cinergy Solutions to undertake a multi-million dollar project to increase energy efficiency on campus and decrease pollution in the process. The project will position a large cogeneration plant, in place of the current heating plant, that uses one fuel source —natural gas— to generate electricity and steam used for heating and cooling, resulting in energy and cost efficiencies.

"When we were awarded the bid on this project," says Charles Abbott, president of Trigen-Baltimore Energy Corporation, a local operating branch of Trigen Energy Corporation and the parent company of Trigen-Cinergy Solutions, "it seemed a logical step to invest in a program with the university's school of engineering to encourage more research and development in using thermal energy efficiently, as well as providing students with hands-on experiences in the operation of such facilities."

At the same time, Trigen-Cinergy Solutions will tap into the expertise of the Clark School and its CEEE. Directed by Mechanical Engineering Professor Reinhard Radermacher, the center's mission is to educate the next generation of engineering professionals in the field of energy conversion and to foster a

The Chesapeake Building houses the state-of-the-art campus research facility for integrated cooling, heating and power systems.

Clark School students benefit from research and coursework in energy conversion through the Trigen-Cinergy Solutions Education Fund.

PHOTOGRAPHS BY JOHN T. CONSOLI

number of consortia that provides the exchange of research and education, and technology transfer in environmentally-acceptable, economically-feasible distributed energy conversion systems.

Radermacher developed the CHP Integration Test Facility that uses the Chesapeake Building on campus as a research facility for building-sized integrated cooling, heating and power systems. This system is a small scale version of what Trigen will accomplish for the entire campus.

"Roughly 67 percent of the energy contained in the fuel for electrical generation is rejected as waste heat into the environment," explains Radermacher. "This waste heat, however, can be recovered and then used for air conditioning, heating, humidity control and other usable forms of energy. Through this process, the average energy efficiency can increase up to 33 percent for a conventional system to as high as 70 percent for an integrated energy system."

The Chesapeake Building is considered "ahead" of most state-of-the art facilities, and places the university's expertise on the leading edge. With national attention increasingly focused on energy efficiency, the vision of the Department of Energy for the Year 2020 is for the system of the Chesapeake Building to become the "the system of choice." This new system is an important capability for the nation to have at its disposal.

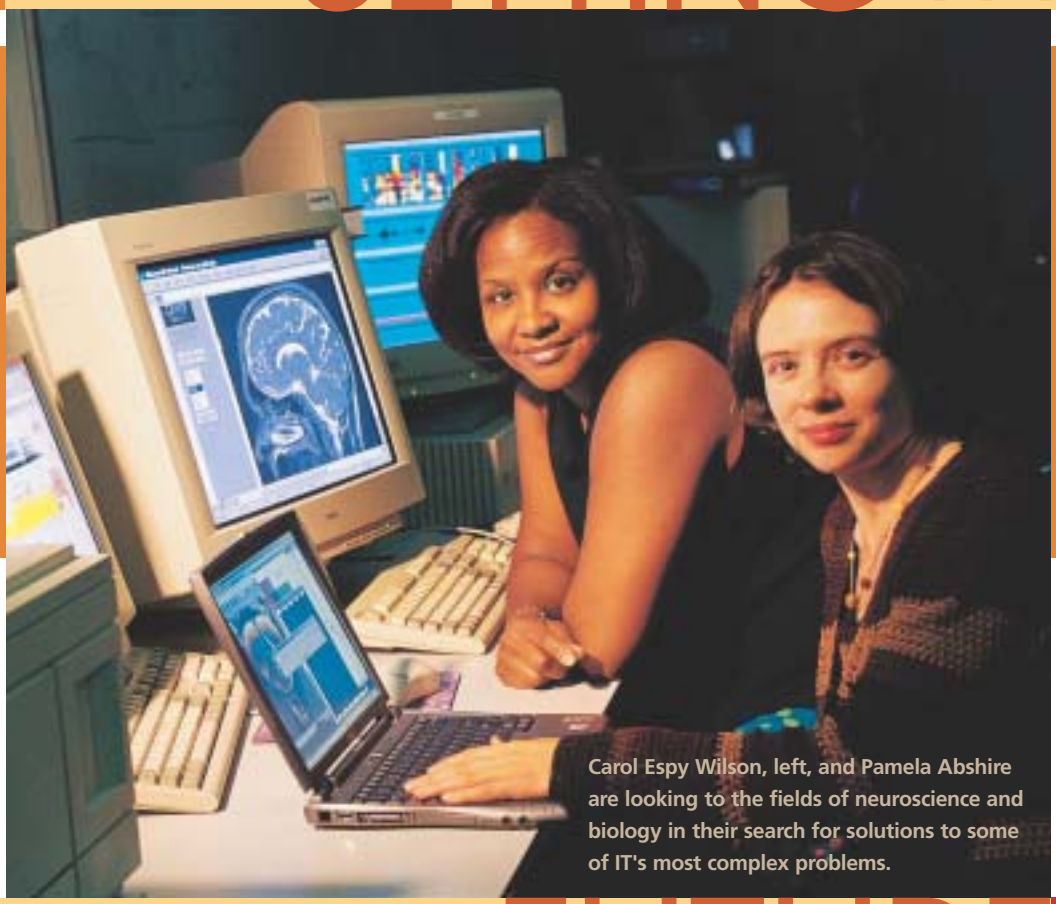
The partnership between Trigen-Cinergy and the CEEE will yield enormous benefits to all parties involved. The Trigen-Cinergy Educational Fund is a model program since it provides not only support for student education but fosters a unique educational experience in their state-of-the-art, commercial facilities, right here on the College Park campus. Abbott added that "we find that there are relatively few training grounds for engineers in this area. We thought about how we could develop talent for an industry with ever-expanding needs."

As one of the newest members of the CEEE Consortium, Trigen-Cinergy can influence new directions in research, gain access to results and intellectual property, participate in networking opportunities with other sponsors, contribute to exchanges with scientists and engineers, and utilize a number of laboratories and facilities at the Clark School. "The CHP Consortium is a cooperative effort aimed at optimizing energy conversion systems to achieve the lowest operating costs and emissions," says Radermacher, adding that "the project work that Trigen-Cinergy and CEEE will undertake together spans the entire range of capabilities for which CHP technology is employed."

Remembering Bill Crentz

ON JUNE 16, 2002, our good friend, William (Bill) Crentz, passed away. He was a true friend of the university and the School of Engineering. He will always be remembered for his distinguished career and interests in coal and energy research, and through the endowment of the William Crentz Chair in Energy Research. Bill received his bachelor's degree in 1932, and a year later, his master of science in what was then called industrial chemistry.

INFORMATION TECHNOLOGY: SETTING THE PACE FOR THE FUTURE



Carol Espy Wilson, left, and Pamela Abshire are looking to the fields of neuroscience and biology in their search for solutions to some of IT's most complex problems.

Story by Michaele Weissman ■ Photography by John T. Consoli

Ray Liu is helping to build a more secure future through his research. He is working to protect and secure how information is transmitted.

