



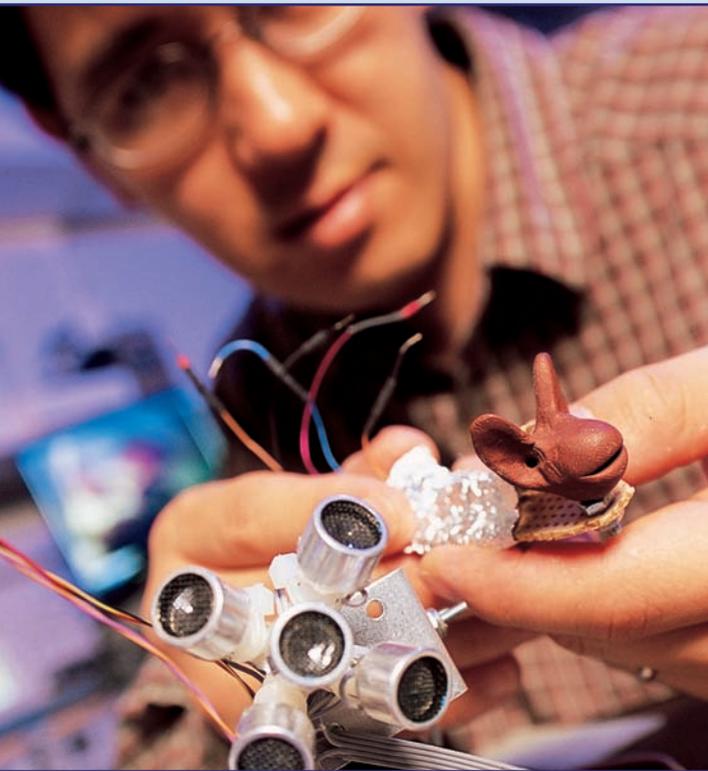
THE MAGAZINE OF THE A. JAMES CLARK SCHOOL *of* ENGINEERING

# You Can Be Part of the Plan

Seeking Alumni Comment for the Clark School Strategic Plan, 2009-2014

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Please note that *Engineering @ Maryland* refers to the A. James Clark School of Engineering by that name in all cases, including stories that describe alumni who graduated before the name was established, in 1994, to honor Mr. Clark's outstanding philanthropy.



## Dear Friends,

How many Clark School alums and current students became engineers because of the U.S. space program?

I am sure that the massive engineering efforts responsible for landing a man on the moon (40 years ago this year), sending satellites far into the solar system, and erecting the international space station have inspired many of us, including those who did not study aerospace engineering.

Indeed the Clark School has produced a significant number of space program leaders:

- Michael Griffin, Ph.D. '77, aerospace engineering, was NASA administrator during the George W. Bush administration.
- Draper Prize winners and Innovation Hall of Fame inductees Jim Plummer, M.S. '53, electrical engineering, and Ed Miller, B.S. '50, mechanical engineering, were leaders in the top-secret Corona satellite surveillance program.
- Judith Resnik, Ph.D. '77, electrical engineering, gave her life as an astronaut on the ill-fated Challenger shuttle.
- And many others who have served as program leaders and engineers at NASA and other organizations.

## How many young people will Jeanette Epps inspire?

Among our many faculty members involved as researchers and consultants, Gregory Baecher,

Glenn L. Martin Institute Professor of Engineering, has just been appointed to the Planetary Protection Subcommittee of NASA's Science Mission Directorate.

We have recently learned that another Clark School alumna, Jeanette Epps, M.S. '94 and Ph.D. '00, aerospace engineering, has been named an astronaut candidate and began her two-year training at the Johnson Space Center this summer.

I know you share my pride in her selection to this program and join me in wishing her success in training and in future missions.

Who knows how many young people Jeanette Epps will inspire to become engineers?

Darryll Pines  
Dean and Nariman Farvardin Professor

**Note:** To learn more about the Clark School's contributions to the space program, and the many ways current students are preparing to make their own contributions, please visit [www.eng.umd.edu/future/future\\_space.html](http://www.eng.umd.edu/future/future_space.html).

## Lessons from the Master

The 3<sup>rd</sup> annual Fischell Festival this spring centered on advanced medical technology. The event featured the official launch of the Robert E. Fischell Institute for Biomedical Devices, a live surgical case involving the latest in medical robotics, and presentations by faculty members, corporate representatives and the president of the Institute of Medicine. But no one taught attendees more about the challenges and satisfactions of medical technology development than the festival's namesake.

Robert E. Fischell, M.S. '53, physics, took the occasion to introduce his latest medical device, the "Svelte Stent." A Clark School benefactor who received the university's 2009 President's Distinguished Alumnus Award, Fischell has spent much of his career improving devices that reopen and keep open blocked coronary arteries. The Svelte Stent provides surgeons with

an elegant, all-in-one method of opening a blocked coronary artery and placing the stent within it, and emits a new drug from an innovative coating on its surface to reduce scar tissue, solving two challenges faced by physicians.

Patients who cannot be helped with a stent may be candidates for an exciting new alternative to traditional open heart surgery: a fully endoscopic coronary artery bypass procedure using a da Vinci robot. Festival attendees had the rare opportunity to watch the stunning procedure via live video as it was performed in Baltimore by Johannes Bonatti, M.D., a University of Maryland School of Medicine professor of surgery and cardiac surgeon, and one of only two doctors nationwide who can perform this procedure. Bartley Griffith, M.D., a professor and director of the division of cardiac surgery and cardiothoracic transplantation at the School of Medicine, was on hand to describe the procedure to the audience in the Kim Engineering Building.

The Robert E. Fischell Institute for Biomedical Devices was officially launched at the festival. "The overarching purpose of the institute is to get devices out

**Left, Graduate students presented their work at the Fischell Festival's poster session. Below, Harvey Fineberg, president of the National Academies' Institute of Medicine, discusses medical innovation.**



PHOTO BY AL SANTOS



PHOTOS BY LUISA DIPETRO

**Graduate Program in Bioengineering student Deborah Sweet is congratulated by Robert E. Fischell (right) and Robert E. Fischell Distinguished Professor and bioengineering department chair William Bentley. Sweet was selected for the 2009 Fischell Fellowship in Biomedical Engineering for her research on an oral drug delivery system for chemotherapy drugs that are traditionally administered intravenously.**

of the labs and into practice using the 'Fischell Factors'—the same development criteria that Dr. Fischell uses for his own devices and business ventures," explained Department of Bioengineering Chair and Robert E. Fischell Distinguished Professor William Bentley. Bentley's own vision of bioengineering is one in which ever-smarter implanted devices will monitor their own status and the status of the patient and report back to doctors. For more information about the institute, and about donating to its success, contact Leslie Borak at 301-405-0317.

Representatives from some 16 companies and organizations, from the U.S. Food and Drug Administration to Igene Biotechnology, demonstrated new products and discussed careers in bioengineering, biomedical engineering and biotechnology. That evening, Harvey V. Fineberg, M.D., Ph.D., president of the National Academies' Institute of Medicine (pictured left), gave a Whiting-Turner Business and Entrepreneurial Lecture examining medical technology innovation vs. affordability.

*To view lectures and surgery and learn more about the festival, see [bioe.umd.edu/fischellfestival](http://bioe.umd.edu/fischellfestival).* ■

# Clark School Explores Energy Sustainability

What can we do today to ensure the availability of natural resources tomorrow? Clark School Dean Darryll Pines created the first Engineering Sustainability Workshop to find out. Presented on Earth Day 2009 with co-sponsors the University of Maryland Energy Research Center and Office of Sustainability, this year's workshop focused on energy. More than 100 faculty members, students and guests from academia, industry and government gathered for a day-long event to present and learn about research ranging from nanotech storage devices that make alternative energy sources feasible to highly efficient heating and cooling methods.

Dean Pines welcomed participants and was followed by a host of presentations from business and industry leaders and faculty members. Jim Connaughton, executive vice president for corporate affairs and public and information policy at Constellation Energy, discussed his company's approach to sustainability. Ross Tyler, director of clean energy at the Maryland Energy Administration, talked

## Students showcase energy-related research.



PHOTOS BY AL SANTOS

about the state of Maryland's clean energy development initiative. Keynote speaker Dawn Rittenhouse, director of sustainable development at DuPont, shared how sustainable engineering is becoming profitable at Dupont.

Among the faculty presenters, Gary Rubloff, Minta Martin Professor of Engineering and director of the Maryland NanoCenter, explained his group's research into nano-

structured electrodes that can serve as storage devices for alternative energy sources such as wind and solar, which are intermittent and thus ineffective sources for many requirements. Rubloff's structures can hold more energy, charge and deliver electricity faster, and remain stable longer than existing devices, solving many of those issues. Ichiro Takeuchi, professor of materials science and engineering, described his successful search for a new piezoelectric material to replace lead in electronic devices and thus reduce the amount of lead that ends up in the ground after recycling. Sheryl Ehrman, associate professor of chemical and biomolecular engineering, presented her group's solution to the intermittency of solar power: the use of photoelectrochemical systems to convert sunlight into hydrogen split from water. Plentiful hydrogen from sunlight could serve as a new energy source to fuel cars. Additional presentations covered the future of nuclear energy, polymer electrolyte membrane fuel cells, propulsion applications for biodiesel fuel, and many other topics.

To view webcasts of workshop sessions, visit [www.eng.umd.edu/sustainability/](http://www.eng.umd.edu/sustainability/). ■



Ross Tyler highlights the state of Maryland's clean energy development initiative.

