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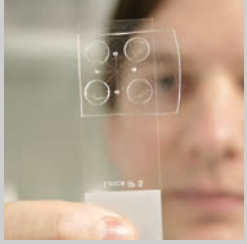
E@M

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

More than Bricks and Mortar

HOW CLARK HALL WILL ADVANCE **HUMAN HEALTH INNOVATION**



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Engineering @ Maryland is published twice a year for alumni and friends of the A. James Clark School of Engineering and the Glenn L. Martin Institute of Technology at the University of Maryland.

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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.

COVER IMAGE
Courtesy Ballinger

Dear Friends of the Clark School,

In the past century, advancements in human health have led to life-changing innovations, from novel therapies targeting the core complexities of genetic diseases to tools for mitigating the burden of treatment for those living with chronic illness.

Behind these advancements are clinicians, researchers, and yes, engineers, dedicated to extending and improving human life.

In a recent interview with USA Today, Francis S. Collins, M.D., Ph.D., who leads the National Institutes of Health headquartered in Bethesda, Md., said, "Biomedical research is at this amazing juncture, where questions that we thought we dared not ask a decade ago are now possible to ask and answer."

The Clark School of Engineering is at the forefront of this juncture.

On November 21, we will break ground on A. James Clark Hall, a six-story, 184,000-square-foot building with state-of-the-art biofabrication labs, maker space, innovation rooms, classrooms, research labs, and collaborative meeting areas with a common goal: to serve as a hub for human health innovation in the state of Maryland, the federal region, and beyond.

This new building will serve as headquarters to the Fischell Department of Bioengineering and the Robert E. Fischell Institute for Biomedical Devices.

...to serve as a hub for human health innovation...

Within the walls of Clark Hall, students at all levels will learn to perform their own research to find solutions to society's major health challenges. Engineers from every discipline will collaborate with clinicians to develop new ideas, and researchers from the University of Maryland, College Park will come together with partners at the University of Maryland School of Medicine in Baltimore and Children's National Medical Center in Washington, D.C., among many other organizations, to translate new technologies into clinical practice.

Bioengineers and clinicians alone do not discover solutions to complex health problems. Advancements in biomedical device creation are spurred from cross-disciplinary collaborations with mechanical and electrical engineers, materials scientists, biologists, chemists, and human factors researchers. This new building will encourage this all-hands-on-deck approach to solving these issues.

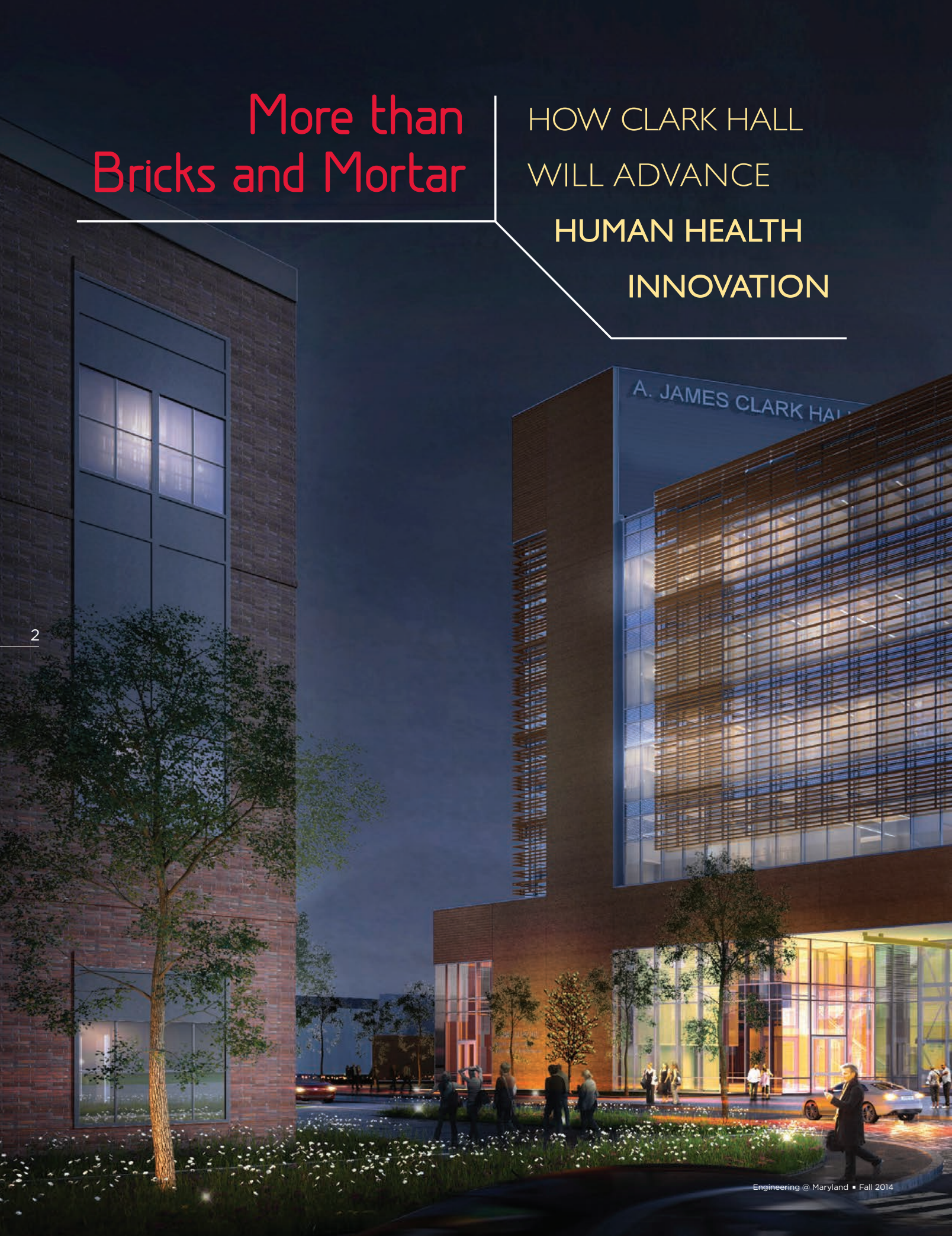
Clark Hall, and the research that takes place in it, will be a beacon for progress in the field of biomedical innovation and, more importantly, it will be a focal point for the University of Maryland community and its partners to join forces in the quest toward improving the lives of millions of humans on the planet.