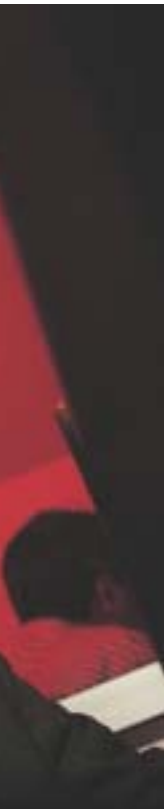


The boom and bust days of the tech industry are shaking the economy, but don't count information technology (IT) out just yet. Despite the continuing impact of September 11 and the economic downturn, there are many who remain optimistic about the long-term outlook for IT.

According to alumni and Clark School faculty in the department of electrical and computer engineering and in the Institute for Systems Research, IT research and new business opportunities are emerging in four areas: the commercial application of security breakthroughs; a wave of wireless innovations; enhanced sophistication of computer hardware and accompanying hardware-software connections; and the intersection of information technology with biotechnology.

While discovery continues at an accelerated pace, many products may not reach the market quite as fast as they did in the late 1990s. Still, good ideas continue to move through the entrepreneurial pipeline, despite the recent spate of Wall Street scandals, says Steve Walker, '68, founder of Walker Ventures, an early-stage venture capital fund.

He notes that in recent years many companies would have rushed to make an initial public offering, but this sense of urgency has calmed. "Now the point is to grow a sound company, expecting that eventually it will be acquired," notes Walker.



FOCUS ON SECURITY

"I am excited about the number of really interesting ideas that have to do with information security," Walker says, citing as a prime example, a software company that prevents security breaches when hand held computers are plugged into personal computers or computer networks.

In recent months, however, some of the hottest IT activity has moved from the business sector to university and government laboratories where research expenditures remain high, as the war on terrorism and homeland security spurs new infusions of federal spending.

Ramesh Rao, '82, a professor of electrical and computer engineering at the University of California at San Diego, explains that in response to the events of September 11, universities are researching new applications of previously developed technologies. Rao directs the San Diego division of the California Institute for Telecommunications and Information Technology, an unprecedented $300 million, public/private IT initiative focused on deploying smart sensors in bridges, roads, waterways and sewage treatment plants. The institute was established to help the state of California maintain its leadership in the telecommunications and IT marketplace. "A lot of technology has evolved in the past 10 years that is very pertinent to homeland security, although previously not directly driven by it. In response, universities are now re-examining their research portfolios," he states. Dean Nariman Farvardin concurs with Rao's assessment, adding that, "The total amount of money for research is increasing, but the number of researchers is not. You will begin to see that acquiring research funding, so long as you're in the right area, is not difficult, and may even be easier than before."

Rao believes the Clark School stands to benefit from the heightened focus on national security. College Park, he points out, "is uniquely privileged" to be located near Washington, DC, the Department of Defense, the National Security Agency and other leading federal agencies.

Indeed, the Clark School faculty's expertise and research initiatives are receiving funds in this critical area, and they are playing an important and critical role in helping to build a more secure future. Professor Ray Liu, for example, is working with algorithms to protect and secure packets of information during transmission. He develops coding schemes that insert "fingerprints" or "watermarks" on information to identify intruders. Liu explains that even though an adversary might try to remove a fingerprint to read classified material without detection, his team has developed a tracking technology that guarantees they will be identified.

Professor Mark Shayman, a specialist in network control, is developing strategies to prevent computer hackers from causing communications networks to crash. Shayman cites a number of instances where networks have become unstable due to unintentional trigger events, such as a defect introduced through a software upgrade. "While it is impossible to develop countermeasures for the unknown, it may be possible to develop control mechanisms that prevent initially localized failures from leading to widespread network outages," says Shayman. He adds that it is possible to specify a relatively small set of generic propagation mechanisms, those mechanisms that permit failures to spread from one switch or router to other nodes in the network. "By

identifying these propagation mechanisms and developing countermeasures for each of them, it would be possible to prevent networks from crashing even if the specific trigger events and defects are unknown," offers Shayman.

THE WIRELESS WAVE

The Clark School's long-standing strength in wireless networks, signal processing, pattern recognition and motion detection are also helping to address many of the nation's most urgent security needs.

At the Center for Satellite and Hybrid Communication Networks, part of the Institute for Systems Research, Director and Lockheed Martin Chair in Systems Engineering John Baras reports, "We have an ongoing $7 million, multi-disciplinary, and multi-sponsor program studying information security in wireless environments."

His team is investigating methods for on-line monitoring of wireless networks to discover, for example, attacks to the networks as early as possible and to respond to these attacks effectively and rapidly. "We are investigating signal processing methods that can protect the wireless medium—the air—from attackers or illegal listeners," says Baras. What is most exciting for Baras is that inspiration for his research on computer viruses draws on how the human immune system responds to a virus and defends itself. That comparison assists him in developing the algorithms used to defend against computer viruses.

The reach of wireless networks extend far beyond security applications. Baras feels certain wireless broadband "is going to be another earthquake as big as the personal computer or the Internet." What Baras calls "BWI: the broadband wireless infrastructure," is one of the main focuses of the center and of his own research program. He and his colleagues are creating hybrid wireless networks that combine wireless with existing wireline, fiber, satellite and laser technologies to create networks with science fiction-like capabilities. Hybrids, they expect, will one day enable subscribers to access and manage information—without clumsy cables and keyboards—from the Internet, personal computers, workstations and from the tiny computers embedded in home appliances. All of these devices will be connected via a broadband wireless network with speeds of at least 100 million bits per second. "Voice activation of computers and other appliances on these networks will or can be much quicker, making access easier and more efficient," Baras explains.

The hybrid wireless network may also be less expensive than current systems. "With wired technology, you pay for the line whether you use it or not," Baras adds. "With wireless, if you don't use the bandwidth, it can be allocated to someone else."

Silicon Valley entrepreneur Brian Hinman '82, agrees that wireless broadband is the next new thing. Hinman made his mark in teleconferencing as the founder of PictureTel Corp., which developed the world's first real-time implementation of motion compensation and transform coding of video images. His new company, 2Wire, Inc., manufactures networking devices that distribute broadband content throughout the home. "The only consumer market growing faster is for DVD players—and that's the fastest of all time," Hinman points out.

Ted Smith '53, founder of FileNET, one of the world's leading providers of content management software solutions, predicts a rosy future for wireless products. Smith, a former Entrepreneur of the Year in Southern California, notes a great future for a router that facilitates wireless connections. "You can take your laptop on a trip or stay at a hotel without a jack and still have a continuous, fast connection at an acceptable cost," he says.

Faculty and graduate students at the Clark School are currently working on dozens of solutions designed to facilitate the wireless revolution, but few compare with the theatrics of the laser-powered optical wireless link of Professor Chris Davis. His technology can direct a laser beam to an office 100 yards away where a photo receiver detects the beam of light and extracts data from it. Davis' research can help solve the expensive fiber optic "last mile problem" of connecting every house and building to the wireless network.