## Certificate and Lab Pave Way for Successful Entrepreneurs

Two new initiatives within the Clark School's Maryland Technology Enterprise Institute (Mtech) will make it easier for technology entrepreneurs to launch successful ventures.

Mtech and the Clark School's Office of Advanced Engineering Education are jointly offering a new four-course Graduate Certificate in Engineering in Technology Ventures and Innovation. The certificate program is designed specifically for entrepreneurial engineers, scientists and technologists to learn about the best practices and tactics for moving their ideas to the next level.

Students will take two core courses covering the fundamentals of technology startup ventures and strategies for managing innovation. They can then choose two of four electives that cover

innovative thinking, corporate technology venturing, engineering decision-making and 21<sup>st</sup> century manufacturing. For more information, visit [www.advancedengineering.umd.edu/innovation](http://www.advancedengineering.umd.edu/innovation).

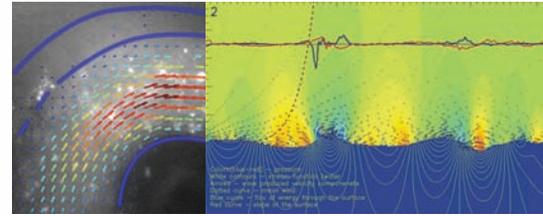
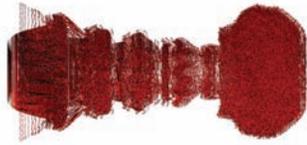
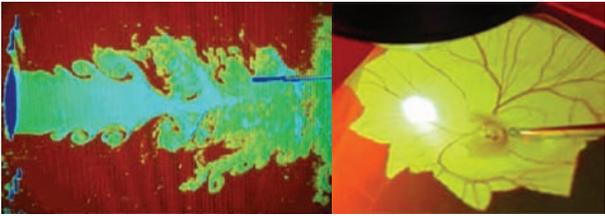
### TERP Startup Lab

Local technology entrepreneurs can now test the feasibility of their new ventures at the Tech Entrepreneur Research and Prototyping (TERP) Startup Laboratory. Located in Mtech's Technology Advancement Program (TAP) building, the TERP Startup Lab gives entrepreneurs a place to quickly develop technology prototypes and receive other needed assistance to start their companies.

Science Applications International Corporation (SAIC) provided \$35,000 in funding for soft-

ware and equipment for the lab, which features 700 square feet of furnished space. Participants receive a mailbox, company listing, shared conference rooms, and free access to basic hardware and software development tools, including Microsoft BizSpark, a complete suite of Microsoft development tools and productivity software.

"The TERP Startup Lab is the next logical step for students and researchers who have been tinkering in the off hours in a dorm room, an academic lab or a garage and now need a space dedicated to moving their idea to the prototype or product stage," says Dean Chang, director of Mtech's venture and education programs and director of TAP. Interested entrepreneurs can learn more and apply to enter the lab at [www.startuplab.umd.edu](http://www.startuplab.umd.edu). ■



## Interdisciplinary, International Burgers Program Advances Fluid Dynamics



Jan Burgers

It began as a seminar series called Fluid Dynamics Reviews some 40 years ago. In 2004 it was established as the Burgers Program for Fluid Dynamics at the University of Maryland, in tribute to one of the great fluid dynamics experts, the late distinguished scientist and University of Maryland professor Johannes (Jan) Burgers. Today it is one of the university's most successful interdisciplinary, international collaborations, celebrating its fifth anniversary this fall at its annual symposium (see box).

"Fluid dynamics is a fundamental activity in engineering—from hydrology in civil engineering to blood flow in bioengineering to the flow that keeps planes in the air that is at the heart of aerospace engineering," says Jim Wallace, Burgers Program director. "The program fosters innovation and collaboration in the field; helps attract leading faculty members, top-quality graduate students and research funds; increases awareness of Maryland's fluid dynamics work; and recognizes the strong legacy of Jan Burgers."

Today the Burgers Program, supported by the endowed Burgers Fund, brings together more than 60

faculty members across 18 different academic and research units, primarily within the A. James Clark School of Engineering and the College of Computer, Mathematical and Physical Sciences. The program was the first to be recognized by the university's Graduate School as an interdisciplinary field committee, and subsequently has received a grant from the school to enhance graduate education in fluid dynamics throughout the university. The program's annual day-long Burgers Symposium features a keynote lecture, other invited presentations and a poster session displaying current graduate and postdoctoral student research.

Each year, graduate students and faculty members participate in exchanges with most of the Dutch universities that participate in the J.M. Burgerscentrum, a consortium of faculty interested in fluid dynamics that spans the University of Delft (where Burgers had a long and distinguished career before coming to Maryland), and universities in Twente, Eindhoven, Leiden and other locations in the Netherlands.

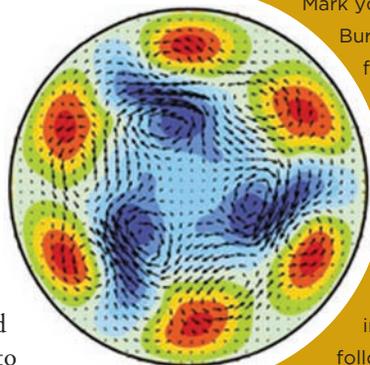
The program also interacts closely with the Center for Applied and

Environmental Fluid Mechanics of Johns Hopkins University in organizing an annual graduate student/postdoctoral fellow showcase symposium. The venue for the symposium alternates between the two institutions, with representatives of the region's fluid dynamics community in attendance.

In May 2010, the Burgers Program will host a four-day intensive "tutorial school" on turbulence for graduate students from around the country and abroad, including instruction and practice activities. ■

### Burgers Symposium Set for November 18

Mark your calendars now for the Burgers Program Symposium set for November 18 from 1 to 6 p.m. in the Kay Boardroom of the Kim Engineering Building. Keynote lecturer Kees Vuik, director of the Center for Computational Science and Engineering at Delft University of Technology in the Netherlands, will be followed by three additional presenters and a poster session. For more information, contact Jim Wallace at [wallace@umd.edu](mailto:wallace@umd.edu) or visit the Burgers Program website at [www.burgers.umd.edu](http://www.burgers.umd.edu).



## Energy Center Names First Director



**ERIC WACHSMAN**, an expert on solid oxide fuel cells and a dynamic leader who emphasizes interdisciplinary systems approaches, has been named the first director of the University of Maryland Energy Research Center.

Wachsman spearheaded the creation of the Florida Institute on Sustainable Energy at the University of Florida, in Gainesville, Fla.

Wachsman received a Ph.D. in materials science and engineering from Stanford University and a B.S. in chemical engineering from the University of California, Berkeley.

A fellow of The Electrochemical Society and past chair of its High Temperature Materials Division, Wachsman has focused on developing advanced, efficient, energy conversion devices and technologies. His research is on ionic transport in solids and the heterogeneous electrocatalysis at their surface.

Wachsman is editor-in-chief of *Ionics*, formerly an associate editor of the *Journal of the American Ceramic Society*, councilor of the Florida Section of the American Ceramic Society, and a member of the American Chemical Society, the International Society for Solid State Ionics and the Materials Research Society. A frequent invited panelist on fuel cell and hydrogen energy research, Wachsman has more than 140 publications and eight patents on ionic and electronic transport in ceramics, their catalytic properties and device performance.

## Clark School Honors Great Teaching and Service to Students



**ALISON FLATAU**, director of the aerospace engineering department's undergraduate and honors programs, received the 2009 Clark School Faculty Service Award. Under her guidance, Clark School students have presented research projects that have won eight of nine American Institute of Aeronautics and Astronautics (AIAA) undergraduate awards over the past three years.

Flatau is the faculty advisor for the student chapter of AIAA, which hosted the regional student conference last year and won the best student chapter award for 2008. She is a prolific researcher, having published 10 archival journal papers and 21 proceedings papers last year alone, in addition to serving several professional organizations as a conference chair, associate chair or reviewer.



**KENNETH KIGER** is one of two recipients of the 2009 Poole and Kent Teaching Award for Senior Faculty. As a Keystone professor, he teaches ENES 100, one of the first engineering courses all Clark School students take. Kiger was instrumental in developing the hovercraft competition that is now the highlight of ENES 100. He has also served on the mechanical engineering undergraduate curriculum committee, on a committee to incorporate mathematics instruction into engineering courses and on the Clark School Strategic Planning Subcommittee for Undergraduate Education. Outside of the classroom, Kiger has traveled to Ecuador with Engineers Without Borders.



**PETER SANDBORN**, who has developed an undergraduate elective on electronic system design and a university honors course titled "Selling Technology - The Success and Failure of Technological Things," also received the teaching award. He was honored for his contributions to a departmental capstone course and for serving as an advisor to project teams in the school's QUEST (Quality Enhancement Systems and Teams) program, a multidisciplinary, reality-centered program for undergraduates from the Clark School, the Robert H. Smith School of Business and the College of Computer, Mathematical and Physical Sciences. In addition, he mentored a national prize-winning student science project at Wilde Lake High School in Columbia, Md.

The **CENTER FOR ENERGETICS CONCEPTS DEVELOPMENT** (CECD) recently celebrated its 10<sup>th</sup> anniversary. CECD, directed by Professor Emeritus of Mechanical Engineering (ME) **DAVINDER ANAND**, joins Clark School faculty with government experts at the nearby Naval Surface Warfare Center, Indian Head Division, to conduct research and provide energetics expertise for U.S. military personnel around the globe. See [www.cecd.umd.edu](http://www.cecd.umd.edu).

