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E@M

THE MAGAZINE OF THE A. JAMES CLARK SCHOOL *of* ENGINEERING

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Cover photo by John T. Consoli
Photo above by Prakash Patel

Dear Clark School Friends,

WE HAVE ALL FOUND OURSELVES in situations in which someone asks, "What distinguishes the Clark School from other schools?"

One way to answer this question is by reference to statistics such as our annual research expenditures, national or international rankings or freshmen SAT scores. Yet while these numbers are informative (and impressive), they do not fully convey our distinctive character.

What distinguishes the Clark School from other schools?

This issue of *E@M* features two Clark School programs that, in my judgment, more fully demonstrate the school's true nature: the Innovation Hall of Fame and Engineers Without Borders.

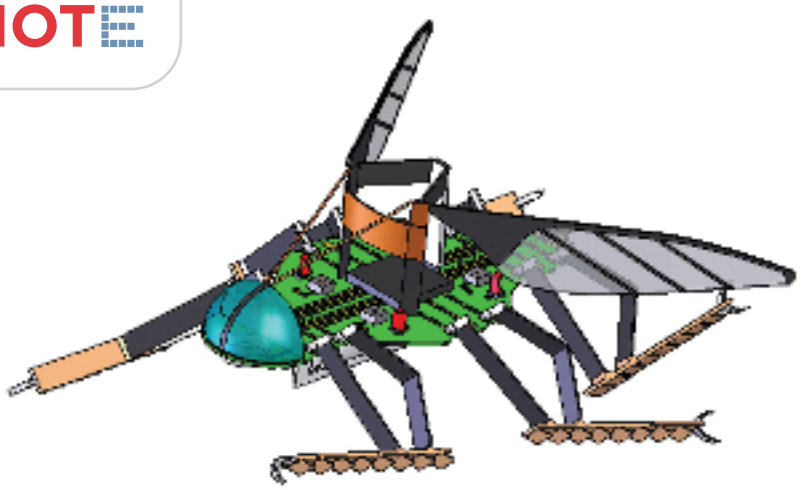
When people learn the incredible array of engineering advances developed by Clark School alumni, faculty and associates that are celebrated in the Hall, they are always amazed. The Hall represents the school's spirit of exploration and ingenuity and inspires our young engineers to join in this great tradition. You'll be very proud to see the quality of work the Hall presents, and I encourage you to visit the Hall the next time you're on campus (or visit our website at www.eng.umd.edu/ihof).

Our nationally recognized Engineers Without Borders chapter is an enormously successful service program that expresses another key characteristic of the Clark School: a commitment to serving society through engineering. The chapter develops and executes life-enhancing projects in Africa, South America and Asia that make a real difference for the people in those communities—and the students who go there to help.

The Innovation Hall of Fame and Engineers Without Borders offer opportunities for our alumni to make important contributions as volunteers or as financial supporters. I encourage you to learn more about these two signature programs and work with us to make them even stronger.

Herbert Rabin
Interim Dean

Clark School Leads Swarming Microsystems Program to Protect Soldiers



The Clark School's Department of Aerospace Engineering will lead a new multidisciplinary, multi-institution initiative to dramatically improve military surveillance capabilities and enhance soldiers' safety.

The program will develop networked, bio-inspired microvehicles that become the eyes and ears of soldiers in the field, crawling or flying over urban and other complex terrains. The tiny units will monitor areas and convey critical information to soldiers who remain out of harm's way.

A networked "swarm" of such vehicles can sense, communicate and move together, forming a virtual "super-organism" to penetrate any structure and find targets of interest, according to Darryll Pines, aerospace engineering professor and department chair. "This swarm could aid in the searches of buildings and caves and also assist in perimeter defense. Soldiers would understand an environment by deploying the networked vehicles into the area instead of, or in advance of, themselves," says Pines.

The program, called the Micro Autonomous Science and Technology (MAST) Collaborative Technology Alliance (CTA) Center on Microsystems Mechanics, is funded by the Army Research Laboratory. The Clark School is the lead institution, joined by the University of Michigan, University of Pennsylvania and BAE Systems as principal members. The program is funded by a $10 million award over five years with an option to continue for another five years.

The award confirms the strategic direction the aerospace department began pursuing about a decade ago. "Our plan was to create a research thrust in microsystems," recalls Pines. "This grant confirms our initial thinking and our 'seed' efforts, and solidifies our research in this area."

Pines notes that the MAST Center is one of several major research projects to be led by the department. "Aerospace engineering is directing major-league competitive grants that will enhance its reputation and that of the Clark School and university," says Pines.

Inderjit Chopra, professor of aerospace engineering and director of the Alfred Gessow Rotorcraft Center at the Clark School, directs the MAST Center along with co-director J. Sean Humbert, an assistant professor in the department. "This is a great opportunity for the Clark School to work with other top schools across the country and to be a lead center," adds Chopra. "The new technology is a high priority for the U.S. Army and key to its success in the future."

He and a team of Clark School faculty members and undergraduate and graduate students, and colleagues from the university's computer science and biology departments, are looking to nature for inspiration for their work. "We look at birds that can fly in gusty environments for long periods of time with little food," says Chopra, who notes that an understanding of biology can help researchers apply basic principles to constructing engineering solutions like the microvehicles.

"We have been working on small applications that we can operate in buildings, tunnels and other confined places," says Chopra. "The technology must enable us to fly these air vehicles for more than 30 minutes on battery power, with a camera attached that can obtain good photos and bring back information to the troops. It must be relatively simple for a soldier to operate with little training."

Chopra is especially excited about the opportunity for more than 25 students to work on the project. "Just imagine building an aircraft with your own hands! How do you incorporate electronics? How do you stabilize it? Working on a small scale, students will gain experience on every component of the vehicle. Every phase of manufacturing occurs here at the Clark School." ■

New President of Alumni Chapter Named

Catherine Stewart, B.S. '03, mechanical engineering, is the new president of the Clark School Engineering Alumni Chapter Board of Directors. An environmental engineer at Baltimore-based Constellation Energy, Stewart was a member of the Clark School's first Solar Decathlon Team and participated in the school's Annual Giving Leadership Task Force.

In addition, Josefina Simpson, '84, has been named the new director of alumni relations for the Clark School. Look for more information on the Clark School website and in upcoming issues of *E@M*. ■

Future Faculty Fellows: Tomorrow's Great Teachers and Mentors

As a doctoral candidate in aerospace engineering (AE), Anand Veeraragavan was totally immersed in his research, working on building combustion-based propulsion systems at the microscale. While his faculty advisor, Christopher Cadou, AE associate professor, was impressed with his research acumen, he believed Veeraragavan also had the potential to be a gifted teacher. With a little prompting from Cadou, the Ph.D. student applied for a fellowship and was accepted in the inaugural class of the Clark School's Future Faculty Program.

The program, launched in fall 2006 by Mark Shayman, associate dean for faculty affairs, is an exciting initiative that serves the needs of doctoral students, the Clark School and the engineering profession. The program is designed to increase the number of highly qualified teachers for the nation's engineering schools; to prepare doctoral candidates to achieve career-long success in the academic world as teachers and researchers; and to place Clark School doctoral students in leading institutions where their impact can be greatest, where they can continue to partner with the Clark School and where their good work will help sustain the Clark School's stellar reputation.

"The Clark School, as a leading academic institution, has a responsibility to ensure the future of engineering education and thus of engineering itself," says Shayman. "The Future Faculty Program enables us to fulfill that responsibility and, in the process, do an even better job of preparing students for success."

Applicants for the program must have passed the Ph.D. qualifying examination and have a minimum of three semesters left before graduation. A competitive selection process assesses each candidate's motivation for becoming a faculty member and his or her potential for securing a tenure-track position.

"Typically graduate schools in engineering train their doctoral students to be good researchers, but not to be complete faculty members," Shayman explains. "We want to equip them with all the tools they'll need."

The Future Faculty Program consists of three one-credit training seminars, a teaching practicum and a research mentoring practicum.

In the teaching practicum, each fellow co-teaches a course with a senior faculty member who offers advice on developing the syllabus, lecturing, preparing and grading examinations and evaluating students. "Some of the school's best faculty members have volunteered to co-teach," says Shayman.

Anand Veeraragavan

In the research mentoring practicum, each fellow co-supervises a student research project with a senior faculty member, helping more junior students formulate the research problem and meeting regularly to provide advice and monitor progress. Current fellow Veeraragavan notes, "As a researcher you are narrowly focused. As a faculty member you take a broader perspective and are aware of applications in fields that you might not have previously considered. In the end, that makes you a better researcher."

Fellows receive a stipend, half of which they are required to spend on attending professional meetings. "Our future faculty need to learn what is happening globally in the field. It is good for them to meet researchers outside their narrow areas and to find people outside the university who can support them as they begin applying for jobs," explains Shayman.

The first group of fellows will begin applying for teaching positions next year. For more information on the Future Faculty Program or to apply, visit www.eng.umd.edu/academics/ffa.html. ■

Internationally Recognized Inventor to Speak at ECE Centennial Gala

PHOTO PROVIDED BY DEAN KAMEN

Dean Kamen, renowned inventor, entrepreneur and tireless advocate for science and technology, will speak at the gala dinner that concludes the weekend-long Centennial Celebration of the Clark School's Department of Electrical and Computer Engineering (ECE) on September 27.

Kamen is the founder of DEKA Research and Development Corporation, where he invents new technologies and provides research and development for major corporate clients. Among his proudest accomplishments is founding FIRST (For Inspiration and Recognition of Science and Technology), an organization dedicated to motivating the next generation to understand, use and enjoy science and technology. He was awarded the National Medal of Technology in 2000 and the Lemelson-MIT Prize in 2002, and is a member of the National Academy of Engineers. Kamen was inducted into the National Inventors Hall of Fame in May 2005.