You can learn more about Clark Hall at: eng.umd.edu/clarkhall

Darryll Pines
Dean and Farvardin Professor of Engineering

More than Bricks and Mortar

HOW CLARK HALL WILL ADVANCE HUMAN HEALTH INNOVATION



A child's growth is typically cause for celebration, each added inch proudly documented on a wall or in a memory book. But when that child has a congenital heart defect, this most fundamental part of childhood comes weighted with dangerous implications. Kids outgrow vascular grafts, just as they need bigger shoes and longer pants. This means that on top of the risks of an initial pediatric heart surgery, invasive follow-up procedures are often required to keep pace with growing bodies, explained John Fisher, Professor and Associate Chair of Bioengineering at the University of Maryland A. James Clark School of Engineering.

But what if the graft could grow, too? Fisher's research team has a better solution: a heart implant that aids the growth of natural tissues, and then disappears when no longer needed. Behold the power of 3-D printing, tissue engineering—and of engineering innovations at the Clark School.

Even as engineering breaks down walls, physical walls can also prove to be invaluable tools—to bring people and ideas together, to maximize resources, and to encourage innovation. That's where the new A. James Clark Hall enters the picture.

This November, a custom-designed home for the Fischell Department of Bioengineering and the Robert E. Fischell Institute for Biomedical Devices will break ground adjacent to the Jeong H. Kim Engineering Building in College Park. When it opens to students in 2016, the 184,000-square-foot building will signal a new era for the university and also for human health advancements in the region.

The day may come when you owe your life, or the life of a loved one, to a biomedical innovation developed here. Vaccinations will hold the power to prevent pediatric cancer. New diagnostic tools will enable the corner pharmacy to instantly detect life-threatening pathogens and immediately begin treatment. Antibiotics will eradicate illness without side effects.

Saving Lives, Fueling Innovation

"Clark Hall will allow us to make connections and do creative things that could extend or enhance human life, and have a positive impact on millions of lives."

Darryll Pines
DEAN AND FARVARDIN PROFESSOR OF ENGINEERING

Significant research paving the way for biomedical innovations is already underway in the Fischell Department of Bioengineering, as well as in the laboratories of the Graduate Program in Bioengineering. Since its inauguration in 2006, the Fischell Department's undergraduate program has more than doubled in size to help make it the university's fastest-growing department. Around 85 percent of the students enrolled in the university's bioengineering graduate program come from the United States, and 48 percent are female; both of those numbers significantly outpace graduate programs nationally.

The burgeoning field stems from the meeting of two scientific forces: groundbreaking advances in technological capabilities and, on a more fundamental level, humanity's desire to make a difference. "Everyone is inspired by solutions to complex problems," said Darryll Pines, Farvardin Professor and Dean of the A. James Clark School of Engineering. "And there's not a single person who has not been affected by cancer or some other disease impacting their family."

The economic landscape sets the stage for health issues in today's society. With the nation in critical need of jobs, the biotech industry is poised to help. High-paying, sustainable jobs in this sector pack an economic punch. A recent Battelle/BIO study found that for every biotech job created in Maryland, nearly three more emerged to support it. Indeed, the U.S. Bureau of Labor Statistics predicts the greatest growth of any job category will occur in biomedical engineering through 2020—from the creation of self-powered devices that prevent and treat disease to the implementation of databases that will redefine emergency response.

In effect, the new Clark Hall will incubate the next generations of bioengineers whose contributions and innovations will propel Maryland's economy for decades to come. The state's bioscience and bioengineering industry is one that Maryland has invested heavily in growing in recent years. Clark Hall will push the state toward national leadership in technology commercialization and the creation of technology jobs in this sector, helping to keep Maryland's smartest students in the state by leveling the playing field with other top-tier universities across the country.

"Clark Hall will be a catalyst for bringing people together both in education programs and research. There will be great synergy that will advance new ideas into concepts, and concepts into new devices that will be transformative in our healthcare."

William Bentley
ROBERT E. FISCHELL DISTINGUISHED PROFESSOR OF ENGINEERING AND CHAIR OF THE FISCHELL DEPARTMENT OF BIOENGINEERING

The Building

Bells and whistles aside, Clark Hall will accommodate the Clark School's rapidly growing programs, reducing class space deficiency by 20 percent, while bringing together the many disciplines involved with human health innovation under one roof and encouraging interdisciplinary collaboration and growth, from electrical and mechanical engineering to biology and information technology. Some 7,332 square feet of classroom space and 11,402 square feet of class lab space will support instructional capabilities within the Fischell Department of Bioengineering, which currently relies on labs and classrooms intended for other departments.

To help spur an organic flow of ideas between many disciplines, the new building will introduce flex classrooms and two stories of flexible laboratories to the campus, including wet and dry spaces as well as a vivarium, and will be designed to engage the public with an atrium that greets everyone who enters the building. That means anyone from within the campus or greater community will be welcome to convene at Clark Hall and participate in a culture of innovation.

Optical laser and imaging laboratories will feature state-of-the-art technology in digital fabrication, rapid prototyping, 3-D printing, optics, and bioinformatics. In the imaging suite, for instance, students and faculty will have the ability to examine molecular resolution of pathogens, whether in the GI tract or bloodstream, that show how a nano-carrier delivers a drug to a specific tumor site. Laser devices and magnetic resonance imagers will allow a close examination of cross-sections of the body and brain.

A New Hub

FREDERICK

U.S. Army Medical Research and Materiel Command, Fort Detrick

MARYLAND

270 BIOTECH CORRIDOR

NIST National Institute of Standards and Technology

Clark Hall, University of Maryland, College Park

The Institute for Bioscience and Biotechnology Research

IBBR INSTITUTE FOR BIOSCIENCE & BIOTECHNOLOGY RESEARCH

FDA U.S. Food and Drug Administration

Walter Reed National Military Medical Center

UNIVERSITY OF MARYLAND 1856

The National Institutes of Health

NIH National Institutes of Health

D.C.