Professor **SHUVRA BHATTACHARYYA**, electrical and computer engineering and Institute for Systems Research, was selected for a Fulbright Senior Specialist Grant at the Salzburg University of Applied Sciences, Austria. The grant will allow him to advise on a new master's degree program that the Austrian university is developing in embedded signal processing.

Assistant Professor **SEAN HUMBERT**, aerospace engineering (AE), received the 2009 Hal Andrews "Young Engineer/Scientist" Award from the National Capital Section of the American Institute of Aeronautics and Astronautics (AIAA) for revolutionary contributions to modeling micro-air vehicle (MAV) dynamics, insect sensorimotor pathways and associated bio-inspired sensors that enable the next generation of autonomous MAVs.

AIAA has elected Willis Young Professor **MARK LEWIS**, AE, as its president-elect. An AIAA fellow, Lewis is a former chief scientist of the U.S. Air Force.

The National Academy of Engineering has elected University of Maryland President **C. DAN MOTE, JR.**, as its new treasurer.

Mote is the Glenn L. Martin Institute Professor of Engineering in ME.

Professor **MICHAEL PECHT**, ME, accepted the National Science Foundation's Alexander Schwarzkopf Prize for Technological Innovation for the work of the **CENTER FOR ADVANCED LIFE CYCLE ENGINEERING** (CALCE). CALCE won the award for its research on physics-of-failure reliability analysis methods and advanced supply chain management concepts for electronic products and systems.

**MIROSLAW SKIBNIEWSKI**, the A. James Clark Professor in Civil and Environmental Engineering, was awarded a *Doctor Honoris Causa* of Vilnius Gediminas Technical University in Lithuania.

# You Can Be Part of the Plan

Seeking Alumni Comment for the Clark School Strategic Plan, 2009-2014



## Dear Clark School Alumni and Alumnae,

How do you make a great engineering school even better? One of the very best? One that makes a powerful positive impact in the lives of its students—and in the world?

You start by setting high goals, creating a plan to achieve them and asking those who care most to add their ideas.

We're asking you, our Clark School alums.

This article introduces the four sections of the Clark School Strategic Plan, 2009-2014:

1. Undergraduate Education
2. Graduate Education
3. Research
4. State, National and International Engagement

For each section, the article describes a few of the many strategies (specified by reference number) developed to date. Take a look at this sampling, and the comments of students, faculty, corporate partners and our Board of Visitors members. Then use the link provided at the end of the article to visit a special web site that will let you view the entire draft plan and offer your ideas and suggestions.

This is a great opportunity to get involved with the future of your school. Please take advantage of it. We're counting on your ideas to help ensure our continued rapid progress.

Darryll Pines  
Dean and Nariman Farvardin Professor



PHOTO BY ADRIAN HOOD



## Section 1: Undergraduate Education

Among the plan's many strategies for improving undergraduate education at the Clark School, several concern the essential tasks of introducing students to the real-world engineering challenges they will soon face, so that they leave the Clark School ready to lead. *As an alum, what would you suggest in this regard?*

### Goal I.5: The Clark School will do more to ensure that our students are better prepared to face the challenges immediately presented to them upon obtaining their degrees and entering the professional world.

Greg Moores, B.S. '80, mechanical engineering (ME) and vice president of engineering for DeWalt, Inc., a division of Black & Decker and one of the world's leading manufacturers of industrial power tools, says 25 percent of Black & Decker engineers are recruited from the Clark School. He attests to their skills and job readiness. "The Clark School focuses on the practical application of engineering and teaches students how to apply engineering principles. When students graduate, they are ready for the workplace," says Moores, a member of the Clark School Board of Visitors.

Black & Decker plays a key role in making this happen, and in doing so provides a model for many industries. The company is actively involved in ENME 371 *Product Engineering and Manufacturing*. There, students propose enhancements to actual Black & Decker products, and company experts provide direct feedback and explain the company's product development process. "When it comes time to recruit students from the Clark School," Moores explains, "they have test-driven us, and we know them." *Could an analogous approach be applied in other industries with other companies?*

### Strategy I.5.A: Establish a Clark School Writing/Presentation Center to improve students' professional communications skills.

*When you were a student, did you understand the importance of communications for your future career? Would you recommend an engineering-oriented Writing/Presentation Center for today's students?*

"The value of an engineering degree lies in one's ability to critically analyze any issue or situation," says University Medalist Phil Hannam, B.S. '09, ME (see related story, p. 19). "Writing is a vital tool for communicating that knowledge and understanding. I strongly support a program to increase writing abilities, particularly with a focus on translating technical issues to language easily understood by both experts in other fields and laypeople."

Greg Moores concurs. "Writing and presentation skills are keys to success for engineers," he says. "The days of the engineer secluded in the lab are over; engineers constantly interface with people, and they must have people skills."

### Strategy I.6.A: Foster a sense of pride and unity among Clark School freshmen by creating and presenting a bonding experience for them prior to the start of the fall semester.

Many people would agree that long before students enter the job market, they need to develop pride in engineering and their school, strengthen their self-confidence, learn teamwork, and form friendships that will last well into their careers.

*Would a "bonding experience" start that process?*

James V. Green, director of the Hinman CEOs and associate director of entrepreneurial education for the Maryland Technology Enterprise Institute (Mtech), believes a shared experience can capture the elements of entrepreneurship, innovation and leadership for incoming students. "Engineering is a team sport both in the classroom and in the work world," says Green. "Becoming adept at working in a team and learning how to lead and follow are qualities that may not be discussed in a traditional engineering curriculum. A dynamic, collaborative learning opportunity would make students feel embraced by the school and excited about their academic careers."

Alumnus Phil Hannam suggests the Clark School design the event in part to convey the value of interaction with students and faculty in the university's other schools as well, concluding, "Any experience that creates bonds between students is a good thing."

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### Strategy I.4.C: Develop a junior/senior year... design course in which faculty members from several departments assist students in projects (that) focus on high-level challenges requiring integration of several disciplines...

*Did you do projects with students and teachers outside your department when you were in school?* Strategy I.4.C places older, more knowledgeable students from different majors in a design experience analogous to—but more challenging than—the ENES 100 class, which creates teams of freshmen to build and race an autonomous hovercraft. “Students from multiple disciplines will take on a high-level problem in teams, as in a professional setting,” says Avi Bar-Cohen, ME professor and chair. “Employers want students with experience in teamwork and communication, ready to lead early in their careers,” adds Joe Schork, chair of the Department of Chemical and Biomolecular Engineering. “This plan will provide that experience.”

Linda Schmidt, an ME associate professor who has been honored for her design work, envisions projects ranging from harnessing water power to generate electricity, to tracking the sun for solar arrays. She says, “It’s fun to work with students as they design and build prototypes and test them against requirements. Throughout the process, students have ‘eureka moments’ when their engineering skills manifest to push the project forward.”

8 Students enjoy project-based work because “it really excites them,” says David Bigio, ME associate professor and director of the department’s undergraduate studies. “They are eager to see if their ideas can actually be used by companies.”

Bar-Cohen builds on that point. “Many of our students generate intellectual property, but too often they leave ideas on the table when they graduate. A course like this could help us capture these assets for the benefit of the student and the university and ultimately address one of society’s unmet needs.”

## Section 2: Graduate Education

*Were you, as an engineering graduate student, well prepared to enter the academic world and succeed as a researcher and teacher? Or to work in the corporate world with engineers outside your area of specialization?* Two strategies in the plan’s Graduate Education section address these questions.

### Strategy II.4.B: Continue to offer the Clark School’s Future Faculty Program, including training in writing and presentation skills, grantsmanship and a mentored teaching experience, for students who plan academic careers.

“As a leading academic institution, the Clark School has a responsibility to help produce great engineering teachers for future generations,” notes Professor and Associate Dean Mark Shayman. “We created the Future Faculty Program to increase the number