"Lasers are ideal for transmitting information short distances," Davis indicates. "You can operate from a fiber source on a pole or street lamp and shoot the laser into nearby buildings." These blasts of light operate at very high speeds, delivering gigabits of information per second and doing it relatively cheaply. Lasers, however, have trouble transmitting in inclement weather, and that's where the flexibility of the hybrid network pays off— in poor conditions the network can temporarily switch from broadband to radio frequency.

HARDWARE IS HOT

On the computing side of information technology, industry professionals are becoming excited, once again, but this time about performance improvements. Recently, software ruled in both the research and commercial realms. Now, a whole new generation of computer scientists and engineers are examining the role of hardware, software and the hardware-software interface.

Professor Shuvra Bhattacharyya is focusing on both hardware and software in an effort to design embedded computers implanted in automobiles, airliners and hundreds of appliances that will last longer, use less power and cost less. "My research tries to capture how you streamline the hardware and software relating to the signal process," he explains. "There are a lot of different metrics to worry about, such as power consumption, the effects of cooling and heat breakdown and the rate the battery is drained."

Battacharvya's work is moving quickly from the research laboratory to specific industry applications, thanks to support from Agilent Technlogies, a 1999 spin-off from the Hewlett-Packard Company that is on the leading edge of major trends in communications and life sciences.

It's the fundamentals of the interface between hardware and software that are at the core of the research conducted by Professor Bruce Jacob. "We have this interface that was created in the 1960s," he asserts. "Since then, everything else in computers has changed—the speed, the complexity, the software—but the set of rules that hardware follows in executing software has remained the same."

As an alternative to expensive fiber optic connections, Chris Davis is testing the use of lasers to deliver data cost effectively over short distances.

John Baras directs a multi-million dollar, multi-disciplinary program studying information security in wireless environments.

He believes that by changing some of the functions of the hardware, he can increase the speed of computing without using more power. "Software does high-level tasks, such as sorting things and making decisions," he adds. "It operates sequentially."

"Hardware does low level tasks such as adding and multiplying, and it accomplishes these tasks in parallel," Jacob elaborates. "Why not add more intelligence to hardware to take advantage of its parallel processing ability?" Jacob's preliminary work has demonstrated performance improvements of 20 percent and a 25 percent reduction in energy consumption. "This means that your satellite or sensor system can do more, cost less to build and run longer."

Professor Donald Yeung is also asking questions about hardware and the inability of computer memory to keep pace with the exponential increase in processor speed. "We've spent so much time improving processor speeds to maximize performance, yet for many important applications, performance is limited by memory," Yeung points out.

He is looking at an approach called "pre-execution" that enables computers to behave as if they had more memory. The hardware is configured so that the application or program can execute multiple sets of instructions simultaneously, jumping ahead to complete future portions of a given task. For example, you can pre-fetch data now for a later point of time in the program—this will allow the processor to compensate for the slow memory.

Yeung is also experimenting with "multithreading," which leverages the processor's speed to run more than one program at the same time. He is exploring ways to use the extra processing power to make a single program run faster. Solving the memory problem with today's faster than ever machine speed, will enable researchers to discover new applications to meet future needs from playing real-time video to speech recognition in voice-activated security devices or your local automated teller machine.

BIOTECHNOLOGY MEETS INFORMATION TECHNOLOGY

In seeking solutions for some of IT's most complex problems, researchers are looking to the fields of biology and neuroscience in their search for solutions.

Professor Carol Espy-Wilson is drawing on the expertise of physicists, neuroscientists, speech scientists, acoustic specialists and phoneticians to create a generation of speaker independent software for voice activation that can comprehend speech as it is normally spoken by humans, not computers. With the advent of voice-activated computers that are keyboard or mouse-free, Espy-Wilson is trying to perfect computer recognition of speech in the same way humans recognize it.

She is studying the "bottom-up processing" of how human beings ignore all the individual differences in speech to extract linguistic information from what they hear. Speech, says Espy-Wilson, functions as a special kind of signal. "We created two systems to analyze this signal," she notes. "The first system turns the signal into other wave forms that serve as input to the second system where the wave patterns are discerned." She asserts that the first system is key, because all the extra-linguistic information is removed there.

Espy-Wilson's approach is very different from the one currently used in commercial speech recognition systems. "Those systems are using sophisticated statistical processing that makes assumptions that are not true for speech. We are trying to do things differently, the way the ear and brain do," she indicates. The effort appears to be paying off as Espy-Wilson's results show her system to be much more accurate and speaker independent than anything commercially available today.

Professor Pamela Abshire also takes lessons from biology and nature, but this time it's to design energy efficient hardware that performs better without requiring greater resources. Abshire, with a background in physics, engineering and biology, applies tools from each of these disciplines to analyze the inherent tradeoffs between information and power.

"Neurons do incredibly sophisticated processing much faster and more efficiently than computers do with existing strategies for tasks such as hearing or vision," she explains. "In biology, the distinction between computation and communication disintegrates. A lot of the computation occurs as a result of having the right signal in the right place. Computation can be broken down into small communication tasks, so we can begin to understand efficiency of complex computations by studying those simpler communications."

Abshire focuses on this connection, modeling and measuring how information moves through physical communication channels. Her eventual goal is to create integrated circuits in which computation and communication merge, just as they do in nature. Abshire looks forward to the not-so-distant future when autonomous sensor-actuators—small smart systems—will monitor and safeguard the health of our environment, our food and

even our own bodies.

These shared interests in what Professor Ralph Etienne-Cummings calls "neuromorphic" engineering motivated his decision to join the Clark School last year.

Etienne-Cummings designs new sensing and robotic systems employing the neuromorphic approach—abstracting engineering principals from the human brain and nervous system. His robots are meant to interact with the environment not as machines do, but as people and animals do. "A video camera is a dumb sensor," Etienne-Cummings explains. "Even at the sensory level, animals and humans do a lot of complex information processing, deciding what is relevant, so you have an information filter right at the point of data collection."

His robots possess this sort of sensory-level filter, making them of great interest to police, the military and other agencies involved in security and crime detection. Placed at the border, a device like this could discriminate in real time between the movement of an animal and that of a potential human interloper and would know when to alert the boarder guard. Though still in its "infancy," Etienne-Cummings is working with a small company that is close to commercializing some of his research.

Clearly, the fuel that provided explosive growth in the tech industry just a few years ago has not been abandoned. Instead, IT is driving a new wave of innovations—from greater efficiencies in our homes to increased security in our world. Leading the charge are researchers in universities and in government laboratories. Along with them, Clark School of Engineering faculty are anticipating and responding to changing market needs with discoveries that promise to take us to technology's newest frontier.

Michaele Weissman is a free-lance writer who lives and works in Chevy Chase, Maryland. Her work has appeared in many national publications, including The Wall Street Journal *and* The New York Times. *She has also authored two books.*

JEONG H. KIM BRINGS BUSINESS ACUMEN TO THE CLASSROOM

DR. JEONG H. KIM joins the Clark School of Engineering as Professor of the Practice with a joint appointment in two departments: electrical and computer engineering and materials and nuclear engineering.

In this position, Kim becomes engaged in the life of the college, conducting research, teaching classes and seminars, supervising student projects and thesis work, and interacting with students in various programs related to technology entrepreneurship.