VIRGINIA

Children's National Medical Center

Children's National Medical Center

For the Region

BALTIMORE

Johns Hopkins University

University of Maryland School of Medicine

Johns Hopkins Hospital

University of Maryland, Baltimore

If 80 percent of success is showing up, as the adage goes, Clark Hall will offer a head start to anyone who enters its doors. With its prominence on the university's campus, students and visiting scientists from many disciplines will rub shoulders with each other. That's no small perk: within an hour's-drive from College Park are many of the nation's top bioscience research forces, including the National Institutes of Health (NIH), Walter Reed National Military Medical Center, the U.S. Army Medical Research and Materiel Command at Fort Detrick, the University of Maryland School of Medicine, the Johns Hopkins University School of Medicine, the U.S. Food and Drug Administration (FDA), and the National Institute of Standards and Technology (NIST).

This new headquarters capitalizes on that geographic advantage, allowing networking and collaboration opportunities not only for all University of Maryland faculty, staff, and students but also for professionals from around the region. That exchange of ideas comes to fruition in part thanks to university partnerships, including the Center of Excellence in Regulatory Science and Innovation (M-CERSI), a collaboration between the the University of Maryland, College Park and the University of Maryland, Baltimore funded by an initial three-year, $3 million grant from the FDA, which convenes regulators and academics in unprecedented ways.

"With our presence here in the D.C.-Baltimore corridor, we may have the largest biomedical research capacity in the world, and when you take advantage of this special location, you can do great things," Bentley said. "Clark Hall is being built basically from the bottom up to be a hub of activity—to bring people from elsewhere in the Clark School of Engineering, the University of Maryland [College Park], the University of Maryland, Baltimore, from companies nearby, from the FDA to NIH, all with the idea of inspiring new technologies to improve human health."

That means students putting their research minds together with policymakers, venture capitalists, and regulatory agents to measure and manipulate cells, tissues, integrated systems, and devices, along the way developing technologies to save lives. "Our location allows us to develop relationships with national labs, gaining exposure that wouldn't happen in other parts of the country," said Associate Professor Ian White (BioE).

Collaboration expands with proximity. The new building will convene many disciplines of the A. James Clark School of Engineering, as well as other academic colleges, which are currently spread across the campus. "We have always managed to collaborate and leverage each other's expertise and resources, but a shared physical environment will raise us all to a much higher level," said Associate Professor Silvia Muro (BioE), who holds a joint appointment with UMD's Institute for Bioscience and Biotechnology Research (IBBR), based in Rockville, Md. "The collegial atmosphere here is very empowering."

Where Research Thrives

To date, Clark School research innovations carry profound implications and touch virtually every aspect of healthcare.

View of flex lab from Interp conference room

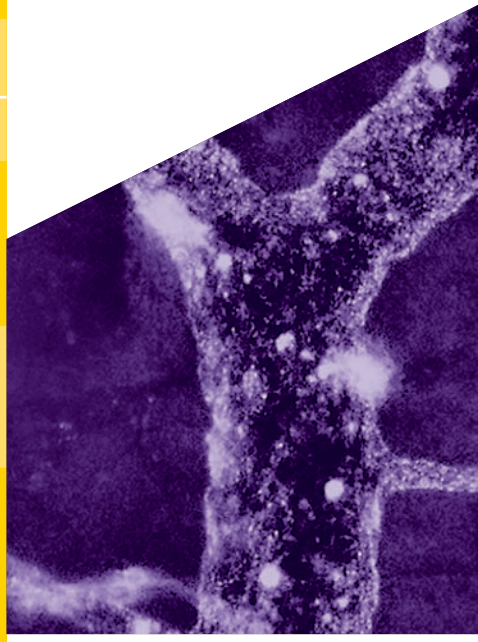
TARGETED DRUG DELIVERY SYSTEMS

Pitting the severity of side effects against the potentially life-saving benefits of some pharmaceuticals creates a complex conundrum. It's also a research opportunity in the eyes of Associate Professor Silvia Muro (BioE), whose laboratory work focuses on the manipulation of pharmaceuticals to improve the way drugs interact with the human body. The goal is straightforward: more reward, less risk.

"This research could help bring new medicines to society to help with neurological conditions—Alzheimer's, Parkinson's, and many other degenerative conditions, including cancer," explained Muro, "For some conditions, we have very good drugs in the market, but strong side effects prevent us from administering a truly therapeutic dosage."

In effect, therapeutic drugs can be like a risky game of darts—sometimes a drug hits the bull's-eye and cells respond as they should; other times the dart misses the target entirely or is propelled with so much force (i.e. too high of a dosage) that it bounces off the board.

One way to improve results, according to Muro, is to convert drug delivery mechanisms, moving away from injections and toward oral administration, which allows for more fine-tuning of dosage and results in greater compliance. Another improvement homes in on targeting abilities, using the cell's natural endocytic mechanisms and devising molecules that can carry enzymes to problem areas where disease has taken hold.



Researchers in Associate Professor Silvia Muro's lab are developing new ways nano-carriers, pictured above in a blood vessel, can effectively deliver therapeutic enzymes used to treat diseases.

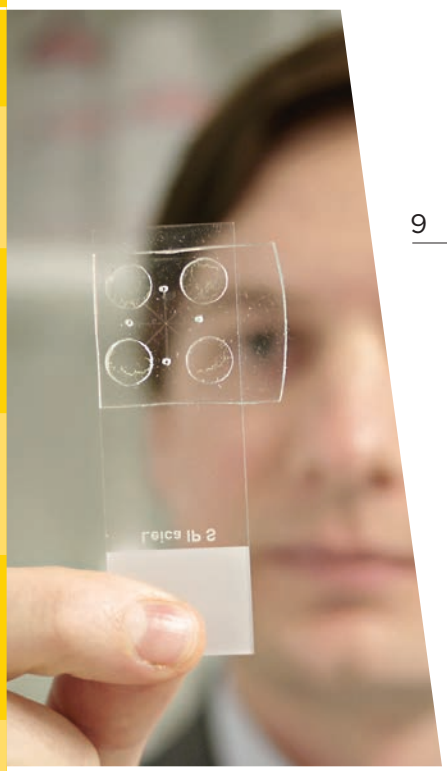
BIOMEDICAL DEVICE INNOVATIONS

Conversely, Professor and Associate Chair John Fisher's (BioE) work focuses on the tissues themselves. He leads the Tissue Engineering and Biomaterials Laboratory, which received a $1.35 million grant from the NIH to develop a bioreactor for stem cell culture to be applied to bone regeneration. Most recently, Fisher has turned his attention toward creating those cardiovascular tissues, such as vessels and heart valves, that can be implanted into the body to help it regenerate or regrow its own tissue. "Our overall goal is to improve patients' lives and at the same time reduce overall expense of health care," Fisher said.