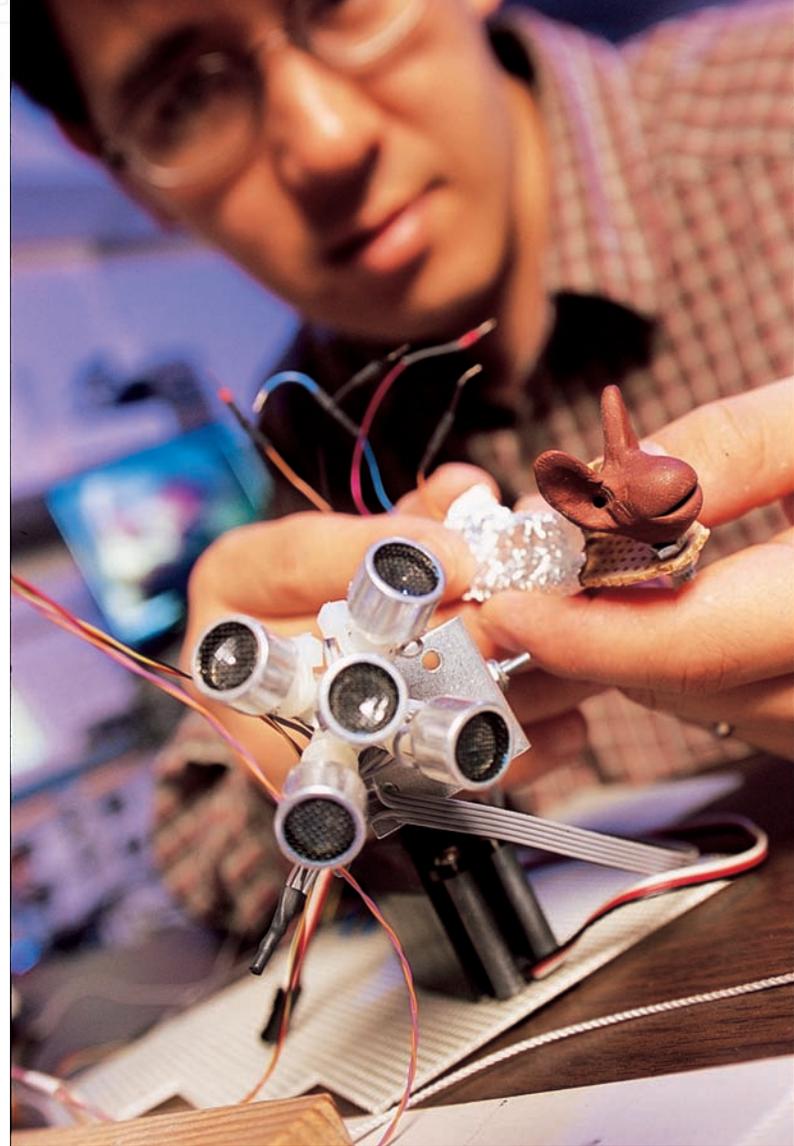


PHOTO BY JOHN T. CONSOLI

of highly qualified teachers the Clark School produces and to prepare participating students to achieve career-long success in the academic world as teachers and researchers.”

The new program has begun to yield promising results. Fellow Enlu Zhou recently accepted a position as an assistant professor at the University of Illinois. Fellow Omar Abdel-Aziz cites the value of the class interaction and student feedback he experienced in the program’s teaching practicum. Fellow Anand Veeraragavan has broadened his understanding of the typical assistant professor’s daily life: “You serve on various academic committees, teach, conduct research and write proposals for funding almost simultaneously. It has to be a perfect juggling act.” Strengthening and expanding the program, which now accepts 20 new fellows annually, will require additional resources.

### Strategy II.I.G: Encourage the development of new interdisciplinary programs... to reflect the actual needs of much contemporary research and development.

Many people would agree that solutions for the world’s most complex problems will not come from any one engineering discipline, and that graduate education should thus include interdisciplinary experiences. A good model is the Clark School’s new sustainable energy engineering degree program,

# Do you agree with these research priorities?

## What else might be considered?

which “was created in less than a year to meet the growing demand for sustainable energy engineers worldwide. The response has been tremendous,” says George Syrmos, executive director of the school’s Office of Advanced Engineering Education. “The program is truly interdisciplinary, bringing together mechanical engineering, chemical and biomolecular engineering, nuclear engineering, reliability engineering and systems engineering, and provides real breadth and depth in the subject.”

In developing programs, Syrmos notes, “We have a sense of the needs of the engineering community, and we approach the private and public sectors and look at national and international trends to identify promising areas.” Syrmos signals bioengineering, nanotechnology, infrastructure security and management of technology as key areas that could provide interdisciplinary opportunities in the future. *What programs would you envision?*

### Section 3: Research

George Syrmos’s sense of potential new graduate programs (see above) is in full alignment with the Clark School’s research priorities, as spelled out in the strategic plan’s research section:

**Strategy III.2.A: Develop national and international research leadership in biotechnology, nanotechnology and sustainability engineering systems, critical research areas that encompass work in all departments...**

In each of these areas, the plan recommends building on the successes of the school’s related centers: the Fischell Department of Bioengineering and Robert E. Fischell Institute for Biomedical Devices, the Maryland NanoCenter, and the University of Maryland Energy Research Center (see related story, p. 5). *Do you agree with these priorities? What else might be considered?*

To define specific research activities within these and other important areas, the plan calls for two parallel approaches. First, the school should establish an advisory group (Strategy III.1.B), and, at the same time, the school should encourage research ideas to arise from its faculty members and their labs (Strategy III.2.B),



including innovative cross-disciplinary efforts.

Sarah Bergbreiter, ME assistant professor, has been encouraged by the school’s receptiveness to new research ideas and the collaboration she sees among faculty members. She recently won a Young Faculty Award from the Defense Advanced Research Projects Agency, given to rising stars in university microsystems research, for her work on microrobots.

“Some of my most interesting research is occurring at the boundaries of computer science, mechanical engineering, and electrical and computer engineering. They all need to mesh to achieve research goals,” she says. “When you collaborate, you are more likely to find yourself in new research areas, and you are able to answer questions in interesting ways.”

André Marshall, associate professor of fire protection engineering, believes the school must take formal steps to establish interdisciplinary research centers and help faculty form research connections. He has been instrumental in planning the meeting of the Eastern States Section of the Combustion Institute, involving faculty from mechanical, fire protection and aerospace engineering. “This activity is a way young faculty can interact and demonstrate strength in their areas of expertise, and is important in enhancing their reputations,” says Marshall.

# The Evolution of the Strategic Plan

The Clark School Strategic Plan reflects the structure and spirit of the new University of Maryland Strategic Plan; however, while the university plan covers 10 years, the school plan covers five. The Clark School's plan will be used by the school and its units, the Office of the Provost and other University of Maryland schools and units that interact with us or wish to learn how we function.

The plan is being developed in an open process. Dean Darryll Pines established four faculty-staff committees to focus on each of the four key sections of the plan and appointed leaders for each:

- Undergraduate Education, led by William Fourney, Keystone professor and associate dean of engineering
- Research, led by Rob Briber, professor and chair of the Department of Materials Science and Engineering
- Engineering Graduate Education, led by Mark Shayman, associate dean for faculty affairs and professor of electrical and computer engineering
- International and Local Engagement, led by Avi Bar-Cohen, professor and chair of the Department of Mechanical Engineering.

Over several months, committee members met to discuss plan components, draft language and make revisions. The plan has been offered for review to Clark School faculty, staff, students, Board of Visitors members, selected volunteer groups, and, with this publication, Clark School alumni. When complete, it will be presented to the provost and serve as the guiding document for the Clark School through 2014.

## Strategy III.I.C: Allocate and invest Clark School Incentive Funds to support new, unfunded research by faculty groups that will lead to new, large, multidisciplinary research centers...

Ultimately, whether they come from the top down or the bottom up, most new research ideas will require support in their early stages. The proposed Clark School Incentive Funds would help pay for new research in the hope that preliminary success will lead to further support by major government funding agencies.

David Fischell, M.D., chief executive officer of Angel Medical System, Clark School benefactor, a trustee of Cornell University and chair of the advisory board for its Department of Bioengineering, is a champion of such funds. "Seed grants have the potential to support transitional projects that take the science and engineering disciplines into medicine," says Fischell, who has founded 10 medical device companies. "There is significant potential for technological transfer."

Fischell explains that to gain government funding, research must be underway and, in some cases, must have preliminary results. "It is nearly impossible to find money to conduct research in a compelling new area. With seed funding, if the research is successful, you have established a baseline to get regular government grants," he explains. "Seed grants of less than \$500,000 can yield more than \$3 million in follow-on government grants and continued projects. There is almost nothing that will yield a greater return."

## Section 4: State, National and International Engagement

To prepare students to master opportunities and challenges anywhere—Maryland, Malaysia or Madagascar—and to find new partners for mutually beneficial initiatives, the Clark School has developed a set of proposals for expanding our engagement with the world at state, national and international levels. *Do you think foreign study is important for engineering students? Do you think the school should be more involved in state, national and international challenges?*

### Strategy III.2.C: Encourage strategic partnerships with other schools, government agencies and corporations that combine research and education...

Models for such partnerships include the Clark School's creation of an M.D./Ph.D. program with the University of Maryland School of Medicine, in which the two organizations have a single point of contact in joint research proposals and place students in each other's labs; and the pilot program, involving the Clark School, the Naval Air Warfare Center, College of Southern Maryland and Southern Maryland Higher Education Center, to explore joint activities leading to aerospace and mechanical engineering bachelor's degree programs in proximity to the Patuxent Naval Air Station. *Do you know of other partnership opportunities the school might pursue?*

Entrepreneur and Clark School Board of Visitors member Brian LeGette, B.S. '89, electrical engineering, envisions members of the board working with peers from other schools in the university and from corporations and government organizations to develop collaborations to solve society's most pressing social and economic problems and "to put the Clark School even more in the center of the action." As the school identifies major research interests, board members "can put out feelers to individuals and companies they know." *What types of challenges do you think the Clark School and its partners might take on?*

### Strategy IV.2.D: Hire adequate staff to develop for both students and faculty members new international internships and expanded exchange programs with top universities abroad...

Stephen J. Woerner, senior vice president for gas and electric operations and planning with Baltimore Gas and Electric Company and



PHOTO BY AL SANTOS

a Clark School Board of Visitors member, is an advocate for study and work abroad. “International internships offer meaningful work opportunities and accelerate the transfer of learning,” he says. “The sooner students have the experience, the more they can do to make a difference in the world, resulting in a higher level of student engagement and a more complete learning experience.”

“Students see there are many ways to learn and approach work and decision-making. Working abroad, students gain an understanding of different cultures, beliefs and lifestyles,” he adds.

Board of Visitors member Ram Mukunda, B.S. ’79, math and EE, M.S. ’81, EE, and chief executive officer of India Globalization Capital, Inc., believes the Clark School should pursue internships with organizations such as NATO, government agencies and U.S. military bases abroad. In addition, “We should establish programs with the best schools in the world and look at world-class multinationals like Nokia, Infosys and Siemens.”