The rank of Professor of the Practice recognizes the impact of Kim's contributions and prominence in the practice of engineering. His technical expertise in communications, wireless technologies, and broadband optical systems and devices, coupled with his understanding of market trends makes him an excellent role model for our students.

Kim has a distinguished career as an engineering entrepreneur. In 1992, he founded a successful telecommunications company, Yurie Systems, and pioneered the development of a revolutionary Asynchronous Transfer Mode Switch (ATM) for wireless applications. The ATM switch became key in the modernization of telecommunications systems for today's digital market. Lucent Technologies acquired Yurie Systems in 1998, and Kim assumed a senior leadership position with Lucent. He played a pivotal role in reshaping their optical communications division through a major restructuring of that division.

Kim's early career included work in computer design, satellite systems designs and data communications, and seven years as a Nuclear Submarine Officer in the U. S. Navy. He received a Ph.D. in reliability engineering from the University of Maryland in 1991, and holds a master's in technical management, and bachelor degrees in electrical engineering and computer science from Johns Hopkins University.

Kim shared his thoughts with us on the future of information technology and his new appointment.

What do you see as the future of information technology?
"Wireless broadband will become very important. Broadband is a resource like electricity or water that must be made available at low cost."

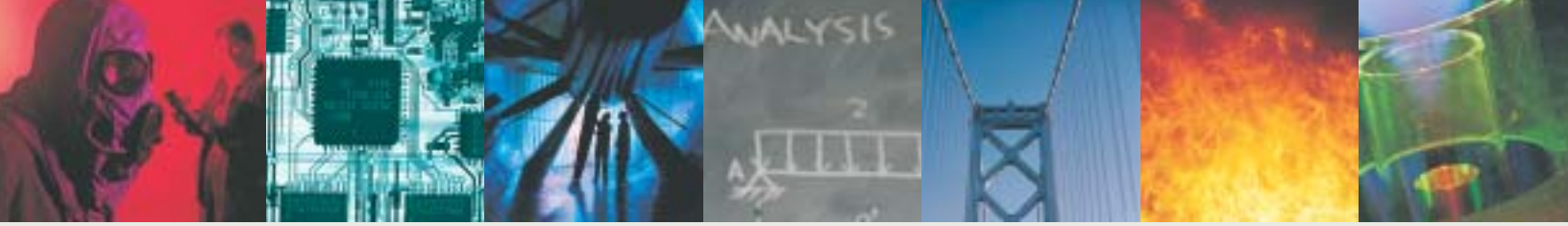
Who will lead the market in the broadband business?
"You can compare the wireless broadband business to the bottled water business. The profit in wireless, as in bottled water, will belong to those who find original ways to package and sell the commodity. The company that finds a way to be more innovative, more service-oriented and more focused on research and development will lead the market."

When will this happen?
"You will probably see incremental improvements, and for many users, wireless broadband may never be fast enough. It is similar to the wireless cell phone, it is now better than it was due to incremental improvements."

What motivated your involvement with the Clark School?
"Former Dean Bill Destler and now Dean Nariman Farvardin truly want to build an engineering program of national prominence. I am a builder and they are builders and it is great to be a part of all they are doing."

How can you best guide students?
"I want to help future engineers think about the way research can be applied to the marketplace. I want to encourage them to look at applications as they are learning the engineering principles."

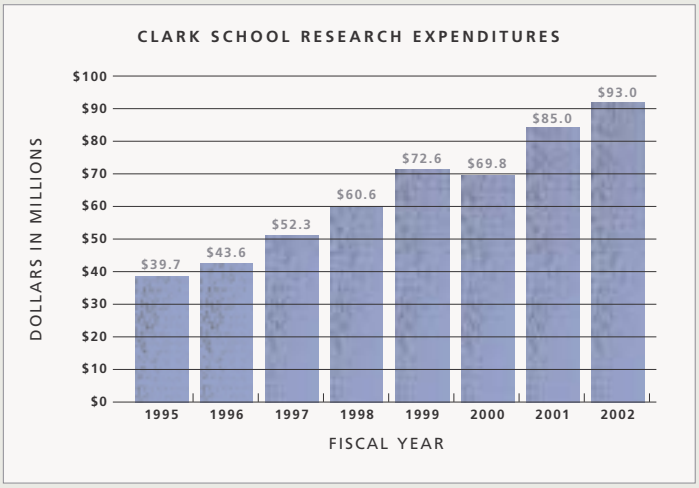
Is there another business venture in your future?
"I am a young man. I am still focused on business and my work with students in the classroom is a good complement to my business interests."



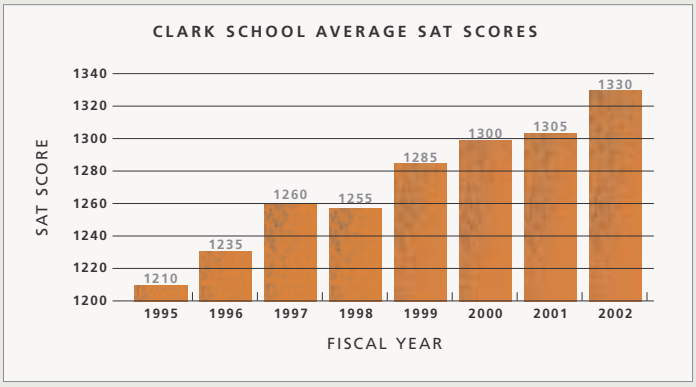
Building a Powerhouse of Engineering Research and Education

BY MANY MEASURES, the Clark School is one of the nation's leading engineering schools. According to *U.S. News and World Report*, it earns its place among the top 20 engineering graduate programs in the country. The success of the Clark School can be attributed to: an excellent teaching and research faculty; the recruitment of the best and brightest students; significant infusion of research funding; impact on economic development at the local, regional and national levels; and a commitment to conduct work that benefits future generations.

"Energetic, ambitious, and talented academics like to be associated with an environment that responds to their energy level and supports new initiatives," says Dean Nariman Farvardin. "If you have an intellectually stimulating environment combined with dynamic faculty and administrators, you can accomplish many goals."



The Clark School has recently recruited a number of outstanding faculty members. These new faculty enable the college to strengthen its education and research program, and to move into areas of new research. Total faculty have climbed to 200 and include seven members of the National Academy of Engineering, over 50 recipients of the National Science Foundation (NSF) early career awards, and 100 fellows of various professional societies.



The faculty is extremely successful in forming cross-disciplinary coalitions and competing for major block grants. Research expenditures have soared over the last seven years making the Clark School a powerhouse for research endeavors. From 1995 to 2002, research expenditures jumped from $39.7 to $93 million, placing the College among the top 10 in the nation. Farvardin cites good decisions made in the last decade to move into new research areas in which significant funding opportunities now exist.

The Clark School is particularly successful in responding to industry needs, notes Malcolm O'Neill, chief technical officer for Lockheed Martin, and member of the college's Engineering Board of Visitors. "They understand better than most universities what is happening in industry today, and what is needed in terms of engineering research curricula and understanding of systems integration," explains O'Neill.