Their work with pediatric treatment is particularly innovative. A few years ago, Fisher helped establish a seed grant program with Children's National Medical Center. In collaboration with Dr. Axel Kreiger, an expert in medical imaging, Fisher's team has devised methods using 3-D printing of biodegradable cardiovascular tissues that can be implanted into a body, slowly degrading as the materials are replaced by host tissue.

Tissue engineering provides a nice solution, because an implant is slowly remodeled by the host tissue into living tissue, which can easily grow along with the patient. The result is a fully reformed vessel or heart valve with nothing artificial to remove—consider it the "leave no trace" ethos of surgery. Fisher and one of his graduate students, Tony Melchiorri, recently won an Invention of the Year award for their work. Based on biomaterial resin that can be printed into vascular grafts using a lithography approach, his project made small diameters possible out of material that can be taken up by the body and degraded in normal cell metabolism.

Likewise, Professor Benjamin Shapiro (BioE) has zeroed in on "control of the small." For example, he precisely manipulates individual tumor cells on-chip in order to observe tumor formation and response to drug therapies with an aim of better understanding which drugs successfully combat the ability of cancer cells to spread and form distant metastases. Shapiro is also controlling magnetic forces to advance the field of nano-carrier drug delivery. His minimally invasive magnetic injection system is being commercialized by Otomagnetics, LLC and is aimed at enabling delivery of therapeutics to ear compartments in order to treat conditions such as sudden hearing loss, tinnitus, and middle ear infections. Additionally, his lab works in touch-free manipulation of live cancer cells in order to observe tumor formation and response to drug therapies with an aim of better understanding which drugs successfully combat the ability of cancer cells to spread.



Professor Benjamin Shapiro's research team has designed nanoscale, microfluidic systems that move cells from place to place on a lab-on-a-chip device–like the one pictured–by using electrical fields to generate fluid flows inside of it.

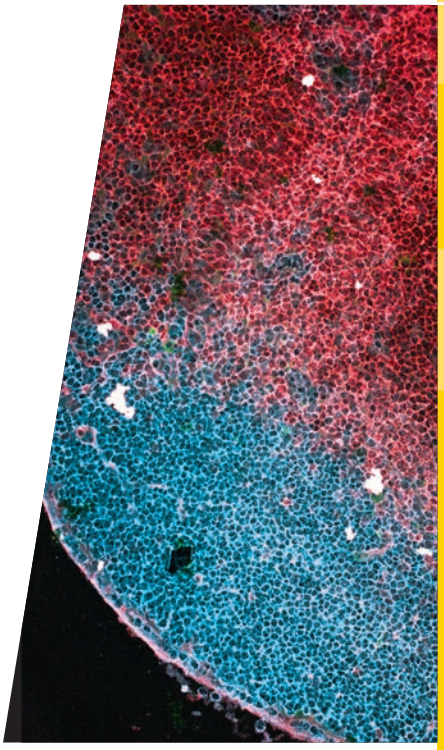
The photo above is from a Design for Disability Study of a glucometer as seen through the eyes of someone with diabetic retinopathy, a usability issue Asst. Prof. Monifa Vaughn-Cooke aims to address through human factors research.

HUMAN FACTORS RESEARCH

Diabetes: More than 9 percent of the American population (that's some 29 million people) has it, with that percentage on the rise. An important part of self-care for diabetics involves monitoring blood glucose levels with glucometers, but adherence levels hover in the range of 60 to 70 percent. Add the fact that seniors are hit disproportionately by diabetes (accounting for around a quarter of the population), and the research area seems to cry out for bioengineering solutions.

As the co-director of the Hybrid-System Integration and Simulation Lab, Mechanical Engineering (ME) Assistant Professor Monifa Vaughn-Cooke is on the task. She approaches human factors research in innovative ways, applying predictive modeling to medical systems and resource management to examine, for instance, the usability of glucometers and other hand-held devices for patients with disabilities. In other words, she makes sure things work in real life. After all, the most sophisticated device in the world is rendered useless if the person who needs it can't figure out how to turn it on, whether because of a disability or a design flaw.

On a grander scale, Associate Professor Jeffrey Herrmann (ME), who leads the Design and Reliability of Systems Division, merges his expertise in systems research with public health care—namely, the strategic distribution of medical resources in the event of a health emergency. So when crisis strikes, whether an outbreak of small pox or a bioterrorism attack, local health departments who have planned ahead are prepared to follow models such as those developed by Herrmann to quickly and efficiently dispense medicine and vaccinations. "Helping public health officials communicate better with the public and to respond in a timely manner saves lives," Herrmann said.



The lymph node, as shown in this fluorescent microscopy image, is the target of the Jewell Lab's polymeric vaccine carriers. During immune response, the B cell zone (blue) at the edge of the lymph node, and the T cell zone (red) toward the center become intermingled to generate cells and antibodies that migrate out of the lymph node to combat infection or disease, such as cancer.

CANCER VACCINE RESEARCH

One of the most heartbreaking parts of cancer? It comes back, often stronger than before—but not if researchers like Assistant Professor Christopher Jewell (BioE) have their way. With support from a pediatric cancer foundation called Alex's Lemonade Stand, the Jewell Research Lab manipulates polymeric carriers to trigger and fine-tune immune response that could prevent a tumor from returning after it has been removed. This work builds on other cancer research but takes it a step further, directly introducing vaccines into lymph nodes, a method that has therapeutic implications for autoimmune diseases such as multiple sclerosis, type 1 diabetes, lupus, and rheumatoid arthritis.

"If you get a really strong immune response, and you have cells that could fight bacteria or infection, but they can't get to where the infection is, they're not going to do a lot of good," Jewell explained.