He cites a number of long-term benefits. “The Clark School is already one of the country’s top engineering schools, and this could move us even further ahead. If students travel to Sweden to learn about sustainable urban planning or alternative energy, those students come back and can implement their ideas in the state and in the region.”

Michel Cukier, ME/Institute for Systems Research associate professor, began a collaboration with the National Engineering School of Bourges (ENSIB), France, located 150 miles outside Paris, four years ago, capitalizing on ENSIB’s expertise in computer security and risk assessment. During the last academic year, 30 undergraduate students from ENSIB served internships at the Clark School. Two ENSIB students also joined the Clark School as Ph.D. students.

Each fall Cukier travels to ENSIB to present Clark School research and recruit new student interns. Some 15 Clark School faculty members help in advising the ENSIB students. Next sum-

mer, Cukier will offer a three-week summer undergraduate course for Clark School students at ENSIB. This partnership could be a model for other schools in other countries, he notes, adding, “This type of relationship has the potential to build an international presence for the Clark School.”

## How You Can be Part of the Plan

Now that you have glimpsed a few of the many strategies developed for the Clark School Strategic Plan, 2009-2014, and started thinking about your own recommendations, please consider putting your ideas into action:

- Request access to the Strategic Plan at [www.eng.umd.edu/alumni/strat-plan-request.html](http://www.eng.umd.edu/alumni/strat-plan-request.html)
- Provide your e-mail address and year of graduation, and we will send you the address for the online plan.
- Review the plan online.
- Comment on specific strategies and/or make general observations using the response windows.
- We will add your submitted comments to those we have received from faculty, staff, Board of Visitors members, and others. We will consider them for inclusion in the plan or in the corresponding implementation document.

“We encourage all members of the Clark School community to send us their thoughts on the plan and contribute to our progress,” concludes Dean Pines. “The next five years will be exciting ones—be a part of it!” ■

*Note: If you do not have Internet access or would prefer a printed copy of the plan, please send your name and mailing address to Missy Corley, Clark School of Engineering, 3230 Kim Engineering Building, College Park, MD 20742-2831.*



PHOTO COURTESY OF ENGINEERS WITHOUT BORDERS

# First, How We Use Phones and Computers.

## Next, How We Watch TV.

### Buno Pati's Innovations Change Our Lives

**B**uno Pati, B.S. '86, M.S. '88 and Ph.D. '92, electrical engineering (EE), has, in his relatively short career, been a major force in the development of the ever-shrinking, multi-functional digital devices we use to communicate, find our way and entertain ourselves. For these contributions, he has been selected as the 2009 Clark School Innovation Hall of Fame inductee.

When Pati is inducted into the hall in October, it will be a milestone for him, but certainly not the end of the road. Not only did he develop phase-shift lithography, he helped start Numerical Technologies, the company that “productized” it, sold that company to Synopsis, Inc. and, with Phil Wisner, B.S. '90, EE, started another one. Called Sezmi, their new company creates products designed to change the TV viewing experience by bringing together in one “network” all the sources of video content available today, including the Internet, and making it easy to manage those sources in a personalized yet automated way. His ideas promise to be transformative for television, pointing to a kind of viewing that reflects the needs and interests of a new generation.

Before launching his companies, Pati served as assistant professor of electrical engineering and computer science at Harvard University and a postdoctoral research associate at Stanford University. He now serves on the University of Maryland Board of Trustees, the Clark School Board of Visitors and the President's West Coast Advisory Council. He also serves as a co-chair of the university's scholarship endowment fund campaign. Recently Pati talked to *E@M* about his activities and the key factors in his success.

**Q: Who were your mentors at the Clark School, and do you stay in touch with them today?**

**A:** “If I were to pick one person, it would certainly be my thesis advisor Perinkulam Krishnaprasad, professor of electrical and computer engineering. He did not constrain me or other students in our research pursuits. He gave us lots of freedom, and that is incredibly valuable. In many ways, my work drew him into new areas, which he supported. I am at the university three times a year for various board meetings, and I do look him up.”

**Q: What led to your first entrepreneurial venture with Numerical Technologies?**

**A:** “That was a function of moving to Stanford and the Silicon Valley area in the early to mid-1990s when there was a flurry of activity, mostly around Internet companies and a variety of start-up technology companies. You can't avoid thinking about entrepreneurship in that environment.

“The core technology for Numerical Technologies came from my work at Stanford. The environment fosters thinking about commercial applications that you



can either take into the market yourself as a company or someone else can take and run with. The Clark School did not have that environment at the time, but it has since developed it.”

**Q: What were key factors in your success?**

**A:** “Aside from timing and luck, having the right people around you is very important. It goes along with the environment. I had some very good people, as board members, general advisors and mentors, who provided the right infrastructure.”

**Q: Did your ventures seem risky to you at the time?**

**A:** “I get asked that question constantly. Most people who start companies or even join early startups do not think about it in terms of risk. They would be focusing on the wrong things. You need to look at what you get to build. Do you come out of it with a set of skills that are more valuable? In startups, you are able to do a number of things you could never do in a large company. An engineer could be involved in or even drive a marketing effort. Those are skills that are valuable throughout your career.

“The most difficult thing was calling my father, who is a long-time professor at Maryland. He had been in academe for 45 years and came from a very academic family. I told him that I was leaving Harvard (where I was then an assistant professor) to move back to the West Coast to work on this company. The questions that came back to me included risk, but ultimately the big question was: “Do they pay well?” In that context, I thought, who is ‘they’ and what is ‘pay?’”

**Q: What has been the impact of your work on the semiconductor industry?**

**A:** “The net impact is very high. The semiconductor industry, at the time, was struggling with the dilemma of continuing to decrease feature sizes. The engine for that industry has been the continual decrease in the size of circuit elements, fabricated on a chip that costs less and consumes less power. There was a perceived road block at the time, and we were able to create the technology and tools to enable the semiconductor industry to keep going along its path. Virtually every chip in the world is made using that technology.”

**Q: How would you describe how your work has improved people’s lives?**

**A:** “We use the electronics and chips in virtually every aspect of our lives today, whether it’s the phone or the computer. We have come to count on constant improvement in our gadgets and devices and technology tools. I would say the

## Why Buno Pati Was Selected

The integrated circuit (IC) is ubiquitous in our daily lives—it is the foundation of the cell phone with its mind-boggling array of “apps,” the MP3 music player and the industry that has grown to support it, the GPS systems in our cars, new medical devices and sensors and other technologies we cannot yet imagine. The ability of the IC to provide so many different types of functions in tiny, convenient packages depends on the density of electronic components it can support. Density, in turn, depends on the resolution of submicron lithography, the technique used to fabricate ICs. Buno Pati’s innovation in this field exploits phase-shifting phenomena to achieve finer lithographic features than is possible with diffraction-limited optics—formerly the “state-of-the-art” fabrication technique. His technology is in extensive commercial use, enabling the IC industry to offer the high level of component density, and thus functionality, required for the products we rely on today.

On October 15, Pati will be inducted into the Clark School’s Innovation Hall of Fame. The ceremony will be followed by the Charles and Helen White Symposium on Engineering Innovation, which will explore the impact of his innovations. For more information on the induction activities, visit [www.eng.umd.edu/ihof](http://www.eng.umd.edu/ihof).

flow-through from the semiconductor industry has improved people’s lives.”

**Q: Sezmi is a very different type of company. What steered you in that direction?**

**A:** “What leads you to these things is essentially the opportunity. And the rest is all about learning how to do it. At Sezmi, what we are doing is easy for most people to understand. The environment is very disrupted right now in the television industry. You have digital video recorders, digital televisions and products to push Internet content on to your television set. It’s all available, but it is a very fragmented environment and an unpleasant experience. Most people are struggling with the number of wires and the number of remotes they need. That is almost an ideal setting for someone to come in and say I can change this. I can bring it all together, and I can get rid of the biggest headache most people have, which is the price they pay for services that they largely don’t use. Sezmi is a full replacement for cable and satellite at half the price you would pay for any comparable offering.

**Q: How can engineering schools prepare students to become innovators and entrepreneurs?**

**A:** “Engineers tend to be innovators at heart. Whether or not they exhibit it up front, it’s there. It’s an innate quality

among people who go into engineering.

“Two things are missing in today’s engineering education. Engineering schools typically do a poor job of teaching students to communicate. You can never be an entrepreneur without those skills because you are constantly selling the ideas, the vision and the concept for your business.

“The second one is a little bit harder to teach. In an entrepreneurial setting, you can’t be afraid of going out on a limb. The Clark School is building the necessary support for entrepreneurship and establishing an entrepreneurial culture to reduce that fear. When surrounded with examples of successful startups, students may begin to understand that their perceived risks are not true risks.”

**Q: Do you have any advice for budding entrepreneurs?**

**A:** “If I had one piece of advice it would be to stop thinking and obsessing about every detail. Too often you worry about everything that can go wrong. As entrepreneurs you need to focus on what you are doing right.” ■

## “WHO WOULDN’T WANT TO BE PART OF THAT?” SIEMER BUILDS BRIDGES BETWEEN THE CLARK SCHOOL AND CORPORATIONS AND FOUNDATIONS



**WHEN** Pam Siemer sits down with corporate or foundation leaders, she has one goal: to draw them into the world of the Clark School of Engineering. This is a world in which—every day—talented and hard-working young people learn new skills and ideas, and help brilliant researchers explore world-changing opportunities and challenges.