The ECE Centennial Celebration includes an evening reception for alumni on September 26 and a luncheon and pair of daytime forums featuring national experts on September 27. University Senior Vice President for Academic Affairs and Provost Nariman Farvardin will moderate "The Future of Information Systems and Communications." Participants include Victor Bahl, principal researcher of Microsoft Corp.; Michael Brown, executive vice president of comScore; Douglas Himberger, vice president of Booz Allen Hamilton; and Innovation Hall of Fame Member Rajiv Laroia, Ph.D. '92, M.S. '89, electrical engineering, and chief technology officer of Qualcomm Flarion Technologies. The afternoon forum, "The Future of Energy," features David Goodstein, professor and former vice provost of California Institute of Technology; Larry Kazmerski, director of photovoltaics at National Renewable Energy Lab; Joseph Turnage, senior vice president of Constellation Energy; and Steven Cowley, director of the Culham Science Center and professor at the University of California, Los Angeles.

For more information about the ECE Centennial Celebration, visit http://www.ece.umd.edu/centennial/. ■

Fischell Festival Focuses on Medical Imaging, New Wing

In a live streamcast from the University of Maryland School of Medicine in Baltimore, Patrick Malloy, M.D., the school's director of interventional radiology, gave student and faculty attendees of the second annual Fischell Festival an eerie view inside a patient's liver as he successfully treated a malignant tumor with directly applied chemotherapy and radio-frequency ablation. It was one of several opportunities for the festival audience to understand how engineering and medicine work hand in hand today.

The festival, which centered this year on medical imaging, began with a Whiting-Turner Business and Entrepreneurial Lecture from Johns Hopkins University President William Brody, who described lessons he had learned in starting three medical imaging companies. In following sessions, Heinrich Kolem, president and CEO, Siemens Medical Solutions, discussed engineering challenges in medical imaging product development; Christoph Hergersberg, Global Technology Leader, Biosciences, GE Global Research, presented his company's perspective on current imaging technologies; and David Fischell, CEO, Angel Medical Systems and department benefactor, described his family's unique process for creating new medical technologies.

After the conference portion of the festival, Robert Fischell, his wife Susan Fischell and son David Fischell participated in the formal dedication of the new 7,400 square-foot bioengineering addition to the Jeong H. Kim Engineering Building. The new wing houses staff offices and labs for current and future faculty. As part of the dedication, the new portrait of Robert Fischell and his sons Tim, Scott and David, was unveiled. It now hangs in the wing's administrative office area. The dedication also included the announcement of the department's newest Fischell Fellow — Graduate Program in Bioengineering student Marc Dandin.

About a dozen companies participated in the festival's crowded Biotechnology Career Fair, demonstrating products and discussing careers in bioengineering, biomedical engineering and biotechnology with interested students, faculty and guests. At the same time, poster presentations featuring the work of more than 40 students and faculty were on display.

Part of the busy poster session at Fischell Festival 2008.

To view lectures and learn more about the festival, see www.bioe.umd.edu/fischellfestival/fest08.html. ■

NanoDay Highlights Latest Discovery: Graphene

Despite its miniscule dimensions, graphene—one of the newest advances in carbon nanomaterials—is responsible in a big way for attracting some of the country's leading researchers to the third annual NanoDay this spring. NanoDay is sponsored by the Maryland NanoCenter, a partnership of the A. James Clark School of Engineering, the College of Computer, Mathematical, and Physical Sciences and the College of Chemical and Life Sciences.

Graphene is a single-atom-thick sheet of graphite that offers less resistance to electrons than conventional semi-conductor materials at room temperature. In his NanoDay lecture, Pablo Jarillo-Herrero, assistant professor of physics at the Massachusetts Institute of Technology, discussed the enormous potential of graphene in nanoelectronics, nanosensors and nanoelectromechanic devices.

Michael S. Fuhrer, associate director of the Maryland NanoCenter and associate professor of physics, explained the unique electronic structure of graphene and future implications for electronic properties. "Electrons in graphene behave as if they have zero mass, which leads to a number of exotic properties," he said.

Other presenters included Walter A. de Heer, professor of physics at the Georgia Institute of Technology, who covered the application of graphene to nanoelectronics, and Rodney Ruoff, Cockrell Family Endowed Chair of Mechanical Engineering at the University of Texas, who discussed a new class of graphene-based materials.

Maryland NanoCenter Director and Minta Martin Professor of Engineering Gary Rubloff led a session on how local organizations and individuals can partner with the center, and Clark School faculty joined colleagues from Maryland and other universities as well as government labs to display recent research findings at an afternoon poster session. ■

Ghodssi Appointed Herbert Rabin Distinguished Professor

The Clark School has recognized Reza Ghodssi for his "sustained and influential scientific and scholarly work" by appointing him the Herbert Rabin Distinguished Professor at the Clark School. The four-year professorship provides discretionary funds to support his research and educational programs.

Ghodssi, an associate professor of electrical and computer engineering affiliated with the Institute for Systems Research, directs the Clark School's Microelectromechanical Systems Sensors and Actuators Lab. He is also affiliated with the Fischell Department of Bioengineering and the Department of Materials Science and Engineering. He has more than 55 scholarly publications and is co-editor of the *Handbook of MEMS Materials and Processes* to be published in 2009.

"This appointment reinforces for me and many junior professors that hard work and scientific accomplishment are acknowledged at the Clark School," says Ghodssi. "I view this as recognition of the many bright students and scientists who have contributed to my group over the years. It drives me to inspire more young men and women joining the field to work hard and achieve."

Ghodssi's research interests include the design and development of microfabrication technologies, and their applications to micro/nano devices and systems, for chemical and biological sensing and small-scale energy conversion and harvesting. His research group is now focusing on sustainable and adaptive miniature implantable medical devices for future diagnostic applications. "The discretionary funds will help us explore new research ideas in collaboration with colleagues across disciplines."

The endowment, named for Clark School Interim Dean Herbert Rabin, was previously held by William Bentley, who is now the Robert E. Fischell Distinguished Professor and Chair of the Fischell Department of Bioengineering at the Clark School. ■

Espy-Wilson Named Fellow of Radcliffe Institute for Advanced Study

Carol Espy-Wilson, a professor of ECE/ISR, begins a homecoming of sorts this fall when she returns to the Boston area as a fellow of the Radcliffe Institute for Advanced Study at Harvard University.

While studying at Radcliffe Institute, Espy-Wilson will also serve as a visiting scientist and scholar-in-residence at the Massachusetts Institute of Techonology, where she received her master's and doctoral degrees. "I was a housemaster at MIT for 12 years before joining the Clark School," recalls Espy-Wilson, who will live on the MIT campus once again.

The highly competitive Radcliffe Institute Fellowship Program has provided yearlong residencies to more than 400 scholars since its founding in 1999. Espy-Wilson joins a class of 50 international fellows representing 32 different academic, professional and artistic fields. She meets weekly with the fellows group and reports on the progress of her work as part of the Radcliffe Institute Fellows' Presentation Series. "This will be an exciting year and I am looking forward to meeting colleagues from all different disciplines," she says.

Her research focuses on understanding the relationship between acoustics and articulation by modeling speech production, studying speech perception, developing signal processing techniques that capture relevant information in speech, and using the knowledge gained to develop speech technologies. Her current projects include speech enhancement, single-channel speaker separation, speech and speaker recognition, and language identification. During the fellowship year, she will focus on the noise robustness of a speech recognition system developed collaboratively with other researchers in engineering, linguistics, computer science and rehabilitation science. Her work ultimately will improve communication and collaboration between people and machines and also improve understanding of how humans produce and perceive speech. ■

Assistant Professor **SARAH BERGBREITER**, mechanical engineering (ME)/Institute for Systems Research, received a 2008 Young Faculty Award from the Defense Advanced Research Projects Agency.

Glenn L. Martin Institute Professor **GERRY GALLOWAY**, civil and environmental engineering, won the 2008 American Association of Engineering Societies Norm Augustine Award.

ME Professor **ASHWANI GUPTA** has been appointed Distinguished University Professor.

Professor **ART JOHNSON**, Fischell Department of Bioengineering, was awarded the Brahm and Sudha Verma Lifetime Visionary Award from the Institute of Biological Engineering.

Professor **MOHAMMAD MODARRES**, ME, received the 2008 International Research Leadership Award from the Society for Reliability Engineering, Quality and Operations Management.

George E. Dieter Professor of Mechanical Engineering **MICHAEL PECHT**, who directs the Center for Advanced Life Cycle Engineering, received the Institute of Electrical and Electronics Engineers Reliability Society's Lifetime Achievement Award.

Professor **NORMAN WERELEY**, aerospace engineering, has been named a technical fellow of the American Society of Mechanical Engineers.

Associate Professor **DONALD YEUNG**, electrical and computer engineering, was appointed associate editor of the Association for Computing Machinery's *Transactions on Architecture and Code Optimization*.

PHOTO BY JOHN T. CONSOLI

BE INSPIRED

Visit the Innovation Hall of Fame

By David Taylor

Enter the front lobby of the Jeong H. Kim Engineering Building and you quickly pass through its airy rotunda into a spacious, three-story atrium, featuring a wide corridor filled on either side with display panels. The panels' understated colors sharply contrast with the groundbreaking accomplishments they herald. This is the Clark School's Innovation Hall of Fame, recognizing Clark School alumni, faculty and associates who have pioneered many of the most significant engineering advances of the past century. (You may also visit the Innovation Hall of Fame website at www.eng.umd.edu/ihof.)