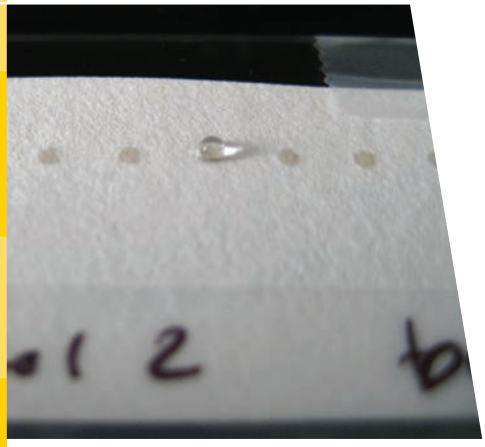
In other cases, this research could be applied toward protecting people against subsequent encounters with such infections as malaria or HIV, or preventing patients from becoming immuno-compromised and vulnerable to other infections. "This research could have a big impact on more efficient and specific therapeutics for patients," he added.

It's a prime example of research already underway that will benefit greatly from new translational research space, in particular the vivarium, where faculty and students can examine how disease models of animals are affected by different diseases and various therapeutics.

SENSORS AND DIAGNOSTICS

Associate Professor Ian White (BioE) knows firsthand the power of collaboration. In partnership with Canon Life Sciences in Rockville, Md., he and the White Research Group are developing molecular diagnostics aimed at leveraging micro-fluidics and micro-systems technology to cut down on time and labor in blood sampling. The Canon Life Sciences research targets bloodstream infections, a crucial opportunity for advancing science given that current diagnostics hover around 50-percent accuracy, according to White, and results can take up to a week. "Our micro-systems technology will take diagnosis time down to a few hours and make it much more sensitive and selective," White said.

Replacing manual preparation of blood samples with automated systems means quicker tests and lower costs, which moves diagnostics within closer reach of patients. That helps take sophisticated hospitals out of the equation, a luxury simply not possible in many places vulnerable for infection outbreak, from refugee camps in third-world countries and military bases to college dormitories, cruise ships, and even rural swaths of the United States.



Through Diagnostic anSERS' patent-pending technique, roll-to-roll inkjet printing is used to precisely deposit special nanoparticle ink, pictured above, onto paper and other flexible support materials for quick, low-cost diagnostic testing.

SURGICAL ROBOTICS

Could robots fight brain tumors? That's the bold question being tackled by Professor Jaydev Desai (ME). His team's latest medical research project intends to task minimally invasive neurosurgical intracranial robots with the removal of difficult-to-reach brain tumors, as guided by surgeons using magnetic resonance imaging. Combining imaging technology and robotics in this way would allow surgeons to remove tumors without damaging healthy tissues, a strong risk with current procedures. The neurosurgical prototype builds on computational tools developed by Desai's team to diagnose and chart the spread of breast cancer.

PHOTO BY JOHN T. CONSOLI

Professor Jaydev Desai, above, developed the worm-life, multi-jointed Minimally Invasive Neurosurgical Intracranial Robot, which allows a surgeon to look inside a patient's brain without having to open it wide.

BIOIMAGING

Biomedical optical imaging represents a huge opportunity for advances in early detection of cancer and other diseases as well as the ability to carry out more precise therapies. As principal investigator for the Biophotonic Imaging Laboratory, Associate Professor Yu Chen (BioE) works with optical imaging technology that is non-invasive and highly specialized, functioning at the cellular and molecular level. These technologies have the capability to provide real-time feedback to surgeons, helping them to avoid damaging blood vessels, and also can enable "optical biopsy," an emerging endoscopic method of visualizing changes to tissue as an alternative to risk-prone surgeries. In 2012, Chen's work in image-guided neurosurgery and observations in brain function earned his lab a 5-year, $400,000 National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award.

Associate Professor Yu Chen specializes in the advancement of optical coherence tomography (OCT), a micron-scale imaging technology that allows doctors to examine changes to tissues in the body and in real time, without the need for a biopsy to acquire a sample. Pictured above is an example of such imaging used to examine cardiac tissue.

An Incubator For Innovation

At the heart of research collaborations within the Fischell Department of Bioengineering beats a spirit of entrepreneurship. The Clark School's record for pushing new technology to market can be credited in part to the Maryland Technology Enterprise Institute (Mtech), which has created 100-plus companies generating more than 5,000 jobs over the past two decades.

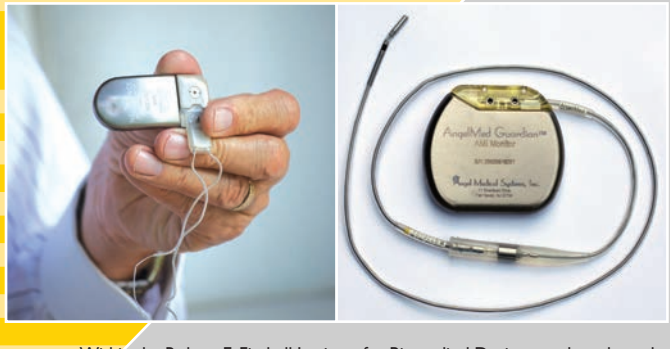
Case in point: As a student, former Fischell Fellow Matthew Dowling, Ph.D., founded Remedium, Inc., a start-up medical device company developing a system to stop hemorrhages based on a self-assembled polymer system. As part of the VentureAccelerator Program, Dowling's team receives support and guidance from Mtech, following in the footsteps of multibillion-dollar biosciences companies such as Digene Corporation and Martek Biosciences, both started by UMD students and incubated in Mtech's Technology Advancement Program.

"It's critical that applied work not only exist in the lab, but also that it gets out into the commercial marketplace," Fisher said, a philosophy that echoes the campus-wide commitment to inspire new technologies by offering initiatives for inventions created here. "The university sets an excellent foundation for what's possible out in the community."

A key feature of Clark Hall will be the Robert E. Fischell Institute for Biomedical Devices. Devices and technologies developed here will be translated into clinical environments around the world, according to Bentley, starting with hospitals at the University of Maryland, Baltimore, as well as Georgetown University, and Children's National Medical Center.

As Bentley sums it up: "Where you have great innovations you'll have great solutions. And those solutions can come from right here in College Park."