“It’s the chance to shape the future,” she says. “Who wouldn’t want to be part of that?”

Her infectious enthusiasm for academic engineering’s highest aspirations, and a knack for storytelling, will be the keys to her success as the

Clark School’s new director of development for corporations and foundations. “When I speak with corporate leaders about our students and our work, I get excited about all the opportunities in which our partners can share: supporting scholarships, mentoring students, learning about research across the engineering disciplines—opportunities to find and attract future employees and improve their corporate knowledge and competitiveness.”

### Updating the Corporate Partners Program

The opportunities Siemer describes are offered through the Clark School’s Corporate Partners program. “Corporations can build relationships with the school based on their specific needs as well as advance their own initiatives from recruitment to research to diversity,” she explains. “Our partners range from large to mid-size, most with international reach, and include well-known names in aerospace and defense, construction, energy, computing, communications, consumer products and consulting.” (See three examples, next page.)

The program was created by University Provost and former Clark School Dean Nariman Farvardin seven years ago. It has grown rapidly in that time, and Siemer now has the opportunity to update the program to drive still more growth. “In today’s economy, both companies and the school need to solidify valuable

long-term partnerships,” Siemer says. “Companies get to know their potential workforce first hand through recruiting events, internships, competitions and activities, and stay up to date on the latest research developments. Clark School students and faculty gain a better understanding of industry and its needs and the chance to expand their opportunities. We believe we can make the program even stronger by offering new types and levels of involvement.”

### Expect to be Contacted

Siemer may be less than six months into her new position at the Clark School, but she is certainly no stranger to the Washington, D.C., area or to engineering education. In a nearly 15-year career with Ohio University she served as associate dean for development for its Russ College of Engineering and Technology and became the university’s liaison on Capitol Hill and assistant vice president for external relations. She was instrumental in securing major funding at Ohio and participated in two major capital campaigns. Prior to joining the Clark School, Siemer was executive vice president of the United Way of the Bluegrass in Lexington, Ky.

Starting immediately, Siemer will be contacting current and prospective Corporate Partners, foundations and organizations to learn more about their needs and connect them with Clark School opportunities. Recruiters and technical and business people in technology-oriented organizations should expect to hear from her. “If you are a Clark School alumnus or alumna, we can work together to build a relationship with your employer,” she adds. “The Corporate Partners Program at the Clark School is a win-win for everyone involved. Who wouldn’t want to be part of that?”

*For information on how your organization can participate in the Corporate Partners program, contact Pam Siemer, director of development for corporations and foundations, at 301-405-8289 or [psiemer@umd.edu](mailto:psiemer@umd.edu).*



The DeWalt Conference Room is a much-used venue for Clark School activities.

## Black & Decker Cultivates Engineers



Greg Moores

Black & Decker's partnership with the Clark School began long before the inception of the Corporate Partners program. And while the company has provided funding for the Jeong H. Kim Engineering Building's Black & Decker Learning Center and the mechanical engineering (ME) department's DeWalt Conference Room, its relationship with the school goes far beyond financial support. "The connection is a natural one because the Clark School curriculum takes a team-oriented,

practical approach, and the type of students the Clark School develops is a great fit for our culture," says Greg Moores, B.S. '80, mechanical engineering, vice president of engineering for DeWalt Inc., the industrial power tool division of Black & Decker, and a five-year member of the school's Board of Visitors. A Black & Decker representative, Aris Cleanthous, B.S. '96, ME, also serves on the ME Advisory Board.

Moores says one of the company's most important contributions to the school is ENME 371 *Product Engineering and Manufacturing*, affectionately known by students as the "Black & Decker course." Students in the course study the development of a power tool product as it moves from the lab to the marketplace. DeWalt senior managers lead six classes throughout the semester and host a tour of the company's design center in Towson, Md. The benefits are twofold. "We bring a real-world experience to the academic world, and it is a great way for us to trial-run students," explains Moores. "We like to grow our own engineers from the ground up. The Clark School is like our farm system."

In addition, Moores lectures annually as part of ENES 100, which engages freshmen in a hovercraft team project. "It is great fun for me to talk about what it is like to be an engineer and to give students strong examples of what engineers can accomplish," says Moores. To further solidify its relationship with the school, Black & Decker donates power tools to student activities, such as the Formula SAE team, the Mini Baja team and Engineers Without Borders.

## Northrop Grumman Gains a Technological Edge

Northrop Grumman Corporation's Electronic Systems sector, based in Linthicum, Md., has been actively involved with the Clark School since its inception. "As one of the nation's leading defense contractors, it makes perfect sense for us to have a relationship with the state's flagship university," says George Reynolds, director of industry and university initiatives. He notes the company's Electronic Systems sector expects to continue to supplement their engineering workforce nationwide over the next few years.

Northrop Grumman has provided funding for the Robotics Club and supported annual scholarships, which often come with opportunities for summer internships. Reynolds and the Electronic Systems sector's chief technology officer, James Armitage, also have personally served as judges for student technical competitions.

"Our strategy for university relations is to develop long-term

pipelines and relationships," says Reynolds. "We have that infrastructure and relationship in place with the Clark School."

"We rely on universities and business incubators to augment our key technology development activities and, therefore, we look to the best and brightest students to keep us on the leading edge of technology," adds Reynolds. "The Clark School's geographical proximity and technological depth and acumen are important factors in our relationship. The school truly knows our business and has a sense of urgency about it."

The company also supports the school's Center for Minorities in Science and Engineering. "Diversity and inclusion are important initiatives for us, so it is natural that we work to encourage and support organizations that help under-represented minorities have access and contribute to our business," Reynolds added.

## Booz Allen Hamilton Thrives on Innovation

Booz Allen Hamilton, which joined the Corporate Partners program in 2008, supported the electrical and computer engineering (ECE) department's recent Centennial Celebration and sponsors ECE's Booz Allen Hamilton Distinguished Colloquium, a lecture series featuring a wide variety of accomplished researchers and scientists, including Internet founder Vint Cerf.

The company also sponsors an innovative special topics course in reverse engineering, a particularly important skill to master for solving problems related to computer systems and national defense, a field in which it is very hard for Booz Allen to find skilled employees. "The Clark School has reached out to us; they want to ensure their programs are relevant. By taking this Booz Allen course on the road, we can reach a broader audience of potential employees," says Laurie Villano, B.S. '83, mathematics, a vice president at Booz Allen and member of the ECE Advisory Board.

"Our product is our people, and our ability to attract high-quality students from a local institution is particularly powerful for us," says Villano. "We thrive on people who can build and lead teams, innovate and be creative and entrepreneurial. We find all of those qualities in Clark School students."

Villano notes how the rapid rate of technological change increases the value of recent graduates who are familiar with advanced technologies and have the latest skill set. "We can't find qualified engineers fast enough to meet our needs," she says. "By partnering with Clark School students in internships and full-time employment, we are starting to close that gap. The Clark School is helping to keep our business innovative." ■

Three start-up companies with roots in the Clark School are now in a better position to develop and market their breakthrough products in the dynamic fields of micro-electronics, medicine and energy. That's because they were all recent winners in the 2009 University of Maryland \$75K Business Plan Competition, hosted by the Maryland Technology Enterprise Institute (Mtech) and sponsored by Fish & Richardson P.C., the Maryland Technology Development Corporation and Nixon Peabody LLP.

# Three Clark School Startups Win Business Plan Prize Money



Attendees listen closely to business plan presentations.

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## FlexEI

### Batteries Scavenge Power for Micro Technologies

FlexEI LLC, which plans to produce rechargeable batteries to supply power for new micro-electronic devices that are remote, mobile or otherwise hard-to-access, won the \$20,000 first prize in the competition's information technology division.

Microchips, sensors, radio-frequency identification chips and other micro-electronic devices used in environmental, transportation, military and medical applications require low power over long periods of time. These devices are often located far from normal power sources or positioned in places (including the human body) that cannot be reached easily. "The FlexEI battery overcomes those challenges," explains Martin Peckerar, professor of electrical and computer engineering (ECE) and FlexEI founder. "Our battery can 'scavenge' and store free energy from a device's environment, including vibrations and existing radio waves, or be recharged by a device that beams radio-frequency energy at it. And its storage capacity is greater than any other battery of its type." Because it is made of a flexible material only millimeters thick, the FlexEI battery can be adapted to novel product designs and even serve as product packaging. Built using environmentally friendly materials, when it finally wears out it will degrade in a benign way.

Peckerar developed the battery with fellow ECE Professor Neil Goldsman; research associate Zeynep Dilli, M.S. '01 and Ph.D. '07, electrical engineering; and Josekuttan Manikathuparambil, a student in the Master's Program in Telecommunications. FlexEI received earlier support from the Laboratory for Physical Sciences in a collaboration between federal and university researchers

(including faculty from the Clark School), as well as a \$25,000 grant from Science Applications International Corporation (SAIC), a Fortune 500 technology company active in the areas of health, energy and the environment. The business plan prize will help FlexEI complete reliability studies and tests under extreme conditions before scaling up production.

## Trauma Solutions

### Synthetic Material Clots Blood, Delivers Drugs

Researchers at Trauma Solutions (formerly Haemechanics), winners of \$20,000 in the competition's life sciences division, have developed a synthetic material capable of inducing blood clotting while simultaneously delivering therapeutics such as antibiotics. The material causes clotting of severe wounds as effectively as biologically-based products but at a reduced cost, says Peter Kofinas, Keystone professor and associate chair of the Fischell Department of Bioengineering and director of the graduate program in bioengineering.