There is George Laurer, B.S. '51, electrical engineering, an IBM engineer who in the 1960s adapted early barcodes to create a standard universal product code (UPC), which has reduced the waiting time of millions of shoppers, vastly improved the efficiency of tracking inventory for retailers and prevented countless medical errors through the bar-coding of medicines. The creator of pulse Doppler radar for reconnaissance (and now for weather tracking), Harry B. Smith, M.S. '49, electrical engineering, is honored in the Hall as is renowned aviation pioneer and Clark School benefactor Glenn L. Martin, the inventor of the bomb sight and automatic parachute. Consider Lloyd Robeson, Ph.D. '67, chemical engineering, whose work with polymer blends, adhesives and engineering plastics led to the creation of an orthopedic splint material, now an industry standard.

Many of these pioneering inventions are so widely used today they simply blend into the landscape, which is exactly why Stanford Berman, B.S. '50, mechanical engineering, created the Hall in 1986: to recognize great engineering and inspire young engineers. Each year, in a brief ceremony held within the Hall, a medallion is conferred on a new inductee, who joins the ranks of some of the most impressive inventors and entrepreneurs of our time.

"The Innovation Hall of Fame gives us a fresh look at these great innovators and their invaluable contributions to society," says Nathan Bluzer, B.S. '67, electrical engineering and Ph.D. '74, solid state physics, who chaired the selection committee for this year's inductee. (See related story, p. 8.) A fellow of the Institute of Electrical and Electronics Engineers and life member of the American Physical Society, Bluzer was inducted into the Hall in 1995 for his pioneering work on advanced microelectronics, including infrared, visible and multispectral sensors, used in such devices as night-imaging video displays. "The Hall reminds students that many of these great innovators once took the same types of classes they do and participated in the same clubs and activities. It shows students what is possible and that they are part of a great tradition."

Ask the Experts

How does innovation happen? It would be hard to find a better group to ask than the members of the Innovation Hall of Fame.

ROBERT FISCHELL

"It takes hard work, good luck, money, and persistence to change the way medicine is practiced," explains Robert Fischell, M.S. '53, physics, and honorary doctorate of science '96. He is the biomedical pioneer who with his family established the Clark School's Fischell Department of Bioengineering and the Robert E. Fischell Institute for Biomedical Devices and was inducted into the Hall in 2002. (See related story, p. 4.) Fischell brought all of these resources to bear in the development of a rechargeable pacemaker, the flexible coronary artery stent and his favorite invention, the AngelMed Guardian system, an implantable cardiac monitor which tracks a patient's condition, alerts him or her of an impending heart attack and signals emergency services.

Where other people are confounded by the frustrations of malfunctioning devices, Fischell says, an innovator sees opportunity. "The process is a continuing alertness to things that don't work," explains Fischell. He quotes industrialist Henry Kaiser in saying, "Problems are only opportunities in work clothes."

RAJIV LAROIA

Another key to innovation is taking advantage of the rich potential for learning from fields outside your specialty. Rajiv Laroia, M.S. '89 and Ph.D. '92, electrical engineering, and 2006 Hall inductee, credits his breakthroughs to browsing journals while at the Clark School.

That's how he drew the connection between the field of source coding—the subject of his dissertation research—and data transmission. Once he saw how the two fields related, he understood how the coding solution he described in his dissertation actually worked better and with greater impact in data transmission. In drawing those conclusions, he developed his process for discovery. "First, gain a broad picture of the situation to identify the space where innovation is needed, then focus on where the technical solution will fit and develop it," says Laroia, chief technology officer of Qualcomm Flarion Technologies.

The result: Laroia's method of precoding data and shaping data constellations for voiceband telephone modems improved the speed of data transmission in the early 1990s. "My first patent came from my work in the Clark School," Laroia says. "That experience taught me the value of intellectual property and innovation." Laroia's telecommunications contributions include the co-invention of the Orthogonal Frequency Division Multiplier, a high-speed data transmission technique that makes broadband wireless Internet access possible.

JEONG H. KIM

For Jeong H. Kim, Ph.D. '91, reliability engineering, professor of practice and the head of Bell Labs who joined the Hall in 2004, the essence of innovation goes beyond any one individual.

"Innovation is teamwork," says Kim, who learned the value of collaboration while a navigator for a U.S. Navy nuclear submarine. "That kind of work requires knowing your own role within a tightly functioning group as well as good communication among team members." He brought those lessons to the Clark School, where he received "a top-notch education" and laid the groundwork for his pioneering work on advancing the asynchronous transfer mode (ATM) switch, which enabled cost-effective, universal connectivity to wide area networks by consolidating multiple traffic types such as voice, data and video on to a single ATM

network infrastructure.

Kim helped fund the Jeong H. Kim Engineering Building to promote the kind of interdisciplinary thinking required for innovation in today's world. "One of the challenges in innovation is the curse of knowledge," Kim explains. Experience guides our knowledge, he says, but it can also limit how we think. "We think outside the box by collaborating with people from different disciplines."

ROMALD BOWLES

The importance of strong mentoring while at the Clark School still resonates with Romald Bowles, B.S. '47, M.S. '48 and Ph.D. '57, mechanical engineering, who vividly recalls his entry into the Hall of Fame in 1989. One reason the award was so meaningful was because he joined John Younger, his mentor and professor of mechanical engineering, who had been inducted two years earlier for developing the retractable aircraft landing gear and tail wheel, the all-metal wing and a device for damping wing flutter.

Bowles is considered the father of fluidics, which explores using fluid to perform functions similar to those performed by circuit components in electronics. His favorite innovation: the wall interaction amplifier that uses fluid to amplify a small signal effectively.

The Clark School helped him get his start, Bowles says, when Younger and other faculty members "gave great meaning to the work of engineering and the way it impacted your own life and the lives of others." Returning to school to accept his award, Bowles especially enjoyed sharing his own experiences with undergraduates. "It's wonderful to see how the school is getting students to think creatively and walk down new avenues to improve the quality of life in the world," he says.

RAYMOND KRIZEK

Last year Raymond Krizek, M.S. '61, civil engineering, became the first civil engineer to be inducted into the Hall. That may be, he says, because civil engineers' contributions rarely result in patentable products but more often involve ways of doing things.

Krizek is self-effacing about his own innovations. "It's a mundane thing," he says of the environmentally safe disposal of industrial wastes, including dredged marine sediment, "but it poses a challenging, perennial problem."

After the Environmental Protection

Hybrid Power Train Inventor Next to Join the Hall

Soon after Alex Severinsky arrived in America as a refugee from the Soviet Union in 1978, he recognized a major problem he believed he could help solve. Severinsky landed in Dallas during the national oil crisis and recalls sitting in line at gasoline stations.

"I'd just come from bread lines and now I was in gas lines," says Severinsky, who decided to tackle the problem of gas consumption. Although his Ph.D. was in electrical engineering from Moscow's Institute for Precision Measurements in Radioelectronics and Physics, he set about analyzing the Periodic Table, searching for practical alternatives to internal combustion. He concluded that a fully-electric vehicle would never be practical, but an electric hybrid could work. He took a job in power electronics engineering, where he could immerse himself in the field of high-voltage semiconductors that was crucial to his ideas for a hybrid.

Looking for support for his newly-founded company, Viteq, in 1986, Severinsky connected with the Technology Advancement Program, a leading venture program of the Clark School's Maryland Technology Enterprise Institute that partners with regional entrepreneurs to build early-stage companies. Through Viteq, he developed uninterruptible power supplies for computer systems; later the company was sold to a Texas-based firm. With the help of then-Assistant Dean Herbert Rabin, Severinsky formed yet another company, Power-Assisted Internal Combustion Engine (PAICE), to create a hybrid power train. Starting in 1992, Severinsky began filing numerous patents for the Hyperdrive power train system and received

Opposite page, from left, Innovation Hall of Fame member Raymond Krizek; Rajiv Laroia, receives his Hall of Fame medallion from University President C.D. Mote Jr. This page, at right, innovator Jeong H. Kim.

"We think outside the box by collaborating with people from different disciplines."

Agency determined that many dredged materials contained unacceptable levels of pollutants, Krizek helped to develop alternatives to open-water disposal. When the Ft. McHenry Tunnel under Baltimore's Inner Harbor was constructed in the 1980s, Krizek's ideas led the state of Maryland to use the three million cubic yards of material dredged for the tunnel to construct Seagirt Container Terminal, effectively confining any pollutants. Dredged materials are also being used to restore eroded islands in the Chesapeake Bay.

He still speaks fondly of the pivotal years he spent studying engineering. "My years at Maryland were among the happiest four years of my life, and they set the tone for what I wanted out of life," says Krizek, who is now the Stanley F. Pepper Professor of Civil Engineering at Northwestern University in Evanston, Ill.

Inspiring New Generations

Jay Renner, Clark School controls instructional lab coordinator, makes the Innovation Hall of Fame a destination spot for the Clark School tours he directs. Recently, Renner led a group of eighth graders through the school. "I try to open up people's minds to the world of technology and how the items we use in everyday life were made possible by people right here," says Renner. "Maybe very soon they will have opportunities to make contributions to the next generation."

D.T. Howarth, B.S. '09, bioengineering, often leads prospective students on tours of the Innovation Hall of Fame in her role as a Clark School Ambassador. "It is inspiring to see so many people connected to the Clark School who have made significant contributions to engineering and to the world," says Howarth. Just as important, Howarth notes, is that so many of the Hall's inductees continue to contribute to the body of research in their fields. "It is just so cool to see so many of the engineers honored who got their start at the Clark School and who have achieved so much. Some days when I am walking by I think that I could be in the Hall of Fame one day for a discovery I have made."

While many Hall innovators would not ask to be singled out from others whose ideas also fueled breakthroughs, they recognize that their individual examples are inspiring. "When you become an engineer, you want to see success stories," says Laroia.