During his graduate education at UMD, Matthew Dowling, above, developed Hemogrip™ and participated in Mtech's VentureAccelerator program to start his company, Remedium Technologies.



Within the Robert E. Fischell Institute for Biomedical Devices, students have the opportunity to transform their ideas into products. Pictured above are two Fischell innovations: an implantable neurostimulator that can detect and correct a seizure before it starts (left) and an implantable cardiac device that warns a patient and emergency medical personnel of a heart attack at its earliest stages.

UMD Launches Graduate Certificate in Regulatory Science and Engineering

The University of Maryland Fischell Department of Bioengineering (BioE) and UMD's Center of Excellence in Regulatory Science and Innovation (CERSI) launched a new Graduate Certificate in Regulatory Science and Engineering at the start of the fall 2014 semester.

In response to the increasing demand for engineers and technical professionals with graduate-level expertise in both regulatory science and engineering, the new graduate certificate program focuses on medical devices and combination product engineering and regulation, statistical analysis required for Food and Drug Administration (FDA)-regulated clinical trial, legal issues, device classification, medical device reporting, and more. Students in the Graduate Certificate program will complete a total of four three-credit courses: Introduction to Regulatory Affairs: Devices and Drugs, Clinical Study Data Analysis, Regulatory Law—Medical Devices, and one three-credit elective from bioengineering, statistics or another focus area within the A. James Clark School of Engineering.

Students can enroll in courses held at the UMD campus in College Park, Md., or elect to take online courses to fulfill the program requirements.

The Graduate Certificate in Regulatory Science and Engineering is part of the MPowering the State collaborative program, as there is a sister program in Regulatory Science at the University of Maryland, Baltimore School of Pharmacy that focuses on drug discovery, development and clinical research. Longer term, the goal is to create a Professional Master of Engineering academic option as a new curriculum is developed.

Q&A with Dr. Peter Kim, VP, Sheikh Zayed Institute for Pediatric Surgical Innovation, Children's National Health System

IN 2013, THE A. JAMES CLARK SCHOOL OF ENGINEERING JOINED WITH THE SHEIKH ZAYED INSTITUTE FOR PEDIATRIC SURGICAL INNOVATION AT CHILDREN'S NATIONAL HEALTH SYSTEM TO FORM THE NATIONAL CAPITAL CONSORTIUM FOR PEDIATRIC DEVICE INNNOVATION (NCC-PDI), SUPPORTED BY A $3.5M GRANT FROM THE FDA.

PETER KIM, M.D., C.M, PH.D., VICE PRESIDENT OF THE SHEIKH ZAYED INSITUTE FOR PEDIATRIC SURGICAL INNOVATION, AND CO-PI OF THE NCC-PDI ALONG WITH PROFESSOR WILLIAM BENTLEY, SHARED HIS THOUGHTS ON THE CONSORTIUM IN AN INTERVIEW THIS SUMMER.

E@M: What is the NCC-PDI and what does it do?

Kim: The NCC-PDI brings together industry and academic researchers to facilitate medical device development in pediatric space. We support the total product development cycle, from coming up with the ideas to maturing ideas to making prototypes, preclinical testing, and then clinical trials, then going into manufacturing space.

E@M: How does the NCC-PDI help to advance human health?

Kim: Although children comprise about a third of the population in the U.S., many medical device companies don't feel that the market is big enough to pursue solutions to pediatric problems. This consortium helps to raise awareness of those needs, and fosters an ecosystem of dedicated and passionate people focused on solving these critical, unmet needs.

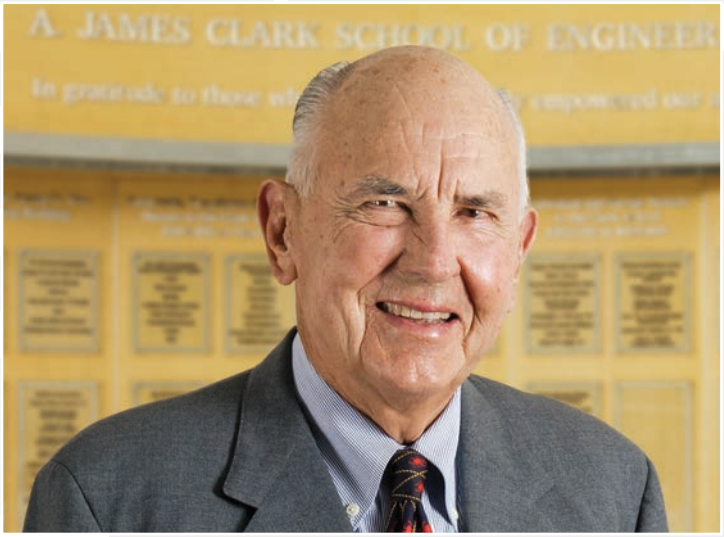
E@M: As a pediatric surgeon and scientist, what is it like to work with engineering researchers at UMD?

Kim: It is a true, complementary relationship. Surgeons tend to see the glass as half full when it comes to solving problems, but often have to ask, "Why can't we do that?" Engineers can tell us why it's not possible, and then help to find a solution through the marriage of our varied expertise.

E@M: What excites you the most about the future of bioengineering and medical devices?

Kim: I think a lot about organ transplantation, and the number of people who die before receiving a new organ. I also think of amputees and the challenges they face while waiting for and adjusting to prostheses. Just imagine if you can simply print out that new organ or limb. I envision that will happen, and based on all of the changes I've seen in my career as a surgeon, I expect that it will happen in my lifetime.

VISIONARY BENEFACTORS:
A. James Clark & Robert E. Fischell



A. JAMES CLARK

When it comes to major building projects, Clark Construction is a household name. From sports venues to hospitals to museums, the company's iconic blue logo is a familiar sight across the country.

As one of the largest privately held companies in the nation, it is hard to imagine its founder's humble beginnings at the University of Maryland.

As a young man of modest means, A. James Clark hitchhiked his way from his home in Bethesda, Md., to College Park each day to pursue a degree in engineering. His education was made possible by a state scholarship, and his only educational expenses were books.