The innovative material emerged from a groundbreaking collaboration between the Clark School and the University of Maryland School of Medicine. Kofinas met Bartley Griffith, M.D., professor and director of the medical school's division of cardiac surgery and cardiothoracic transplantation, at a Fischell Festival at the Clark School. In developing anti-coagulants for improving circulation, Kofinas's research assistant Brendan Casey, Ph.D. candidate in bioengineering, came upon a material that had the opposite effect, and the team recognized its value. Adam Behrens, B.S. '11, chemical and biomolecular engineering, also contributed. "Our



The Clark School was well-represented on winning teams in the 2009 University of Maryland \$75K Business Plan Competition. Pictured at top, the FlexEI team; bottom left, the Trauma Solutions team; and bottom right, the Tseai team.

PHOTOS PROVIDED BY MTECH

material induces the blood coagulation cascade process to make a clot and stop bleeding even for hemophiliac blood,” says Kofinas.

Kofinas and Griffith received seed funding from a University of Maryland program known as Cross-Disciplinary Seed Grants, a joint initiative between the College Park and Baltimore campuses that requires collaboration between principal investigators from both places. The new business plan prize will help the company incorporate under its new name, complete licensing and attract venture capital. “The collaboration is unique,” says Kofinas, “and we’re very happy for the opportunity.”

Trauma Solutions, LLC, was also one of 16 finalists in the recent Global Business Plan Competition sponsored by Draper, Fisher and Juventon (DFJ), a leading early-stage, venture-capital firm, and Cisco. Trauma Solutions is one of four finalists that will receive funding from DFJ.

## Tseai Energy Unlimited Biomass Energy Boosts West African Economies

Tseai Energy Unlimited, which is developing a system for producing electricity in remote regions of developing countries, won \$10,000 in the competition’s undergraduate division, as well as a \$15,000 Warren Citrin Social Impact Award, a new prize this year made possible by a donation from Warren Citrin, co-founder of Gloto and Solipsys (now Raytheon Solipsys). Tseai Energy applies alternative technologies, especially bio-

mass energy from the waste products of palm fruit harvests, to provide electricity for communities and enterprises in West Africa.

Tseai founder Trevor Young, B.S. '10, environmental economics, is a student in the Hillman Entrepreneurs Program, an innovative educational initiative tailored to entrepreneurial transfer students who begin their study at Prince George’s Community College and complete their bachelor’s degrees at the University of Maryland. He was inspired to seek rural energy solutions after a 2002 visit to his native Sierra Leone. Following completion of a paper identifying the problem and its solution, he realized, “I can move this from the theoretical to the practical.” He then developed the plan for Tseai Energy Unlimited with Stanley Obaka, B.S. '10, geology, and Shavon Holland, B.S. '09, American studies.

The business plan prize allows Tseai to complete analyses of samples using waste husks and liquid from the palm fruit, a profitable crop in West Africa, to power biomass electricity production there. The electricity will in turn power palm-processing ventures important to local economies by harnessing methane, a greenhouse gas. The award builds on pre-seed Mtech funding that Tseai used to conduct focus groups in West Africa and collect samples.

Young is committed to building both the company and his ties to the Clark School. “I’ll be part of this Mtech program for life in one way or another, hopefully as a donor one day,” says Young with a smile. ■

## Russ Finds His Voice

Young Goldwater Scholar Joins International Bioethics Dialogue



**“I strongly believe the discipline of biological engineering needs its own code of ethics. Medicine’s ancient code of ethics, the Hippocratic Oath, offers this admonition to doctors—‘First, do no harm.’ It is a powerful reminder to all that whatever we do to help humanity can have unexpected and undesirable side effects. Therefore, we bioengineers also have a responsibility to our fellow human beings and to our environment to develop and live by a code of ethics.”**

from “Mapping the Moral Boundaries of Biological Engineering”  
Zachary Russ, *Journal of Biological Engineering*

Zachary Russ, B.S. ’11, bioengineering, is a young man who pairs a love of research with a keen awareness of—and ability to explore and express—the moral questions inherent in research and its potential to change lives.

In the fall of his freshman year, Russ began work-

ing with Joonil Seog, assistant professor in bioengineering, on his first research project. Seog’s work used novel biomaterials to create a special type of coating for a nanoscale medical device, for example a kind of stent that could release chemical therapeutics.

Russ started as an unpaid undergraduate intern. “Then,” he jokes, “I was promoted.” He stayed with the project as a paid undergraduate researcher.

At the same time, he began to think deeply about the implications of research, and decided to test his ideas in the public domain. He entered the bioethics essay contest sponsored by the Institute for Biological Engineering, first in 2008 and again in 2009, taking the first-place prize both times. His 2008 paper explored public fears about synthetic biology and genetic engineering in general, highlighted actual risks, and suggested how synthetic biology can mitigate those risks. His 2009 essay titled “Mapping the Moral Boundaries of Biological Engineering” argued that the interdisciplinary field of bioengineering must have its own code of ethics, not one borrowed from a parent field. Both papers were published in

the *Journal of Biological Engineering* and can be viewed online.

This spring, Russ claimed still another honor when he received a prestigious Barry M. Goldwater Scholarship for the 2009-2010 academic year. The Goldwater Scholarship, named for the late senator from Arizona, recognizes outstanding undergraduates majoring in mathematics, natural sciences and engineering. His research with Seog formed the basis of his scholarship application. After writing 13 drafts of the research proposal for the application, Russ admits, “Winning was very satisfying.” Russ is grateful to his advisors for encouraging his double major in mathematics and bioengineering. That unusual combination, says Russ, was yet another factor that helped him snare the Goldwater Scholarship.

His research also paved the way for two summer internships: one in bionanotechnology at Rice University in 2008, and a second this past summer in synthetic biology, as an Amgen Scholar at the University of California, Berkeley.

Ultimately Russ plans to pursue a Ph.D. in bioengineering and work in research, probably designing nanoscale medical applications. He loves the opportunity to work with state-of-the-art equipment such as the scanning electron microscope. “Engineering has a lot of fun toys,” says Russ.

Still, two of his favorite Clark School moments occurred outside the lab, at the conferences of the Institute for Biological Engineering, where he presented his winning essays and was introduced to “incredibly exciting researchers” and their projects. Russ’s ease at interacting with more senior researchers, and delving into the ethical issues that underlie their work, points to a long and successful career as an engineering leader. ■

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## Fischell Undergrads Dominate Bioethics Contest

For the second year in a row, Fischell Department of Bionengineering undergraduates, including three freshmen, beat out a national field of 184 other entrants to earn four of the five top spots in the

Institute of Biological Engineering’s (IBE) annual bioethics essay contest. In addition to Russ (see related story above), freshman Victoria Stefanelli placed second and freshmen Chris Dupuis and Laith

Abu-Taleb were first and second runners-up, respectively. All of the winners presented their papers at the IBE annual conference in March.

# Truman Scholar Hannam Named University Medalist

Phillip Hannam, B.S. '09, mechanical engineering, was named the 2009 University Medalist at the spring 2009 commencement ceremony. The award is given to the most outstanding graduate of each academic year and recognizes the senior who best personifies academic distinction, extraordinary character and extracurricular contributions to the university and the larger public.

Hannam was a member of the university's prestigious Gemstone program and received a Truman Scholarship during his junior year. He has traveled extensively in Germany, China and Vietnam studying international development and sustainable energy, served as a member, project leader and president of the university's Engineers Without Borders chapter with projects in Brazil and West Africa, and in April of this year received the Clark School's International Service Award. The Laurel, Md., native is committed to local and global efforts to mitigate climate change. ■



## Dean Pines Honors Graduate Student Researchers

Clark School Dean Darryll Pines demonstrated his commitment to fostering student research this spring by launching two competitions to evaluate the work of master's

degree and doctoral students. "The chance to be recognized as the Clark School's best—that's a powerful motivator," says Pines. "These prizes shine on students' resumes,

and show the world that our student researchers make a positive impact in engineering and the world. I look forward to making these awards a Clark School tradition."

### Johnson Studies Helicopter Brownout

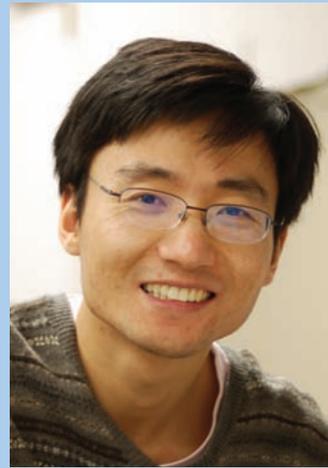


Bradley Johnson, M.S. '09, aerospace engineering, was awarded first place in the Dean's Master's Student Research Award Competition for his paper titled "Mechanisms of Sediment Entrainment and Transport in Rotorcraft Brownout." Johnson has been studying the problem of helicopter brownout, a condition that sends sand and dust flying upon takeoff and impedes the sight of helicopter pilots.

He conducted experimental simulations using rotors of small-scale helicopters to study the problem, and was advised by J. Gordon Leishman, the Minta Martin Professor of Engineering in the aerospace engineering department. Johnson was selected by a panel of Clark School faculty members.

Johnson's research won the Best Aerodynamics Paper at the 2009 forum of the American Helicopter Society earlier this year. He soon will be putting his expertise to work for Vestas, a Danish wind turbine company that is opening a research and development facility in Texas. "Many of the basic theories of helicopter design can be applied to wind turbines," notes Johnson, who was able to secure a junior position with the company due to the extensive research experience he gained at the Clark School.