Kim agrees. "I was inspired by successful people when I was a young student," he says. "When you can relate to colleagues and alumni of the university, it puts your dreams within reach."

That makes it all the more important for students, alumni, faculty members and visitors to the Clark School to reflect on some of the 20th and 21st centuries' most notable engineering innovations—and their connections to the Clark School—the next time they walk through the Kim Building.

All are encouraged to nominate Clark School alumni, faculty members and associates to the Innovation Hall of Fame. See www.eng.umd.edu/ihof. ■

David Taylor is a freelance writer who has written extensively for the National Science Foundation and the National Academies. His work has appeared in Smithsonian, Baltimore, Chesapeake Bay *and other magazines.*

additional help from Mtech in arranging a meeting with staff from the National Institutes of Standards and Technology and the U.S. Department of Commerce. With funding from Baltimore-based Abell Foundation, he made a physical prototype of his engine and on October 14, 1999 demonstrated the PAICE system in Detroit. Severinsky proved that the system could effectively reduce the gas consumption of a Cadillac Coup de Ville by half in city driving while retaining its driving performance.

Engineers at U.S. and Japanese automakers were interested in Severinsky's invention, but top management resisted. A visionary staff engineer at Toyota later developed the same idea as Severinsky for hybrids. When the Toyota Prius was introduced, Severinsky fought to protect his patent rights. After a protracted legal battle with Toyota, he won the civil case in 2005.

Severinsky is satisfied with the turn of events. "I bought my car from Toyota," he says, smiling. "My wife loves it. It uses several of my inventions." He credits Toyota for creating an unusual working environment in which in-house competition of ideas is fostered.

With his new company, Fuelcor, he has returned to an old interest that is even more relevant today: using electronics to improve oil production. The idea behind Fuelcor, launched in 2005, is to "make fuel instead of hunting for it" by synthetically manufacturing hydrocarbon compounds from their ultimate products of decomposition – carbon dioxide and water. Fuelcor is already in the early stages of commercialization on two continents. "This is the ultimate technology in transportation fuels," he says. ■

Alex Severinsky will be inducted into the Innovation Hall of Fame at a Clark School ceremony on October 30, 2008. The ceremony will be immediately followed by the Charles and Helen White Symposium on Engineering Innovation, which highlights the impact of the inductee's innovation. For more information, see www.eng.umd.edu/ihof/new.html.

Engineers Without Borders

Improving Life, One Community at a Time

BY NANCY GRUND

The spread of disease, particularly among young children, was rampant in the Ecuadoran villages of Uduzhapa and Conseco, due largely to the lack of a sanitation system or potable water supply.

In a rural village in northern Thailand, adults and children traveled far from home for medical care or stood in a line up to 150 patients long to see a visiting doctor.

In the villages surrounding the town of Dissin in Burkina Faso, West Africa, schools and literacy centers operated without electricity, leaving students and families in the dark after sundown.

PHOTO COURTESY OF EWB-USA UNIVERSITY OF MARYLAND, COLLEGE PARK CHAPTER

EWB students Thierry Some (right, in white shirt) and Jason West (center, in blue shirt) meet with villagers in Dissin, Burkina Faso, to discuss the plan for installing lighting in 12 village schools.

From building a health clinic, to installing latrines in homes, to constructing solar lighting systems, members of the Clark School community and practicing engineers are using fundamental engineering to help residents of many of the world's poorest countries improve their lives. Through the University of Maryland chapter of Engineers Without Borders (EWB), a national nonprofit humanitarian organization that partners with developing communities on engineering projects, Clark School students and faculty are leading a dedicated group of volunteers who make tangible contributions and foster goodwill around the globe.

The university's EWB chapter owes its existence largely to one woman—Deborah Goodings. The professor of geotechnical engineering in the Clark School's Department of Civil and Environmental Engineering (CEE), and co-director of the university's Master of Engineering and Public Policy program, founded the chapter in 2004. Its first meeting attracted barely a roomful of engineering students. Today 150 members represent students from every department within the Clark School, a handful of majors throughout the university and faculty and practicing engineers.

Goodings recalls the university's first EWB project—teaming up with two institutions to build a health clinic in a rural hill tribe village in northern Thailand. With no track record for EWB, Goodings and five students approached then-Provost Bill Destler for travel funds. She recalls, "He placed a $7,000 bet on us, and that bet turned into a great investment." Supplemented with funding from the Office of International Programs, they embarked on "a fabulous experience for all" that led to an award from EWB-USA and ignited even more interest in the chapter.

To date, the university's EWB chapter has completed nine projects (see "EWB in Action" sidebar) and garnered further recognition. In 2007 the chapter was honored again by EWB-USA for helping Villanova University in its first project; that same year, the chapter's work in Ilha das Peças, Brazil, earned that country's prestigious environmental award, the Santander Prize.

The Evolution of a Project

Maryland's EWB chapter is committed to designing and implementing engineering projects in developing communities around the world that meet a detailed list of criteria. "There are logistical requirements like availability of materials for projects in-country, and a working financial infrastructure. There are community requirements, like country stability, depth of need, project impact and local support," explains Goodings. "We have limited our efforts to simple infrastructure projects communities want that can be completed in a relatively short period of time and will be sustainable."

After a viable project is identified, an assessment team typically comprised of two student project leaders, a faculty member and a practicing engineer, travels to each site to review project needs. "We look at the culture, the environment and the community hierarchy. Then we choose the appropriate technology and the right team and start collecting engineering data," says Goodings, who has been honored by both the Clark School and the university for her work with the chapter.

If additional engineering expertise is needed, Goodings frequently relies on members of the EWB Chesapeake Professional Partners Chapter, which pairs practicing engineers with EWB projects. "Volunteerism is alive and well among engineers," says John Sankey, vice president of Reinforced Earth Co., who heads the Chesapeake chapter and who has traveled with students to Thailand, where they laid a water pipeline, and to Ecuador, where they dug pits and poured concrete to build 39 latrines in two local villages.

Light for Literacy

Projects and country locations are frequently based on EWB-USA recommendations, but at the University of Maryland many have a more personal connection. Peter Chang, professor of civil engineering, was the faculty lead on the first project to Ecuador, but the chapter's subsequent projects in Brazil, where Chang grew up, have come from collaboration with his sister, a development economist in Brazil, and from his professional contacts at Brazilian universities.

The same is true for the chapter's work in West Africa: Jungho Kim, professor of mechanical engineering, approached a mechanical engineering student with family members in one of the poorest countries in the world, Burkina Faso, formerly known as Upper Volta. With the student's help, Kim utilized his engineering expertise to develop an EWB project to install solar-powered lighting systems at village schools around the town of Dissin in southern Burkina Faso.

"The work with EWB allowed me and the students to apply our engineering skills in a fundamental way and to immediately see how people are affected by technology," says Kim. "Whether exposed to Africa or South America, students return from these kinds of experiences with a greater appreciation for how 90 percent of the world lives."

Kim's interest in solar power led him to develop an EWB project for a competition sponsored by The World Bank. Fifty-two competitors, including Kim, were chosen from more than 500 entries to present their ideas to provide lighting for parts of sub-Saharan Africa. Kim's concept: Establish a solar lighting cooperative in Dissin to provide electrical lighting for households at a cost comparable to what residents spend on kerosene for lamps. The coop would include solar-powered recharging centers where village residents could recharge household batteries rather than carry them to another town and wait for them to be recharged. While it did not win the World Bank competition, the concept is the centerpiece of an upcoming EWB project.

PHOTO COURTESY OF EWB-USA UNIVERSITY OF MARYLAND, COLLEGE PARK CHAPTER

Village buy-in and participation is key to EWB project success. Villagers in Conseco, Ecuador, both young and old, build latrines with EWB student Sona Chaudhry (left).

Clark School Students Make a Difference

EWB in Action:

Members of the university's EWB chapter have employed their energy and expertise around the globe in the following projects:

Shining A Light

DISSIN, BURKINA FASO

For 12 schools and literacy centers that once closed their doors each day with the fading light, Clark School students designed photovoltaic-powered lighting systems to keep the facilities operational into the night. Working with village representatives to assemble the system components, the team wired charge controllers; constructed and wired light fixtures and switches; connected mounting brackets for solar panels; and installed solar panels donated by BP Solar.

Building a Health Clinic

SAMLI, THAILAND

In Samli, the center of a cluster of Lisu hill tribe villages near the Myanmaran (Burmese) border, members of the university's EWB chapter teamed with two other EWB chapters to construct the villages' first primary and emergency health care facility. Clark School students set up the electrical system, the plumbing, the septic system and the interior walls.

Providing Clean Water

BAAN BO MAI, THAILAND

The only clean water for a farming village in this northern Thailand community of Burmese refugees was a 2.5 kilometer trek away, until Clark School teams laid pipe from a mountain stream to the village center. Teams made three separate trips to build a water intake system, a small impermeable dam to feed the intake system and two kilometers of pipe. The end result: Two taps—one for an orphanage and one for the village—where water now flows at 60 gallons per minute.

Installing Solar-Powered Water Pumps

DISSIN, BURKINA FASO

Villagers had to travel more than two kilometers away, often waiting in long lines, to hand-pump clean drinking water, until Clark School students helped automate the pump-

continued on page 13

PHOTO COURTESY OF EWB-USA UNIVERSITY OF MARYLAND, COLLEGE PARK CHAPTER

Students are involved in the full implementation of all EWB projects. Here, EWB student Sebastian Ordonez is back on task after a rain shower, cutting roofing sections for latrines in Uduzhapa, Ecuador.