"Based on a strong sense of energy and forward momentum in the university, we are perceived to be a rapidly rising university," says Farvardin. Reputation of the faculty, increased visibility of the university, and enhanced recruitment activities have yielded an influx of enormously talented and diverse students. Within the last seven years, average Scholastic Aptitude Test scores for incoming freshmen rose significantly from 1210 to 1330, and the analytical and quantitative Graduate Record Examination scores rose some 73 points to an average of 1480.

"What differentiates our students is their ability to interact in a complex team environment with individuals of different technical and cultural backgrounds, their awareness of global issues, their communication skills and their leadership abilities," cites Farvardin.

All of those qualities are of particular importance to industry, adds O'Neill, who sees the Clark School as the preeminent supplier of engineering talent for the region. He also notes that the broad training these students receive prepares them well to quickly apply their skills to the workplace.

New initiatives are constantly underway to create the best possible educational experience for students. This fall, a new graduate program in bioengineering begins, and research opportunities for undergraduates are abundant across all departments. NSF recently awarded two new Research Experiences for Undergraduate sites that expand research opportunities in molecular and cell bioengineering, and in telecommunications. Exciting new courses in biology, public policy and systems engineering also will be offered in the near future.

Dedicated resources maintain an infrastructure to support this superior level of study and research. The Jeong H. Kim Engineering and Applied Sciences building, which will house some of the most sophisticated engineering research and educational laboratories in the nation, along with enhancements to existing buildings, laboratories and computer networks ensure the very latest technology tools to faculty, staff and students.

"The Clark School is a wonderful melting pot from which to draw. They are really working to prepare engineers for the future needs of the industry," adds O'Neill.

Clark School Grows New Breed of Entrepreneurs

Economic downturns may actually have upsides for aspiring entrepreneurs. "This type of economy requires more thorough homework and preparation to obtain funding and forces entrepreneurs to take a more realistic approach to starting a business," says David Barbe, professor and executive director of the Engineering Research Center.

Barbe is giving his students the tools they need to bring their ideas and products to market through a new engineering course offered for the first time this past spring. The Fundamentals of Technology Startup Ventures, the first such graduate course offered at the Clark School, was fully subscribed for its inaugural semester.

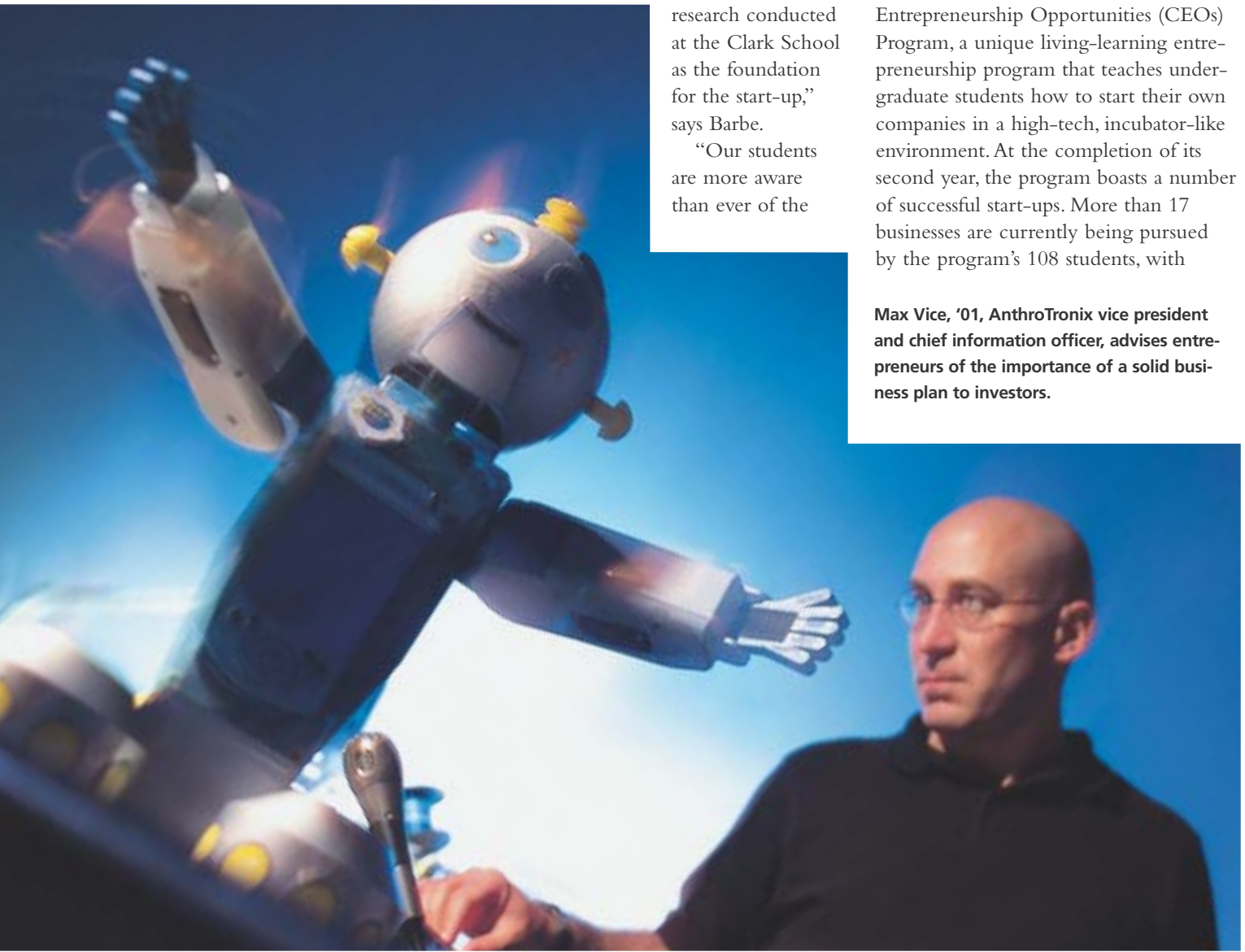
"This was not a textbook course," says Barbe. "It was a very hands-on, practical course that gave students basic knowledge about the business world and introduced them to the concepts and terminology needed to build a successful company and to interact with investors," he adds. The course included guest lectures and culminated in a group project in which student teams submitted written business plans and subsequently presented the plans to the class. Barbe noted that many of the plans submitted hold market potential.

"We recognized a need for students to know more about how to start companies, using the research conducted at the Clark School as the foundation for the start-up," says Barbe.

"Our students are more aware than ever of the different career paths they may take," he adds. "From high school on, they read about and watch media stories about entrepreneurs and how their products are making an impact on society," says Barbe, who started his own company that offered continuing education programs on new technologies some 25 years ago.

As an offshoot of the course, a new student-run organization targeted to any graduate student majoring in engineering or other technical disciplines will be launched this fall. The Technology Ventures Club is yet another Clark School initiative to meet the growing entrepreneurial needs of students.