### Ren Pioneers Innovative Nanostructures



Shenqiang Ren, Ph.D. '09, materials science engineering (MSE), won first place in the Dean's Doctoral Student Research Award Competition for his work on "Bottom-up Multiferoic Nanostructures." "Our group is the first to come up with this idea, using self-assembly of block copolymers to pioneer the field of templating multiferoic nanostructures, a new material to improve current storage and

spintronic technology," says Ren. "With this capability, we can self-assemble nanocomponents with quite exotic properties for electronic nanodevices that can be used for future magnetic data storage and spintronics devices." Ren was selected by a panel that included Board of Visitors members.

Ren's pioneering research has broad applications and led to four peer-reviewed publications from 2007 to 2008, including three papers selected by the virtual journal *Nanoscience and Technology*. His work won the inaugural MSE Doctoral Thesis Award this spring, and he will soon start postdoctoral research at the Massachusetts Institute of Technology. Ren has filed for four patents for university-related inventions based on his work. "The Clark School gave me the freedom to pursue my research interests, to do what I believe in," says Ren, who cites the support of his advisor, Manfred Wuttig, professor of materials science engineering, as key to his success.



## Alumni Expertise Benefits Hubble Telescope

Clark School engineers continue to contribute extensively in space exploration. The latest example is in the recent NASA mission to service the Hubble Space Telescope. Pictured in the Shuttle Atlantis payload bay in preparation for launch at Kennedy Space Center are, from left: **MIKE OETKEN**, B.S. '99, mechanical engineering (ME); **MARK PEDEN**, B.S. '87, aerospace engineering (AE); **KATHY MASCETTI**, B.S. '86, ME; **JACKIE JOHNSON**, B.S. '94, ME; and **STEVE HOYLE**, B.S. '89, AE. For a full list of Clark School alumni involved with this project and more information about Clark School connections to space exploration and the space industry, visit [www.eng.umd.edu/future/future\\_space.html](http://www.eng.umd.edu/future/future_space.html).

## Get in the Swing

Join friends and fellow alumni for the 6th Annual Clark School Engineering Alumni and Faculty Golf Outing and Banquet on Wednesday, September 23, at the newly-renovated UM Golf Course. Shotgun start is at 2 p.m. An awards banquet and silent auction will immediately follow. If you would like to assist the Alumni Chapter Board with the tournament, please contact Clark School Alumni Relations Director Josey Simpson at [josey@umd.edu](mailto:josey@umd.edu). Information about tournament sponsorships and a link to a registration form are available online at [www.eng.umd.edu/alumni](http://www.eng.umd.edu/alumni).



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## Alumni News



The Chinese Institute of Engineers has selected **JEONG KIM**, Ph.D. '91, reliability engineering, president of Alcatel-Lucent Bell Labs, as the recipient of its 2009 Distinguished Lifetime Achievement Award. The award recognizes Asian-American engineering professionals with a record of significant personal achievements and contributions to academia, public service and industry. Kim was also included in *Fast Company* magazine's "12 Most Creative Minds of 2008" list.

**GEORGE STIMAK**, M.S. '76, electrical engineering (EE) and M.B.A. '83; **JONATHAN NEUMANN**, B.S. '00, M.S. '02 and Ph.D. '05, EE; **RICHARD FISCHER**, B.S. '84, M.S. '86 and Ph.D. '93, EE; and **KEVIN BOULAIS**, Ph.D. '96, EE, have been named "Top Navy Scientists and Engineers of the Year."

**STEPHEN KERBER**, B.S. '03 and M.S. '05, fire protection engineering (FPE), and **DANIEL MADRZYKOWSKI**, B.S. '88, mechanical engineering, and M.S. '93, FPE, both with the National Institute of Standards and Technology, have won the U.S. Department of Commerce Medal for Scientific/Engineering Achievement for their work on positive pressure ventilation and wind-driven fires.



The National Board of Advisors of the Rotary National Award for Space Achievement Foundation selected former NASA Administrator **MICHAEL D. GRIFFIN**, Ph.D. '77, aerospace engineering (AE), to receive its highest honor, The National Space Trophy.

**SYED O. HASSAN**, B.S. '04, AE, and AE graduate student, received the NASA Space Flight Awareness Honoree Award, which is presented

to NASA employees for their dedication to quality work and flight safety.



**PRADEEP SHARMA**, Ph.D. '00, mechanical engineering, was recently selected as the recipient of the American Society of Mechanical Engineers 2009 Thomas J.R. Hughes Young Investigator Award.

**THOMAS D. MURPHY**, B.S. '57, chemical engineering, has received the Frank W. Reinhart Award from the American Society for Testing and Materials International Committee on Standards.



**H. VICKY ZHAO**, M.S. '03 and Ph.D. '04, EE, received the Institute of Electrical and Electronics Engineers Signal Processing Society's 2008 Young Author Best Paper Award.

# Deep Ties to the Clark School Lead the Rauch Family to Give Back

**R**obert Rauch, B.S. '73, civil engineering, jokes that “I started my career by digging ditches, then moved to surveying ditches, then drafting ditches. Now I design ditches.” In fact, the president of Robert D. Rauch & Associates has seen his Easton, Md.-based development business flourish internationally.

As soon as he entered the work world as a surface-water hydrologist with the Maryland Department of Natural Resources, Rauch knew his Clark School education had prepared him well. His supervisor put him in charge of coordinating flood insurance and flood modeling across the state and sent Rauch to Princeton University for short-term training in finite element modeling, an intensive mathematical modeling approach. While he admired the theoretical rigor of his Princeton colleagues, he found that they, in turn, were impressed by the steady-state flow and riverine modeling techniques that he had learned at the Clark School.

“They were as impressed by my hands-on, practical knowledge as I was impressed by their theories,” says Rauch. “Many things I took for granted in my education have proven to be very effective.”

Rauch has never taken his University of Maryland experience for granted. It’s where he met his wife Dale, B.S. '73, education. “We met on campus and were married in the chapel,” says Rauch. “The university has been at the center of most of the major things in my life.”

## Expanding Support to the Clark School

After working for the state for five years and as Talbot County director of public works and county engineer for six years, Rauch opened his own design and development firm. He has designed golf courses and planned communities around the world. Recently he designed a number of leading-edge retirement communities on the East Coast, including Heritage Shores, a 2,000-unit community in Bridgeville, Del.

His two sons followed in his footsteps at the Clark School. Casey, B.S. '03, biological resources engineering, and Dustin, B.S. '08, civil engineering, are now part of the family business. When Rauch’s sons, both of whom married Maryland graduates, became alumni, he wanted new ways to remain connected to the Clark School. “I took the opportunity to expand my participation and support,” he says.

This year Rauch spearheaded the donation of a championship 18-hole golf course at the Easton Club, on Maryland’s Eastern Shore, to the university. He designed the complex with partners



From left, Casey, Dale, Dustin and Robert Rauch.

at Allen & Rocks, and last year he suggested they donate the \$5 million facility, including a 10,000-square-foot clubhouse and a pavilion overlooking the Tred Avon River, to Maryland.

Rauch continues to deepen his involvement with the Clark School, exploring ideas with Dean Darryll Pines on how to expose high school students interested in engineering to college life and coursework. “That activity is rewarding and something I’m excited about,” says Rauch, who serves on the board of a mentoring program called Architects, Contractors and Engineers.

He feels strongly about what the Clark School offers. “We’ve got students coming out of the Clark School that are highly employable. They get jobs and are hard workers,” says Rauch. “The students impress me with how they uphold the standards of the school.” He credits the university and the Clark School with being a cornerstone for his family, his friendships and his professional accomplishments. “The university is an integral part of all aspects of our lives.” ■

**TO LEARN MORE ABOUT MAKING A GIFT TO THE CLARK SCHOOL, PLEASE CALL OR WRITE:**

Leslie Borak, assistant dean for external relations, Clark School of Engineering, University of Maryland, College Park, Maryland 20742-2831 ■ 301.405.0317 ■ lborak@umd.edu

PHOTO PROVIDED BY THE RAUCH FAMILY



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## Do You Remember?

Do you know what is going on in the photo above? The names of the people shown? Send your answer to [clark-communications@umd.edu](mailto:clark-communications@umd.edu) and you may be eligible for a prize!

### Spring 2009 Photo

Thanks to all who wrote in with details about the photo on the back of the last issue. Mary Cole, B.S. '85, mechanical engineering (ME), was selected at random to receive a selection of Clark School goodies for letting us know she recognized Sharon Bauer, B.S. '85, ME, front and center in the photo, depicting a mini-Baja team from the early- to mid-1980s.

### Fall 2008 Photo

We finally know what is depicted in the photo on the back of the Fall

**GREAT  
EXPECTATIONS**  
THE CAMPAIGN for MARYLAND

2008 issue thanks to Mike Kalb, B.S. '70, civil engineering, who says that the gentlemen pictured on the train were attendees of a 1970 meeting of the American Society of Civil Engineers student chapter, and all were civil engineering majors. In the photo, Kalb recognized Dennis Webb,

B.S. '69 and M.S. '75, on the left; (Hal) Steven Kanofsky, B.S. '70, fourth from left; and Joel Magram, B.S. '71, in the door of the cab. The photo was taken at the Port of Baltimore. Kalb will also receive a Clark School goodie bag for sending us this information.

### 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. ■