Living, Working and Learning in Other Cultures

Jason West, B.S. '05, M.S. '08, materials science and engineering, was a project leader for the EWB solar lighting project Kim oversaw in Burkina Faso. He found the success of a project depends, in large part, on close collaboration with the local communities. "The villagers were our equal partners in Burkina Faso," says West. "We taught them how to install and take care of the system and they shared their knowledge about available materials and preferred locations for the panels."

While his team built a prototype of the lighting system and tested it on the roof of the Clark School's Glenn L. Martin Building prior to their trip, West quickly learned "there are so many unknown variables on a project." Roof angles in relation to the sun's position required on-the-spot adjustments once the team was in the field.

Jacob Zwillinger, B.S. '08, aerospace engineering, worked alongside Brazilian university students, environmentalists and community residents to build a water tank in the small fishing village of Bebedouro in Brazil. The team stayed in a local posada, or small hotel, while they built a system to filter wastewater from septic tanks.

"We had to dig a hole the size of a small swimming pool, then fill it with gravel and plants to serve as a filter," describes Zwillinger. "When we tired of shoveling, the villagers took over." Zwillinger found the EWB team's classroom-based approach complemented the villagers' hands-on approach. "We wanted to do our calculations and apply our formulas, while the local residents were used to simply doing what needed to be done." When the Clark team realized they had forgotten lubricant to connect PVC piping, the villagers offered a perfect solution. "We used what was available—butter—and it worked just fine," says Zwillinger.

Emily Klose B.S. '08, civil and environmental engineering, and a former chapter vice president, co-led a project in Thailand to build a water system to provide clean drinking water for an orphanage. She found adjustment to the local culture relatively easy, but notes, "The biggest culture shock was returning to the U.S. and recognizing our obsession with consumption," says Klose. "People in these villages are happy, content and live good lives without many of the resources we think are absolutely necessary."

As a practicing engineer co-leading that project, Patrick Murphy, an engineer by training who works in NASA's Office of Education, recalls the challenge of travel to remote areas. "We had to pass through several military checkpoints, then meet with local village leaders about the project. Our contact in the village had been a Freedom Fighter in Myanmar (Burma), who decided to put his gun down and create the orphanage for children whose parents were killed in conflict."

In building the project, Murphy says, "We tapped into an existing stream, trenching up and down hills using a global positioning system, to construct a gravity feed for the water system." Sustainability is a key component of every project and "we made sure residents knew how to operate the system when we left," he adds.

Changing Students' Lives

Students learn lessons through EWB that stretch beyond basic engineering concepts and often influence their futures. The program dovetails with the Clark School's emphasis on developing leaders who understand the social implications of their work. "Our students are witnessing first hand the needs of people in the poorest communities in the world and developing solutions that significantly affect people's lives and the social structure of their communities," says Goodings.

Michelle Neukirchen, B.S. '05, CEE, a past president of the university's EWB chapter, says, "With EWB, I saw what is required to pull a community together. Our influence on others' lives is so much greater than we realize." Neukirchen has put her skills into daily practice as one of the few engineers employed by Catholic Relief Services, an international relief agency. Following the 2005 earthquake in northern Pakistan, she led a major water reconstruction project to assist 100 villages in the earthquake recovery and to address the country's severe drought in the south. This fall she begins a graduate program in international relations at Johns Hopkins University.

Ready to Give, Ready to Grow

As awareness and enthusiasm for the chapter mount, Goodings and her students anticipate continued increases in chapter membership and costs. "More projects, higher fuel prices, and a weak dollar keep us stretching," she explains. "The generosity of the university and other donors, as well as the critical

Regional Workshop Set for Fall

The Clark School will host the Engineers Without Borders Southeast Region Workshop Nov. 7-9 at the University of Maryland Inn and Conference Center. The theme of the weekend will be "Best Practices and Lessons Learned." Some 90 chapters along the East Coast will be invited to the workshop. More information on the regional workshop can be found at http://www.ewb-usa.org/.

support of the faculty who volunteer their time to lead projects, have made our success possible. As we continue to grow, however, we know we will need to seek greater institutional support," says Goodings.

She encourages alumni to become involved through volunteering and financial contributions. The experience can be highly rewarding. As an immigrant, an engineer and a mother, Sogand Seirafi, M.S. '90, geotechnical engineering, and chief of transportation, planning and design in the Montgomery County Department of Public Works and Transportation, says the EWB chapter has great appeal. "EWB is reaching people most in need, and volunteers are transforming people's lives in communities around the globe as well as transforming their own lives," says Seirafi, who has helped raise funds for the chapter.

Individual donors are increasingly responding to the chapter's inspiring stories with ongoing support. Following a student presentation to the Clark School's Board of Visitors, Charles E. "Chuck" Waggner, B.S. '54, chemical engineering, made a $5,000 gift; he recently added another $17,000. (See Spring 2008 *E@M*, p. 13.) Waggner's gift will help support the chapter's sponsorship of an upcoming regional EWB workshop. In addition, his friends have made commitments totaling $5,800 to the program in his honor. University Board of Trustees member and former dean of the Smith School of Business Bill Mayer donated $7,500, and Pedro Wasmer, B.S. '62, civil engineering, and a Clark School Board of Visitors member, was equally impressed and committed $10,000 to the group. (See related story, p. 21.) The Scholl Family Foundation recently stepped forward with a $25,000 gift to the EWB chapter to support the solar-powered pump project in Burkina Faso. (See related story, p. 14.)

"...and the knowledge to keep it."

This summer, David Lovell, professor of civil engineering, traveled with a student team led by chapter president and recent Truman Prize winner Phil Hannam (see related story, p. 20) to the villages of Dakole and Nakar in Burkina Faso to retrofit hand water pumps with solar-powered motors and build two water storage tanks. The tanks improve access to water that residents can use to irrigate crops and produce more food during the region's dry season. At the project's end, the villagers in Dakole gave the EWB team gifts of a ram, two chickens and two pigeons. The people of Nakar, too poor to offer any gifts, performed a dance along with the following song:

"For a long time, we were thirsty. Then people came, and they dug a well. But we were still thirsty. And then you came and gave us the water we needed and the knowledge to keep it." ■

Nancy Grund is editor of E@M.

(Left) Elliot Cohen (yellow shirt) works with other EWB students on filling septic tank formwork with concrete in Bebedouro, Brazil. (Above) EWB students Bob Hayes (left, red shirt), and Len Goff (right, red shirt) use their rudimentary French to negotiate for lunch in Dissin, Burkina Faso.

PHOTOS COURTESY OF EWB-USA UNIVERSITY OF MARYLAND, COLLEGE PARK CHAPTER

EWB in Action *continued*

ing stations. The team installed two solar-powered water pumping and storage systems for two of the neediest villages and taught community members how to work with the low-cost technology.

Building a Sustainable Waste-Water Treatment System

BEBEDOURO, BRAZIL

The communities of Bebedouro and Santa Amelia lacked sanitary wastewater removal and treatment: Waste simply flowed into the streets. A newly constructed charity school partnered with a Clark School team to build a septic tank and leach field to treat its waste and to demonstrate to the community better ways to deal with waste from their homes.

Installing a Sanitation System

UDUZHAPA AND CONSECO, ECUADOR

Without a sanitation system or potable water supply, residents of these villages were frequently sick until a Clark School team installed practical and functional pour-flush latrines. Villagers and students worked together to construct latrines in 39 houses to reduce the contamination of their water sources.

Enhancing Access to Water

PATADEL, ECUDAOR

The water system for the 340-person village of Patadel, Ecuador, was built 20 years ago to accommodate only 60 residents. Between the system's ongoing deterioration and its overuse, water was available only two hours a day at best and even less in the dry season of January through March. The EWB team worked with the villagers to construct a new water storage tank and install a chlorination system for water purification.

Providing Water and Sanitation

ILHA DAS PEÇAS, BRAZIL

A growing demand for water and increasing sewage overflow threatened the fishing industry in this small village until Clark School teams employed sustainable environmental engineering techniques in two related projects. One team constructed a water tank in the village, and a second team returned to create a "constructed wetland" to treat wastewater from septic tanks through a mechanical and biological filtration process involving layers of plants, sand and gravel. ■

PHOTO COURTESY OF THE SCHOLL FAMILY

The Scholl Family in Japan. From left, Tommy, Susan, Tom and William Scholl.

Philanthropy as a Family Affair

Scholl Family Foundation Supports Engineers Without Borders Project

A successful engineer, entrepreneur and investor, Tom Scholl has long been a staunch supporter of and repeat donor to the A. James Clark School of Engineering.

Tom and his wife Susan, B.S. '73, advertising/design, have also made a commitment to instill their philanthropic values in their two children, William and Tommy. In 2000 they created the Scholl Family Foundation to involve their sons directly in supporting personally meaningful projects.

"When we began, we wanted to create a foundation that would get our family thinking about making charitable gifts," explains Tom. "Our mission was to involve the whole family in worthwhile causes and to make small contributions to specific projects for which one or all of us could be held accountable for what our funds actually accomplished."

When Scholl, a partner in the venture capital firm of Novak Biddle and chair of the Clark School's Board of Visitors, attended recent presentations by students in the University of Maryland chapter of

Get Creative With Your Gift to the Clark School

When it comes to supporting the Clark School and the *Great Expectations* campaign, gifts are needed at every level to fund many of the school's most important programs and projects. If you are ready to make a gift, but can't quite decide the most appropriate use of your funds, let us offer a few creative suggestions.

Rollin', Rollin', Rollin'

Invest in a set of four Hoosier tires to help drive a Clark School Society of Automotive Engineering Baja racecar to the finish line. Investment: **$650**.

A Different Kind of Road Trip

Support a student engaging in a week of community-service learning and action, such as traveling to New Orleans to rebuild homes. Investment: **$600** for one student, **$6,000** for an entire team.