Shortly after graduation in 1950, he joined the George Hyman Construction Company, a small, local contracting business with a rich history in civil construction. Over the course of several decades, his leadership and vision transformed it into a thriving business with a national footprint. In the late 1960s, he became President and CEO, and in 1995, Hyman Construction merged with Omni Construction to become the Clark Construction Group. Today, Clark Construction's portfolio boasts local and national landmarks including Oriole Park at Camden Yards in Baltimore, Md., the National Museum of the American Indian in Washington, D.C., and Music City Center in Nashville, Tenn.

Clark's steadfast commitment to undergraduate education moved him to endow a $15 million fund for undergraduate scholarships in 1994, and in 2005, a new $30 million A. James Clark Scholarship Fund to provide financial support to undergraduate engineering students based on merit, need, and diversity. His gift strengthened the university's ability to attract the most talented students nationally and helped address the nation's shortage of highly trained engineers. In recognition of Clark's philanthropic leadership, the University of Maryland School of Engineering was renamed as the A. James Clark School of Engineering.

Inspired by his strong interest in the promise of biosciences and biotechnology, Clark made a generous gift of $15 million to support the design and construction of the A. James Clark Hall, which will be the 27th structure built by Clark Construction on the University of Maryland campus.

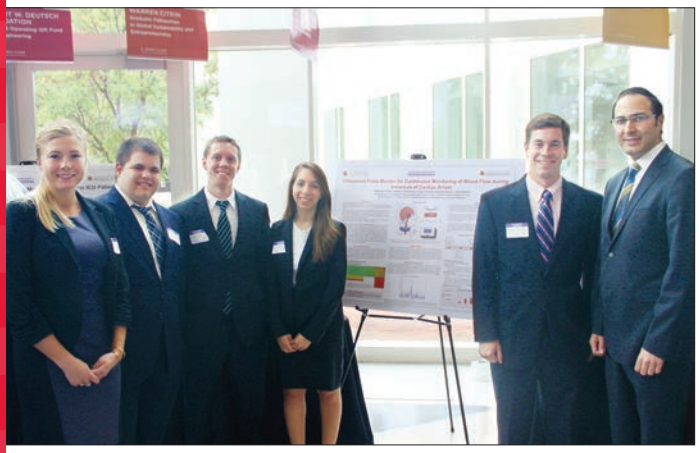
"Mr. Clark's contribution to this new building goes beyond his commitment to his alma mater," said Darryll Pines, Clark School Dean and Farvardin Professor. "He sees that the future of human health will be impacted by research done in Clark Hall."

Clark served as a member of the University System of Maryland Board of Regents, an honorary trustee of the University of Maryland College Park Foundation, and a charter member of University of Maryland College Park Foundation Board. The University of Maryland has bestowed upon him an honorary doctorate and its Distinguished Engineering Alumnus Award, and he was inducted into the University of Maryland Alumni Association's Hall of Fame. Clark is also a member of the National Academy of Engineering.

HUMAN HEALTH INNOVATIONS

BIOENGINEERING 2014 CAPSTONE:

Student Projects Focus on Cardiological Health, Surgical Tools, and More



FIRST PLACE:
Ultrasound Pulse Monitor for Continuous Monitoring of Blood Flow during Instances of Cardiac Arrest

Stefanie Cohen, Shawn Greenspan, Greg Harding, Regina Keane, Josh Nehrer

ADVISORS:
Dr. Ron Samet (University of Maryland School of Medicine) and BioE Associate Professor Yu Chen

SECOND PLACE:
Intelligent Drill: Training Tool for Orthopedic Applications

Catherine Burke, Sarah Engel, Courtney Koenig, Lindsey Petrelle, and Savannah Vogel

ADVISORS:
Professor Christopher Davis (Electrical and Computer Engineering), Dr. Lew Schon (Union Memorial Hospital), Leyla Isik (Point Surgical, LLC), and Laura Pingel (Point Surgical, LLC)

THIRD PLACE:
Ankle Mark: A Dynamic Health Tracking System

Rohan Bale, Katherine Chen, Lynn Chen, Maryam Mukhamedova and Aaron Rubinstein

ADVISORS:
Dr. Kevin Cleary (The Sheikh Zayed Institute for Pediatric Surgical Innovation, Children's National Medical Center), and Dr. Lew Schon (Union Memorial Hospital)

Demonstrating firsthand bioengineering's enormous potential to change lives, the Fischell Department of Bioengineering (BioE) 2014 Senior Capstone class exhibited a total of 16 novel concepts during the Capstone II finale last spring.

With projects ranging from a customizable 3-D tissue-engineering scaffold and an intelligent drill for orthopedic applications, to a carbon monoxide sensor for cars and a smart phone display interference for the driver seat while a car is in motion, this year's showcase demonstrated how bioengineering impacts all aspects of everyday life.

The 2014 Senior Capstone Design Competition also marked the department's biggest Capstone event yet, as 81 students pitched their products to a panel of esteemed judges, as well as to BioE faculty and fellow students. Created and sponsored by Mrs. Susan Fischell, wife of Clark School benefactor Dr. Robert E. Fischell, the Capstone Design Competition has become a marquee event, capping off the end of each academic year.

Five judges from both industry and academia recognized a total of six teams with awards, which included prizes for the first, second, and third-place teams, as well as for those groups recognized in categories including "Best Business Plan" and this year's "Impact" award. Additionally, one group was named this year's "Students' Choice" award-winner.

More information about each of the projects featured in the Fischell Department of Bioengineering 2014 Senior Capstone Design Competition is available online at http://ter.ps/bioecapstone.

The vision, design, and development of Clark Hall has brought together the minds of University of Maryland and Clark School administrators, faculty, and staff, as well as a team of talented architects and builders. The plans, however, could not be executed without the generosity of two benefactors committed to improving human health for millions through engineering innovations.

ROBERT E. FISCHELL

Dr. Robert E. Fischell insists that the life-saving biomedical devices he has developed are not a result of genius, but of simple problem solving.

A native of New York City, Fischell is the inventor behind major medical breakthroughs, including highly flexible, drug-eluting coronary stents, the first implantable insulin pump, and a magnetic pulse device for treating human pain, from migraine headaches to back aches.