Engineering entrepreneurs also are taking advantage of the Hinman Campus Entrepreneurship Opportunities (CEOs) Program, a unique living-learning entrepreneurship program that teaches undergraduate students how to start their own companies in a high-tech, incubator-like environment. At the completion of its second year, the program boasts a number of successful start-ups. More than 17 businesses are currently being pursued by the program's 108 students, with



Max Vice, '01, AnthroTronix vice president and chief information officer, advises entrepreneurs of the importance of a solid business plan to investors.

PHOTOGRAPHS BY JOHN T. CONSOLI

AnthroTronix robots help children increase their physical mobility, literacy skills and independence in learning.

seven of those companies already recording profits.

Participants in the Hinman CEOs Program receive an early introduction to entrepreneurship through an annual fall Boot Camp, a one-day primer on starting a company. Additionally, each fall, entries are solicited for the program's Business Plan Competition. Current and former students who graduated in the last five years and play a material role in their companies are qualified to enter their companies in the competition.

The highly successful second annual business plan competition was conducted this spring in conjunction with the Technology Advancement Program (TAP), an incubator facility offering space and support services for early-stage companies engaged in developing technology-based products or services with commercial potential.

AnthroTronix, Inc., which participates in TAP, captured the top prize of $15,000 in the small business category. AnthroTronix was selected for its creation of a robotic technology that combines biomedical, electromechanical and software engineering in the creation of therapeutic toys to increase a child's physical mobility as well as their literacy skills and independence. JesterBot™ and CosmoBot™ are controlled by sensors worn by the child. The robot mimics the gestures made by the child's physical motion or voice. This interaction is tracked by a web-based interface that allows the therapist, parent or teacher to monitor the child's therapy progress and gives the patient the ability to complete therapy from their home.

"This award validates our company as a start-up and demonstrates to potential investors, to government contractors and to members of the press that we have solid ideas and a strong business plan," says AnthroTronix vice president and chief information officer Jack Maxwell Vice, computer science, '01. "Our business plan assists us with the management of our next generation of robots."

Vice notes, "It is so easy to get wrapped up in the technology, but you really need a strong business plan to demonstrate that you can take the technology to market."

Cori Lathan, president and chief executive officer of AnthroTronix, was recently named one of the world's 100 Top Young Innovators by *Technology Review*, MIT's Magazine of Innovation, and received the *Maryland Daily Record* 2002 Top Innovator of the Year award. Chris Edwards ME '02 serves as one of the lead designers for the robot.

Fischell Named to Innovation Hall of Fame

This past spring, noted engineer, physicist, inventor and entrepreneur Robert E. Fischell was inducted into the A. James Clark School Innovation Hall of Fame.

Created in 1985 by alumnus Stan Berman '50, the Innovation Hall of Fame recognizes Clark School alumni and faculty who have made significant technical contributions to society through engineering innovation.

Fischell was recognized for his career-long work in developing lifesaving medical devices and systems. A prolific inventor with nearly 200 U. S. and international patents in his name, his work has resulted in a large variety of medical device improvements and new technologies, including the first implantable insulin pump, the rechargeable pacemaker and highly flexible stents for placement in coronary arteries. Fischell excels at commercializing his most promising inventions, then forms companies to develop and refine his technologies and make them available to major medical companies.

He is currently chairman of Fischell Biomedical, LLC and Angel Medical Systems, Inc. A member of the National Academy of Engineering, Fischell received an honorary doctor of science degree from the university in 1996. He is a director of the University of Maryland Foundation and serves on the University of Maryland College Park Foundation Trustees Board and on the Board of Visitors of both the Clark School and the College of Mathematics and Physical Sciences. Last fall, Fischell established a fellowship program to give graduate students an opportunity to create and design new medical devices or systems.

Nominate the Next Candidate

Nominations are currently being accepted for the 2003 Innovation Hall of Fame. We encourage you to nominate candidates. Go to web site: **www.eng.umd.edu/news/hall_of_fame** for more information and to complete an online nomination form.

ARCS Foundation Awards Scholarships

The Metropolitan Washington Chapter of the ARCS (Achievement Rewards for College Scientists) Foundation, Inc. recently presented $15,000 scholarships to two Clark School of Engineering graduate students, Sean Anderson and Suneel Sheikh.

Anderson is pursuing a Ph.D. in electrical engineering. His research efforts are guided by Professor Perinkulam Krishnaprasad and focus on the role of geometric phases in sensing and control and mobile robotics. Sheikh, who is pursuing his Ph.D. in aerospace engineering, is focusing his research on spacecraft dynamics and control under the guidance of Professor Robert Sanner.

The ARCS Foundation, Inc. is a national volunteer women's organization dedicated to helping the best and brightest U. S. graduate and undergraduate students by providing scholarships in natural sciences, medicine and engineering. It was formed in 1958 in Los Angeles and has grown to 12 chapters throughout the United States. The Washington Chapter, established in 1968, has awarded scholarships totaling $2.5 million since its founding. Members of ARCS are all volunteers who donate their time and financial support.

According to the president of the Metropolitan Washington Chapter, Helen (Holly) Coyne, the members of the organization participate because, "They are interested in science and in being a part of a group that gives away all that it raises." In the last five years, the chapter has donated $182,000 to students at the Clark School. Coyne noted how impressed the members are with their contacts at Maryland and with the facilities at the Clark School.

In 2000, the chapter gave University President C. D. Mote Jr., its "Eagle Award" to recognize his longstanding interest in students and his own contributions to science.

The ARCS Foundation, Inc. does not grant scholarships directly. Scholars are selected by the 43 colleges and universities to which ARCS chapters make allocations. In the 2001-2002 academic year, 1,400 ARCS members awarded more than $4 million to 43 schools.

PHOTOGRAPHS BY JOHN T. CONSOLI

Clark School Team Places Second

A Clark School student team was among 33 teams competing in the Society of Automotive Engineers AeroDesign East Heavy Lift competition in Titusville, Florida this spring. As part of the competition, Clark School students designed and built an airplane to conform to very specific restrictions, including taking off in 200 feet and landing in 400 feet intact. In addition, the plane had to carry as much weight as possible with a payload volume of 300 cubic inches. The Clark School team earned second place in both the design competition and in the overall competition, flying nearly 22 pounds.

Clark School student team members include: Brandon Fitchett, Baek Huh, Dan King, Brian Nestico, Mahamane Toure, Kevin Wawroski and Will Woolford. Kevin Ulek served as the graduate student advisor and Anthony Vizzini, director of the Composites Research Lab, was the team's faculty advisor.

Notable Alumni

Dr. Ramesh R. Rao EE '82, M.S. '84, professor of electrical and computer engineering at the University of California at San Diego (UCSD), has been named director of the San Diego division of the California Institute of Telecommunications and Information Technology, a partnership between UCSD and University of California, Irvine. With more than $300 million of support from state government and private industry, the institute will provide opportunities for researchers to explore new sensor concepts, new wireless and optical networking strategies, and new ways to manage and analyze the resulting information flow.

A Challenge for Leadership

From developing new methods of corneal sculpting that may ultimately correct our most common vision problems to researching ways to thwart bioterrorism threats, the Clark School is a leader in pioneering research and education programs. That leadership falls short when it comes to alumni support.