Building Leaders

Send two students to a leadership retreat to learn more about the qualities of leaders and how they work effectively in teams. Investment: **$100**.

Recharge Our Batteries

Help the Clark School's Engineers Without Borders chapter provide solar panels, rechargeable batteries and lighting at literacy centers in remote villages in Burkina Faso, West Africa. Investment: **$2,000**.

PHOTO COURTESY OF EWB-USA UNIVERSITY OF MARYLAND, COLLEGE PARK CHAPTER

A Host of Possibilities

Outfit a new activity room in Martin Hall for the Undergraduate Student Council, where the group can host meetings, social gatherings and study groups. Investment: **$10,000**.

Engineers Without Borders (EWB), he realized how closely the group's mission is aligned to that of his own family's giving priorities. At his invitation, Deborah Goodings, EWB faculty advisor and professor of civil and environmental engineering, and three undergraduate students visited the Scholl home for dinner to share information about the chapter and discuss specific funding needs.

When the Scholls learned about the small town of Dissin in Burkina Faso, West Africa, where the residents from the surrounding villages drew water from wells with hand pumps, they were intrigued by the solution posed by Clark School students. A solar energy retrofit to those pumps could improve the pumping capabilities and ensure enough water could be pumped during the dry season to irrigate their subsistence gardens. (See related story, p. 10.)

"The presentation was well designed and well developed," says 18-year-old son William. "They had done their planning in terms of the activities our foundation could support." Through a Boy Scout project, both boys were already familiar with the location of Burkina Faso and its capital, Ouagadougou, which further solidified their connection.

This summer the Scholl Family Foundation donated $25,000 to help EWB chapter members complete the solar-powered pump project. The gift enabled students to purchase materials essential to the project and to travel to Dissin.

"It is a case of engineering used to address the most basic needs of the poor, of Clark School students understanding their capacity and responsibility to be world citizens, and of a gift that provides the means to accomplish it," says Goodings.

When the project was complete, details of the community response were emailed to the Scholls. "The community was flabbergasted and couldn't believe they can now grow gardens," says Susan. "These types of projects are so responsible and make so much sense. It is great for our family to be involved at the grassroots level."

To help ensure the permanence of the program, Tom has discussed with Goodings how to establish ongoing funding support for the program. "While it's an important experience to learn how to raise money, it would be nice if students could spend more time and effort on choosing the best projects and devising solutions rather than constantly fundraising on a case-by-case basis," explains Tom.

Active in community-based projects through Boy Scouts and their church, the Scholl children "understand the importance of giving back," says Tommy, age 14, who traveled to West Virginia this summer to repair homes in a needy community. "With projects like Engineers Without Borders, we believe we can really make a difference."

One of the lessons the Scholls have learned: It is never too early to start talking to children about the importance of philanthropy. "We love seeking out and getting educated about projects, discussing them and making decisions together," says Tom. "We are tickled to death that the boys are watching projects unfold with us," adds Susan.

William begins classes at Montgomery College this fall and aspires to continue his education at Maryland studying finance and engaging in volunteer opportunities like EWB.

For more information on the University of Maryland chapter of Engineers Without Borders and how you can support the chapter, visit www.eng.umd.edu/ewb. ■

Space Out

Help fund a new gathering space for electrical and computer engineering students in the A.V. Williams Building. Investment: **$10,000**.

Aim High

Help high-achieving Gemstone Program students travel to professional conferences to present research findings and make important contacts for the future. Investment: **$5,000**.

PHOTO COURTESY OF GEMSTONE

PHOTO COURTESY OF EWB-USA UNIVERSITY OF MARYLAND, COLLEGE PARK CHAPTER

Let's Confer

Send an Engineers Without Borders student to the organization's national conference to present the accomplishments of the university chapter. Investment: **$1,200**.

A Fresh Perspective

Supply electronics project kits for the new "Explore Electronics" course for freshmen in electrical and computer engineering. Investment: **$5,000** each.

Get a Tow Hold

Help Terps Racing purchase a vehicle for towing their race cars to competitions. Investment: **$2,500**.

PHOTO BY MIKE MORGAN

Sowing the Seeds for Student Startups

Gift from Hinman CEOs Graduate Singal Challenges Alumni to Contribute

Anik Singal, B.S. '05, finance, knows firsthand the challenges of raising seed money for a new business. He founded his company, Affiliate Classroom, through the Hinman CEOs, the nation's first living-learning entrepreneurship program, in 2005. At that time, he recalls, "Just a few thousand dollars would have gone a long way. I was actually considering giving up equity in my company for $500."

Singal was never forced to strike that deal and wants to ensure that other young entrepreneurs do not face similar dilemmas. Thanks to Singal's recent gift of $50,000 to establish the Hinman CEOs Alumni Fund, students starting their own ventures now have greater access to critical seed money.

"Entrepreneurial undergraduates who create ventures face challenges in raising sufficient funding to pursue their ideas," says Singal. "This fund is designed to meet the needs of these creative and innovative students.

"When you start a company at a young age, access to money is huge. Professional investors

Anik Singal, left, who recently established the Hinman CEOs Alumni Fund, still meets regularly with Dean Chang, director of entrepreneurship and venture creation for Mtech.

don't want to give you funding because you haven't proven yourself, and funding from other sources is competitive," he notes.

The Challenge Campaign

Singal is hoping his gift will spark the generosity of others. As founding chairman of the Hinman CEOs Alumni Fund advisory board, he is leading the Hinman Alumni Challenge Campaign to inspire alumni to manage and contribute to the fund.

"At other universities, entrepreneurship programs have a close-knit alumni group that provides the resources students and graduates need," Singal says. "Hinman alumni are all over the world and have helped their companies raise millions of dollars. When it comes to knowledge and geographic location, they have vast resources."

Singal's goals are to make it easier for students to tap the alumni network for free advice and funding assistance. "I would like to see all Hinman students get the seed money they need because Hinman alumni are contributing to this fund," says Singal.

The idea for the gift and alumni network was born during a trip to San Francisco. Following a dinner at the California home of the program's founder and benefactor, Brian Hinman, B.S. '82, electrical engineering, and about 20 Hinman students and graduates, "I realized Hinman alumni are very successful and are eager to give back and share insights with current students, but there is no formal channel to do it," says Singal.

Through the new fund students apply for increments of $500 to $5,000 in seed money by writing a business plan. A committee of Hinman alumni and senior staff of the Maryland Technology Enterprise Institute (Mtech), which manages the Hinman program and several other entrepreneurship programs, evaluates each proposal with funding based on the merit of the plan and its probability of success within a reasonable time. Mtech staff mentor each winning company and oversee the use of funding, while Hinman alumni may assist companies and provide professional networks.

Success Begets Success

Singal's company, which provides step-by-step training to help people develop and launch Internet businesses, has grown 500 percent since he left the Clark School, with staff in virtual offices throughout the U.S. and in two locations in India.

Part of his motivation for making the gift is Singal's personal gratitude. His appreciation extends to the Hinman CEOs Program and support from Mtech, including hands-on mentoring and consultation through the Venture Accelerator program, which supports companies developed by faculty and students at College Park. In fact, Singal still works from a campus office and meets weekly with Dean Chang, director of entrepreneurship and venture creation for Mtech. "When I am seeking networking advice or referrals, Mtech is the first place I go," says Singal.

Singal's continued collaboration with the Clark School gives his gift added significance. "Anik is a product of the entrepreneurship offerings at the University of Maryland," notes Chang. "He saw a way he could help clear one of the last remaining hurdles with a seed fund. Like a true entrepreneur, he did something about it."

Hinman students also have access to the $250,000 Impact Pre-Seed Fund started last year through a donation by Solypsis Co-founder Warren Citrin. (See *E@M*, Fall 2007.) ■

Olympus Recognizes Entrepreneurship Education Innovator Barbe

In 2001, David Barbe, professor of electrical and computer engineering and executive director of the university's Maryland Technology Enterprise Institute (Mtech), was charged with developing a culture of technology entrepreneurship at the Clark School.

In the time since, he has led the creation of the Hinman CEOs, the first living-learning entrepreneurship program for undergraduates (funded by Brian Hinman, B.S. '82, electrical engineering); the VentureAccelerator Program, which keeps an experienced entrepreneur or venture capitalist on staff to help faculty and students start companies; the University of Maryland (UM) Business Plan Competition, which rewards faculty, students and recent alumni who generate the best ideas for new companies; and the UM Technology Start-Up Boot Camp, a free, one-day workshop on how to start a technology-based company.

This year, Olympus recognized Barbe's incredible record of accomplishment in entrepreneurship education. At the 12th annual meeting of the National Collegiate Inventors and Innovators Alliance (NCIIA), the company presented Barbe with its Lifetime of Educational Innovation Award.

"At Mtech, we have consistently focused on results and building programs that will drive new, successful technologies to the marketplace," says Barbe. "I feel privileged that Olympus and the NCIIA have looked at those efforts and are recognizing them."

In 2001, Barbe developed and taught the first technology entrepreneurship course for undergraduates in the Clark School and he recently developed a similar course for graduate students. He and his colleagues at Mtech now teach entrepreneurship to some 500 students each year from high school to graduate school.

"When people think of the best engineering schools in the country for entrepreneurship education or technology entrepreneurship, Maryland comes to mind," says Tom Byers, engineering professor and founder of Stanford University's Technology Ventures Program. He credits Barbe for taking the Clark School to the forefront in this area.

John B. Ochs, professor of civil engineering and director of Lehigh University's Integrated Product Development Program, agrees. "Here at Lehigh we are launching a program that is modeled after several key aspects of what Dave has pioneered at Maryland," he notes. "He is one of the top five educators in the country in entrepreneurship."

The University of Maryland was ranked 14th for undergraduate entrepreneur programs and 18th for graduate programs in *Princeton Review. Fortune Small Business Magazine* ranks Maryland as one of America's Best Colleges for Entrepreneurs. ■

CLARK SCHOOL CONNECTIONS

Triple Major Wei Delivers Clark School Commencement Address

PHOTO PROVIDED BY ERMIN WEI

Every day brings new opportunities for discovery and exploration, and Clark School graduates are well prepared to pursue them, triple major Ermin Wei, B.S. '08, told fellow students in her Clark School Spring 2008 commencement address. Wei is certainly on that track. In addition to majoring in engineering, finance and math and participating in three honor societies, Wei was the university's 2008 Undergraduate Student Researcher of the Year and begins doctoral studies at the Massachusetts Institute of Technology this fall.

The child of engineers, Wei grew up in Suzhou, Jiangsu, China, and was always fascinated by her parent's ability to "make lots of useful appliances and fix everything at home." She transformed that awe into a career aspiration when she began looking at U.S. universities while living here during her mother's year-long work assignment in Ohio.

The Clark School became her number one choice because "the school has excellent faculty members, curricula design and research opportunities," recounts Wei. But equally important, "Maryland had the most warm-hearted students and faculty members. I felt at home right away."

Wei focused on a computer engineering major, but with long-term plans to start a technology company she soon added finance as a second major. Graduate school was also on her radar screen and she knew "that math would be beneficial." Encouraged by her research mentor P.S. Krishnaprasad, professor of electrical and computer engineering and the Institute for Systems Research (ISR), Wei pursued a third major in mathematics.

Her strong desire to be better prepared further motivated her. "In today's interconnected and interdependent world, knowing other cultures and languages is important," she explains. "So I added German language, literature and culture as a minor." A participant in the University Honors Program, the Electrical and Computer Engineering Honors Program and the Business Honors Program, Wei graduated with a 3.97 GPA.

"Time management was my biggest challenge," Wei admits, "making a four-year plan, taking care of a complicated prerequisite advising system and arranging eight courses each semester. I set up a goal, prioritized, then made a reasonable detailed plan and carried it out," she describes. "Overall, it wasn't that hard to do all three majors in four years."

During the summer of her sophomore year, Wei interned at Microsoft, where she worked on the extraction of key words in real-time news articles and introduced a new system that improved the extraction process significantly. One of her most memorable Clark School experiences is working as a research assistant in the Intelligent Servosystems Laboratory. Her research included developing a motion model, a bat vocalization model and a signal processing model, all useful in understanding the control and signal processing computations that bats use during navigation and prey-capture. A related project on modeling and simulating pursuit control laws during bat prey-capture helped Wei garner the Undergraduate Researcher of the Year Award.

Yet despite her incredible course load and research interests, Wei advises students, "Don't focus solely on academics. The area has many attractions and the campus offers many associations to join."

Fire Protection Grad Ensures Safety of South Pole Station

The frigid Antarctic cold is not the only hazard at the National Science Foundation's new South Pole Station. Fire protection is essential in this inhospitable climate, and Samuel S. Dannaway, B.S. '78, M.S. '08, fire protection engineering (FPE), is playing a key role to ensure the station complies with fire safety standards.

PHOTO PROVIDED BY SAM DANNAWAY

SPAN THE GLOBE

Dannaway, president and chief fire protection engineer of S.S. Dannaway Associates, Inc., Hawaii's leading FPE and building/fire code consulting firm, recently made two trips to the South Pole to inspect and test fire protection and life safety systems of the South Pole Station. Another trip is planned for January 2009.

Dannaway has called Hawaii home since he was transferred there from a position at the D.C. Naval Yard in 1979. He started his own company in 1985, and his early Navy connections led to the firm's contract with the South Pole Station.

"The new station is designed to accommodate about 200 people during the busy summer months," Dannaway explains. During the winter, the population drops to 30 people, who maintain the station and protect the U.S. rights to occupy the South Pole.

As an undergraduate, he planned to study pre-med at Maryland. But during volunteer work as a firefighter and an emergency medical technician at the Silver Hill Volunteer Fire Department in Prince George's County, Md., he experienced the hazards of firefighting and changed his major to FPE. "Engineering is a fantastic field and you are always employable," adds Dannaway, who was attracted to the field's emphasis on problem solving.

While at the South Pole in January 2006, Dannaway was not only an inspector but a student. In fact, he may be the only Clark School student to submit coursework from that frigid end of the earth. Enrolled in the online professional master's FPE program at the time, several of his class assignments were submitted to the Clark School directly from the South Pole.

Dannaway attended the 50th anniversary celebration of the FPE department at the Clark School two years ago, and stays connected with other graduates by attending annual meetings of the National Fire Protection Engineering Association and the Society of Fire Protection Engineers (SFPE). Last year Dannaway, a past president of SFPE, received the society's John J. Ahern President's Award in recognition of his contributions to the field.

"We are a small group of alumni, but we are strong supporters of FPE and of the school," says Dannaway, a former scholarship recipient who recently committed $10,000 to help establish the John Bryan and Harry Hickey Scholarship Endowment for FPE students.

"You run into Maryland graduates constantly because we've done a good job establishing a reputation throughout the field," adds Dannaway.

To prove that point, Dannaway recalls his stopover in Christchurch, New Zealand, while traveling to the South Pole in 2006. Half a world away from the Clark School, that evening Dannaway met two FPE graduates for dinner: Charles M. Fleischmann, B.S. '85, civil engineering and FPE, an associate professor in civil and natural engineering at the University of Canterbury, and his wife Carol Ann Caldwell, B.S. '81, FPE, a partner in a New Zealand engineering consulting firm. ■

Sam Dannaway has made two recent trips to inspect and test fire protection systems at the South Pole Station.

Going for the Goldwater

PHOTO BY MIKE MORGAN

Whether designing space suits or providing clean water in a developing country, Heather Bradshaw, a mechanical engineering major, has taken advantage of every learning opportunity offered by the Clark School, which she calls "the best place for me to achieve my dreams." This spring she took another step toward reaching those dreams when she was named a winner of a 2008-2009 Goldwater Scholarship.

Bradshaw, who begins her fourth year this fall, was one of 321 students nationwide who received the Goldwater, which covers the full cost of tuition, fees and books, plus room and board up to $7,500 a year. "It's the premier national scholarship in science, math and technology for undergraduates who are interested in research," says Robert Infantino, the university's faculty representative for the Goldwater Scholarship.

A Presidential Scholarship and Clark Scholarship recipient, Bradshaw says the Clark School "empowers students and gives them real and meaningful projects and hands-on experiences." She cites her participation in the QUEST program, a reality-based learning experience for undergraduates that focuses on cross-functional collaboration and quality principles, as one example. As part of a QUEST project, Bradshaw and her team developed an innovation for escalator design that sparked a patent-pending idea.

Outside the classroom, through Engineers Without Borders Bradshaw helped design a water sanitation system for a village in Brazil. (See related story, p. 10.) She was also a member of the winning team in the university's 2007 Sci/Terp video competition, making a video to engage middle school students in science, engineering and technology. ■

Show Your Support for Maryland Chapter of EWB

Froehling & Robertson, Inc., is organizing the University of Maryland's chapter of Engineers Without Borders fourth annual golf tournament on October 17 at 8:30 a.m. at Cross Creek Golf Club in Beltsville, Md. The event includes putting and chipping contests, door prizes, raffles, a silent auction and a lunch at 2 p.m. following the tournament. For more information or to register, contact Robert Mashewske at BMashewske@fandr.com or call 443-506-7906. To make a direct gift to the University of Maryland Engineers Without Borders chapter, email or call Deborah Goodings at goodings@umd.edu or 301-405-1960 or contact the Clark School development office at 301-405-8289. To become involved as a practicing engineer advisor to the chapter, contact the EWB Chesapeake Professional Chapter current president John Sankey at jsankey@reinforcedearth.com. ■

Hannam Captures Truman Scholarship

Phillip Hannam, a Clark School junior, is one of 65 students nationwide to receive a prestigious Truman Scholarship for his leadership and service potential, intellectual ability and likelihood of his "making a difference."

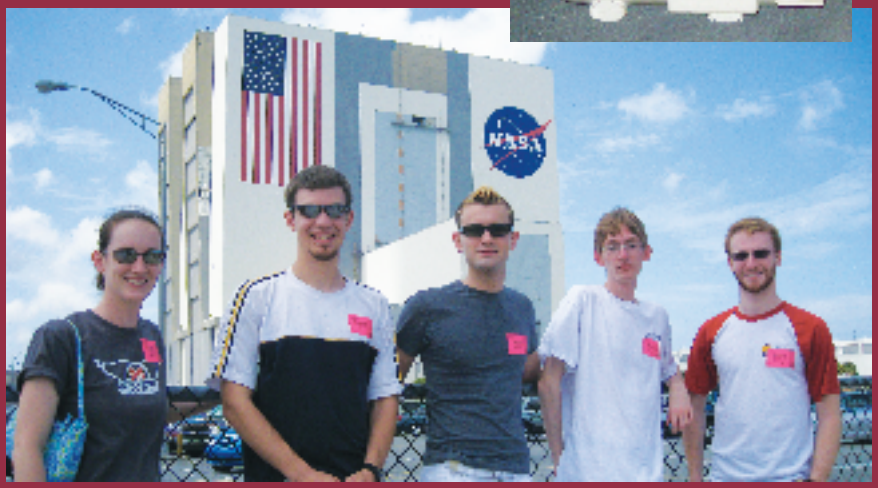
Hannam, a mechanical engineering major, has been a member of Engineers Without Borders since his freshman year and currently serves as the chapter president. (See related story, p. 10.) This summer he led a project in Burkina Faso, West Africa, to install solar-powered water pumps. He is also a member of the Gemstone Program, a multidisciplinary four-year research program for selected undergraduate honors students in all majors, and has worked through student groups to raise awareness of climate change and clean energy on campus. Following graduation next year, he plans to pursue dual master's degrees in mechanical engineering and public policy.