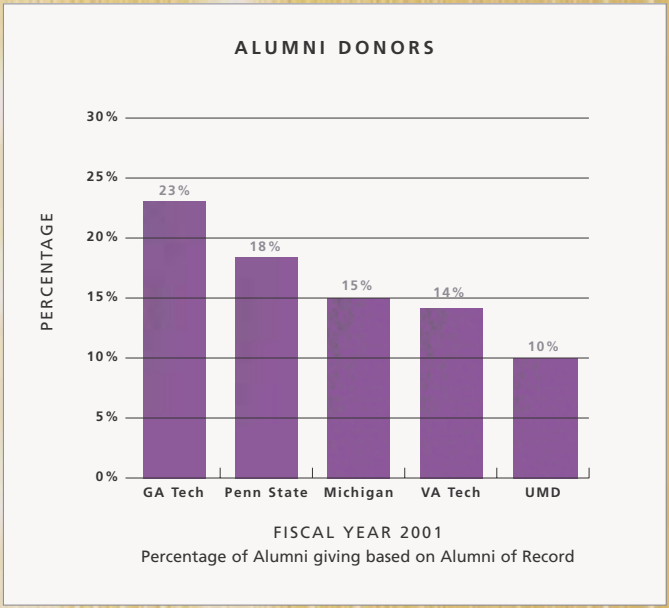
Compared to the percentage of alumni giving by similar institutions, the overall participation rate for the University of Maryland lags behind at 10 percent and less than 8 percent for engineering alumni.

In recent years, the portion of expenses covered by state funding has declined so that only 30 percent of the Clark School's operating expenses are funded by the state of Maryland. Corporate and individual gifts are more important than ever.

In an effort to significantly increase annual giving by alumni, the Clark School will launch their annual fund drive in October. Engineering alumni will be contacted and urged to make a gift. Your gift provides needed funds for scholarships, student projects and upgrades to classrooms and teaching labs.

Equally important, participation in alumni giving demonstrates your leadership in ensuring that Maryland is one of the top engineering programs in the country. Each year, engineering programs are evaluated by many measures, and alumni participation rates is on of the key measurements. We need your help to continually build the engineering program and thus increase the value of your degree.

For more information on the Clark School Annual Fund or other Clark School funding opportunities, please contact:
Nelson G. Marban, director of development, 301.405.8289. or ngmarban@eng.umd.edu



Alumnus Brian LeGette receives Ernst & Young's Entrepreneur of the Year Consumer Products Award

Brian LeGette and Ron Wilson, chief executive officers for Big Bang Products (Baltimore, Maryland) recently received the 2002 Ernst & Young Entrepreneur of the Year Consumer Products Award for Maryland.

Ernst & Young, through its Entrepreneur of The Year® awards, recognizes great business achievements and accomplishments that are made possible by the entrepreneurial spirit.

Seven years ago, LeGette and Wilson, had an idea to build a better ear warmer. After all, how can you wear a hat and attach earmuffs at the same time? The 180 degree earmuff is constructed with a frame that wraps around the back of your head.

LeGette graduated with a bachelor of science degree in electrical engineering from the University of Maryland in 1989 and earned his MBA from the University of Pennsylvania's Wharton School in 1995. He received the University of Maryland's Outstanding Young Alumnus Award in 1989.

Awards Gala Honors Clark School Alumni

At the Third Annual Alumni Association Awards Gala, held last spring, two Clark School graduates were honored based on their outstanding achievements and demonstrated success.

Gordon R. England, EE '61, Secretary of the Navy, received the President's Distinguished Alumnus Award in recognition of his leadership and service in the defense and technology industries.

University of Maryland President C.D. Mote Jr. noted, in conferring the award, that "Gordon England had the extraordinary experience and achievement in industry needed to lead the Navy." England expressed his surprise and appreciation in receiving the award. "When you consider all the graduates from the University of Maryland, and all the degrees and specialties and walks of life, this is a very distinct honor for me," says England.

England became the 72nd Secretary of the Navy following his confirmation by the U. S. Senate in May. Prior to his nomination, he served as executive vice president of General Dynamics and began his career as an engineer at Honeywell working on the Gemini Space Program.

Lloyd Robeson, '67 Ph.D., received the Clark School of Engineering Distinguished Alumnus Award for his contributions to the field of engineering, and service and contribution to the university. Robeson, a principal research associate for Air Products and Chemicals, Inc., is an accomplished engineer specializing in the field of polymer and polymer blends. He conducts projects on long-range polymer science research for his firm's Corporate Science and Technology Center in Allentown, Pennsylvania.

Robeson holds 91 patents for his work with polymers. He has also co-authored *Polymer-Polymer Miscibility* and authored or co-authored more than 90 publications.

Nominations are now being accepted for the Gala 2003 Distinguishing Engineering Alumnus award. Nominations, which should include the nominee's name, class year and major and contact information for both the nominee and nominator, can be faxed to: Cornelia Kennedy, Director of Alumni Affairs, A. James Clark School of Engineering, at 301.314.9867 or email: ckennedy@terpalm.umd.edu

In Memoriam

Alfred Gessow, professor emeritus and former chairman of the aerospace engineering department, died on May 2, 2002. Gessow founded the university's Center for Rotocraft Education and Research in 1981 and was the director until 1992. The center was renamed in his honor and is one of the nation's leading institutions of rotocraft research and education. The center recently received the prestigious Grover E. Bell Award from the American Helicopter Society (AHS) for its pioneering contributions in smart structures technologies that successfully transitioned into full-scale helicopter systems.

A legend in the field, Gessow served on the government's National Advisory Committee on Aeronautics, a predecessor to the National Aeronautics and Space Administration (NASA). He held the positions of fluid physics branch chief and director of the aerodynamics office before joining the university. He received NASA's Exceptional Service Medal in 1974, and in 1990, received an Award for Excellence in Graduate Aviation Education from the Federal Aviation Administration.

Gessow authored the very first textbook in the field, *Aerodynamics of the Helicopter*, which is now recognized as a classic. The text is still widely used by professionals, researchers and educational institutions worldwide even though the textbook was published four decades ago. He also served as technical director of the AHS, which named him an honorary fellow, and was the founding editor of the *AHS Journal* and founding chairman of its education committee.

Gessow is survived by his wife, Elaine, four children and eight grandchildren. Gessow's family previously established an endowed chair and named endowment for the Gessow Center for Rotocraft Education and Research. Gifts to the Alfred Gessow Fund made to University of Maryland College Park Foundation and mailed to University of Maryland, Department of Aerospace Engineering, College Park, Maryland 20742.

Kenneth Bak Hing Hom, age 72, died on March 9, 2002. Hom was a retired structural engineer at the David Taylor Naval Ship Research and Development Center in Carderock, Virginia. He began his career in the submarine structures division of the center in 1955 and retired in 1988. He was branch chief of the submarine performance evaluation branch and the submarine design analysis branch and served on the Navy's accident evaluation board for the nuclear submarine USS Scorpion, which sank with all hands on deck in 1968. He received his graduate degree in mechanical engineering in 1961.

David T. Brown, age 80, died on January 1, 2002. Brown earned his undergraduate degree in mechanical engineering in 1939. His firm, Brown Construction and Engineering, oversaw the restoration of many of the historic landmarks of Annapolis, Maryland, including the Maryland Inn, the King of France Tavern and the Shiplap House. His firm's restoration of the William Paca House, a national historic landmark, is the largest renovation project undertaken by the Historic Annapolis Foundation.

Andrew Donehew Muhs, age 31, died on April 20, 2002 when the jet he was navigating crashed during an air show near Naval Base Ventura County, California. Muhs, a Marine Corps captain, worked at the university's space systems laboratory as a student and received his undergraduate degree in aerospace engineering in 1994. He joined the Marine Corps that year and played a major role in developing a computer-based scheduling and tracking system used for Marine aviation training and readiness. His decorations include the Navy's Meritorious Service Medal and the Navy Commendation Medal.

Burton James "Jim" Wilson, age 80, died on May 10, 2002. Wilson was an instructor in the electrical engineering department from 1990 through 1998. He taught undergraduate courses in power machinery, power electronics and electromagnetics and assisted in the design of the department's Electric Machines Laboratory. For more than 30 years, Wilson worked for the U. S. Naval Research Laboratory in a number of positions before retiring in 1982. He received his bachelor's and master's degrees in electrical engineering from University of Illinois-Champaign.

Alumni Notes

Paul J. Kolodziejski, AE '86, chief, advanced spacelift, for the U. S. Air Force was recently named as the requirements lead for the Air Force-NASA One Team to review the feasibility of a joint national reusable launch vehicle effort, a multi-billion dollar research and development program.

Mary E. Lacey, ME '78, former executive director of the Indian Head Division of the Naval Surface Warfare Center, was appointed to the highest civilian job within the center. Lacey is the center's technical director in charge of network installations in Indian Head, Carderock and Dahlgren, Virginia as well as in Indiana and California.

William O. Lewis, CE '84, was named general manager of The Austin Company's southeast region office in Atlanta, Georgia. Lewis is responsible for management and business development for the office. The Austin Company provides site location, planning, design, architecture, engineering and construction services to industrial, commercial and government clients.

Ralph F. Luca, nuclear and fire protection '84, recently supervised and mentored some 10 fire protection engineers for the U. S. Navy, Naval Facilities Engineering Command, and was selected to head a $70 million recapitalization project of military facilities in Naples, Italy. He now serves as deputy director of a customer and client liaison program for the entire Naval Facilities Engineering Command.

Donald L. Muschlitz, ME '73, was named the Gilbane Building Company's 2001 Builder of the Year in the Central Region for his work as project manager, coordinating $11.4 million in renovations to the 95-year-old Memorial Hall Building in Columbus, Ohio.

Gordon B. Richman, ChE '84, is vice president, strategic compliance consulting and general counsel at EndQuest, Inc., a quality assurance and regulatory compliance consulting firm based in Hyattstown, MD. He provides strategic regulatory advice and training to Food and Drug Administration-regulated industries with additional responsibilities in domestic and international operations.

Stanley W. Wiles, CE '90, was recently promoted to Navy Lieutenant Commander. He is the Commanding Officer at the U. S. Naval Mobile Construction Battalion Five in Port Hueneme, California.

Forward Thinking

Engineering has always been part of Fred Kohloss' life. His father, a career officer with the Army Corps of Engineers, had a tremendous influence on him. Although trained as an electrical engineer, his father thought mechanical engineering would be a better choice for his son. Fred heeded his father's advice.

In 1941, Fred was a junior in engineering at Maryland. Like many of his generation, the attack on Pearl Harbor accelerated his education. "We went from junior to senior year without pause, a full engineering curriculum plus extensive ROTC training," he recalls. "I graduated in February 1943 with a B.S. in mechanical engineering, entered the Army and officer candidate school." He married Peggy Grunwell in September 1944, before shipping out to Southern France. After the German surrender, Fred was sent to the Philippines, then to the occupation of Japan.

After the war, he taught engineering at George Washington University (GWU), while attending classes at GWU Law School. He earned a J.D. in 1949, but returned to the University of Maryland for evening and weekend graduate classes in engineering. "I look back and remember the good faculty. Dean Steinberg was a civil engineer, and a fore thinker. Knowing that engineers were weak in communication skills, he made sure this was part of the curriculum," Fred reminisces. With the availability of an accelerated summer program, Fred decided, however, to transfer his credits to the University of Delaware, which awarded him a master of mechanical engineering degree in 1951.

Several career positions followed, including chief engineer of refrigeration and air conditioning for design-build firms in D.C. and Cleveland. When the youngest of his three daughters had a health problem in the Ohio winters, Fred secured a position with an air conditioning division of a Honolulu mechanical contractor. He organized a Honolulu consulting engineering firm in 1956 with another engineer, and later formed Frederick H. Kohloss and Associates in 1961, which expanded to branches in several U.S. cities and Australia.

Fred prides himself on applying innovation in all aspects of his work, and is a pioneer in economical, energy-conserving air-conditioning systems for tropical climates. He is a past president of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and a Life Fellow of ASHRAE and the American Society of Mechanical Engineers. Fred received Hawaii's Engineer of the Year award in 1980, the University of Maryland Distinguished Engineering Alumnus Award in 1997, the Bill and Louise Holladay Distinguished Fellow Award (ASHRAE) in 1998, and a Lifetime Achievement Award from the Hawaii Council of Engineering Societies in 1999.

Fred continues his work as an engineering consultant, and also serves as a member of the Clark School Board of Visitors. Fred explains that, "Since I have been lucky and relatively successful in my engineering career, I wanted to give back to a place that has given me so much." Fred and Peggy, a watercolorist and according to Fred, "an assistant grandmother to every kid in Hawaii," established a charitable remainder unitrust benefiting the Clark School. Through this tax-advantaged planned gift, Fred and Peggy receive an annual income based on a set percentage of the trust's value. Upon their deaths, the trust will convert to the Margaret G. & Frederick H. Kohloss Engineering Endowment. Their forward thinking will benefit future engineers for generations to come.

"I keep up on other schools," Fred says, "The Clark School offers a nice balance between teaching and research. There are many good organizations to give towards, but education is important, and good teachers…this is what students remember."

To learn more about charitable Remainder unitrusts or for confidential inquiries about other planned giving arrangements, please call or write:

Nelson Marban, Director of Development, Clark School of Engineering, University of Maryland, College Park, Maryland 20742 ■ 301.405.8289 ■ ngmarban@eng.umd.edu

Faculty and Staff Commitment Award Fountain

During the 1997-1998 academic year, the department chairs and directors of the Clark School began a dialogue about how to recognize individuals who have made outstanding contributions to making the Clark School a better place. Coinciding with the discussion was a beautification project for the outside of Glenn L. Martin Hall. The University Facilities Council, the Department of Operations and Maintenance, and the Clark School agreed to raise funds to build a plaza with a fountain where names of faculty and staff contributors could be carved in stone and recognized for years to come.

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