"Meeting fellow leaders throughout the Truman process gives me faith in our collective ability to overcome challenges, while also giving me faith in my own abilities," says Hannam, who is honored to be chosen from the among the nation's most promising public servants.

Truman Scholars are selected from U.S. colleges and universities by a panel that typically includes a university president, a federal judge, a distinguished public servant and a past Truman scholar. Hannam was recognized at an awards ceremony in May at the Harry S. Truman Library in Independence, Mo. ■

Project TURTLE Wins NASA Competition

A team of Clark School aerospace engineering students won first place in the undergraduate division of NASA's Revolutionary Advanced Systems Concepts – Academic Liaison (RASC-AL) student design competition. Project TURTLE (Terrapin Undergraduate Rover for Terrestrial Lunar Exploration) beat out nine other designs, including those created by teams from Georgia Institute of Technology, the University of Washington, Notre Dame and the University of Alabama in Huntsville. ■



Pictured in front of the Vehicle Assembly Building at Kennedy Space Center are members of the winning team. From left, Madeline Kirk, Joseph Lisee, Aleksandar Nacev, David McLaren and Jason Laing.

Alumni News

AMY CHILDRESS, B.S. '92, civil engineering, has been appointed chair of civil and environmental engineering at the University of Nevada, Reno.

WEN-HSIEN CHUANG, Ph.D. '05, electrical engineering (EE), has received an Intel Achievement Award, the greatest honor an employee can earn at Intel.

JOHN MILLER, B.S. '69, aerospace engineering (AE) and M.S. '74, mechanical engineering (ME), a director at the Army Research Laboratory, received the Presidential Rank Award for 2007. The award honors high-performing senior career employees for "sustained extraordinary achievement."

VAHID MOTEVALLI, B.S. '83, M.S. '85 and Ph.D. '89, ME, has been named associate provost for research and graduate studies at Dubai Aerospace Enterprise University.

ANDREW NEWMAN, Ph.D. '99, EE, won the Hart Prize for Excellence in Development from the Johns Hopkins University Applied Physics Laboratory.

BUNO PATI, B.S. '86, M.S. '88 and Ph.D. '92, EE, and **PHIL WISER**, B.S. '90, EE, have announced the creation of a new broadcast TV network called "Sezmi. " The new network, set to debut later this year, will deliver TV shows to most large U.S. cities for about half of the monthly cost of cable and satellite television.

RODNEY ODDOYE, B.S. '02, EE, received a Modern Day Technology Leadership Award at the 22nd Black Engineer of the Year Awards Conference. Oddoye works for BGE as a senior engineer.

MICHAEL S. TOROK, M.S. '85 and Ph.D. '89, AE, received the Distinguished Engineering Alumnus award this spring from the university's Alumni Association. Torok is chief engineer, U.S. Marine Corps programs for heavy lift helicopters, for Sikorsky Aircraft Corp.

SANDRA UGRINA, Ph.D. '07, AE, an AE research associate and resident at the National Institute of Aerospace at Langley, Va., received a L'Oreal USA for Women in Science Fellowship.

Engineer Turned Entrepreneur Gives Back in Gratitude to Clark School

Pedro Wasmer, B.S. '62 civil engineering, may have been one of the last to register for engineering classes as a freshman, but since then he's been at the head of the class in many ways.

Wasmer's achievements are rooted in the American dream of many immigrants. Born in Santiago, Cuba, he moved to Baltimore in 1951, after his widowed mother remarried. The University of Maryland played a large role in his success, welcoming him to the civil engineering department despite his late decision to attend engineering school, and reinstating a scholarship, he recalls.

"It may not sound like much today, but a $250 scholarship was very important to me," says Wasmer, who is particularly grateful for the opportunity he was given to pursue not only engineering courses but also classes such as economics and international relations.

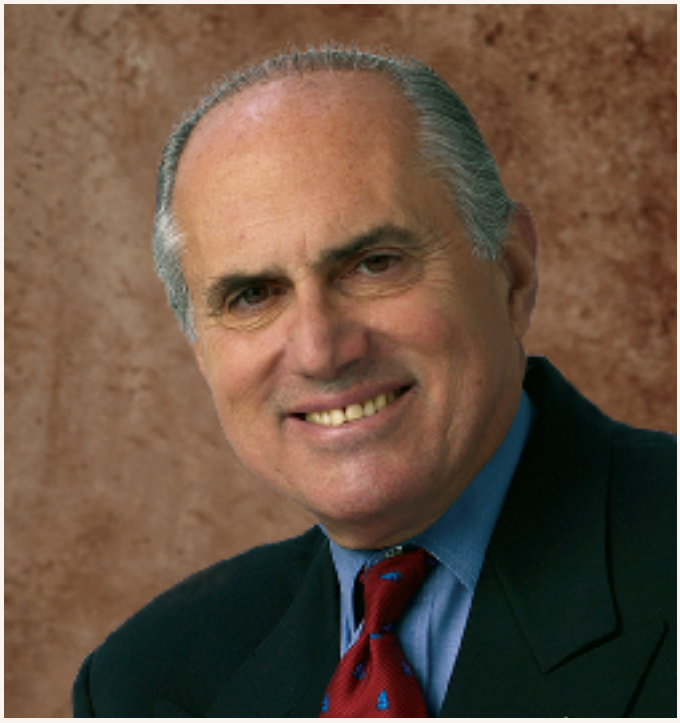
As a student, Wasmer quickly immersed himself in the life of the university, becoming a member of Sigma Chi Fraternity and president of his class and of the university's Student Government Association. It comes as no surprise that Wasmer is now a leading Hispanic entrepreneur and a committed member of the university family.

Wasmer's career began as a civil engineer. Later he worked in information technology for IBM Corp. and Honeywell, where he was involved in marketing the company's computers. Next, he took his talents to DPF, Inc., a Fortune 500, New York-based computer leasing company where his interest in leasing opportunities was sparked.

Throughout the years, Wasmer has often rubbed shoulders with graduates of Ivy League schools, but notes his Maryland education has served him well. "I have always felt extremely comfortable in any setting holding discussions with anyone," he says. "In fact I usually lead the pack, and I give Maryland credit for that."

In 1980, Wasmer started Somerset Investment Services, which was ultimately purchased by a large New York bank. He later formed Somerset Capital Group Ltd., an international equipment-leasing firm, which he sold last December, retiring as its CEO. *Hispanic Business Magazine* consistently recognized the company among the top 500 Hispanic-owned businesses in the country, and Wasmer was a finalist for its Entrepreneur of the Year Award.

Several years ago, when an old friend invited Wasmer to join the University of Maryland Alumni Association Board, he met former Clark School Dean and University Provost William Destler. "We got along like a house on fire, and my interest in the engineering program was revived," says Wasmer. He is now a member of the Clark School Board of Visitors and a trustee of both the University of Maryland College Park Foundation and the University System of Maryland Foundation. Last spring, Wasmer received the Tyser Gottwals Award from the University of Maryland Alumni Association for his service to the university.



Pedro Wasmer credits the Clark School for the "absolutely excellent engineering education" he received.

"I received an absolutely excellent engineering education," recalls Wasmer. "Engineering gave me the confidence to try new things and taught me do things logically."

Inspired by the encouragement he received while a student, Wasmer made a gift of $500,000 to the Department of Civil Engineering to establish an endowed professorship.

Recently, after hearing a presentation by the Clark School's student chapter of Engineers Without Borders (see related story, p. 10), his generosity was reignited. "I was fascinated by the work of this group. There are so many parts of the world that need basic engineering assistance, and I support its efforts to bring clean water, sanitation and road structures to needy countries."

His wife of 43 years, Ann "Gussie" Wasmer, who describes herself as a "trailing Terp," has supported her husband's involvement with the university. Each year, the couple hosts a lunch for incoming Maryland students from their home state of Connecticut. "I remind the students that there are ways to thank the university in terms of time, talent and money," he relates. "What they get back from the university experience far transcends the cost of tuition." ■

To learn more about making a gift to the Clark School, please call or write:

Stu Stabley, acting assistant dean for external relations, Clark School of Engineering, University of Maryland, College Park, Maryland 20742-2831 ■ 301.405.8289 ■ sstabley@umd.edu

Do You Remember?

Do you know what is going on in the photo above? The names of the people shown? Send your answer to mcorley@umd.edu and you may be eligible for a prize!

GREAT EXPECTATIONS
THE CAMPAIGN *for* MARYLAND

Spring 2008 Contest Winner

Scott McBroom, B.S. '88, mechanical engineering (ME), was one of several people to correctly identify the GM Sunraycer vehicle in the photo on the back cover of the Spring 2008 *E@M*. The vehicle was on display at the Smithsonian Institution as part of the 1987 World Solar Challenge. McBroom recognized Robert Piacesi, B.S. '90, ME, (second from left) in the photo. Piacesi went on to become a team captain of UM's Sunraycer team. Others in the photo include from left, Bill Raynor, B.S. '91, ME; Maureen Williams, B.S. '91, ME, and M.S. '99, materials science and engineering; David Hamilton, B.S. '92, electrical engineering; and UM staff member Pam Stone. McBroom received a selection of Clark School merchandise for his response, which was selected at random from the correct entries.

Remember This

You can help to protect the Clark School's history and create an even brighter future by participating in *Great Expectations: the Campaign for Maryland*. Thank you for your support. ■

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