After earning a degree in mechanical engineering at Duke University, Fischell relocated to Maryland to work at the U.S. Naval Ordnance Lab at White Oak and later at the Johns Hopkins Applied Physics Laboratory. In 1953, he earned a master's degree in physics at the University of Maryland, and in 1996, the university awarded him an honorary doctorate.

Fischell's interest in medical device innovation grew from his research in designing long-lasting batteries for spacecraft, which he translated to the first rechargeable pacemaker for cardiac patients. His latest inventions include an implantable device that warns a patient and medical personnel of a heart attack at the very first sign of its start, and a neurostimulator implanted in the skull that can detect abnormal electrical activity in the brain and correct it before a seizure occurs.

In 2005, Fischell and his family donated $31 million to establish the Fischell Department of Bioengineering and the Robert E. Fischell Institute for Biomedical Devices at the University of Maryland.

Most recently, Fischell committed $6 million toward A. James Clark Hall, where the Fischell Department of Bioengineering and the Robert E. Fischell Institute for Biomedical Devices will be headquartered.

More than 200 patents and a dozen companies later, Fischell is a familiar face to the Clark School's students, faculty, and staff.

"One of the best things about Bob Fischell is that he gives us his time," said William Bentley, the Robert E. Fischell Distinguished Professor of Engineering and Chair of the Fischell Department of Bioengineering. "He spends time with our students and faculty to help us understand how to solve health problems through innovation and methods to commercialize inventions to address clinical problems."

Fischell is a member of the National Academy of Engineering, and is the recipient of many major honors, including the Inventor of the Year for the United States in 1983, induction into the Space Technology Hall of Fame and the Clark School's Innovation Hall of Fame, and an honorary Doctorate for Humane letters from the Johns Hopkins University in 2008. He serves on the Board of Visitors for both the Clark School and the University of Maryland School of Medicine and the University of Maryland Foundation Board of Trustees.

CLARK SCHOOL

SpringTMS™ TOTAL MIGRAINE SYSTEM

INVENTOR: ROBERT E. FISCHELL (M.S. '53, HONORARY SC.D. '95)

COMPANY: eNEURA

The SpringTMS device relieves migraine headaches through transcranial magnetic stimulation. The portable device delivers magnetic pulses to the head just seconds apart, resetting the brain's misfiring neurons. The device is under review by the U.S. Food and Drug Administration, and is already available in Europe.

MAGNETIC SYRINGE

INVENTOR: PROFESSOR BENJAMIN SHAPIRO (BIOE)

COMPANY: OTOMAGNETICS, CO-FOUNDED BY DIDIER DEPIREUX (ISR), DAVID BEYLIN, AND IRVING WEINBERG

Otomagnetics, LLC is developing a method to magnetically deliver drugs and other therapeutic payloads to hard-to-reach targets, such as ear compartments and the eye. This is being considered as a potential minimally-invasive treatment for hearing loss, middle ear infections, and eye conditions.

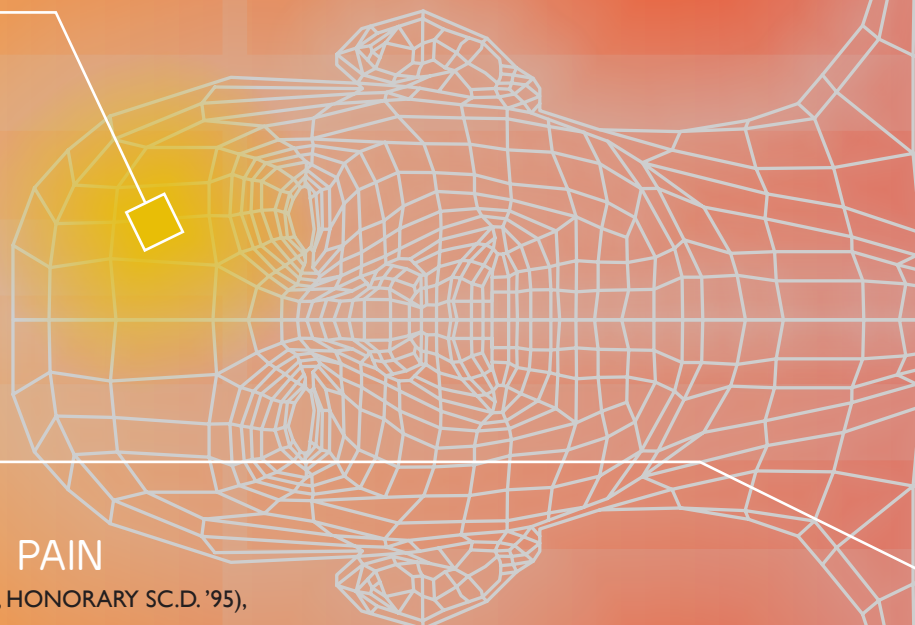
IMPROVING FOOTBALL HELMETS FOR CONCUSSION PREVENTION

INVENTORS: LAITH M. ABU-TALEB, AZAM A. ANSARI, DANA A. HARTMAN, RYAN HAUGHEY, DAVID KUO, JULIE R. LOILAND, KARAN RAJE, AFAREEN REZVANI, AND ADAM L. ZVIMAN

COMPANY: GUARDIAN HELMETS, LLC

This football helmet attachment takes the form of a shock absorber filled with a dilatant fluid, one that thickens under sheer strain, such as the force of a tackle. The simultaneous absorption and transfer of energy from the impact, and the decreased acceleration of the player's head and neck, should result in a dramatic reduction of concussions.

The device was innovated by bioengineering students advised by Mechanical Engineering Professor Kenneth Kiger and mentored by Robert E. Fischell for the 2012 Capstone Design Challenge.



ELECTROMAGNETIC STIMULATOR FOR BACK PAIN

INVENTORS: ROBERT E. FISCHELL (M.S. '53, HONORARY SC.D. '95), ASSOCIATE PROFESSOR ADAM HSIEH (BIOE) AND PROFESSOR WESLEY LAWSON (ECE/IREAP)

COMPANY: ZYGOOD

In collaboration with Associate Professor Adam Hsieh (BioE) and Professor Wesley Lawson (ECE/IREAP), Dr. Robert Fischell has applied electromagnetic stimulation technology—similar to that delivered by his SpringTMS device—to help patients manage back pain.

DRUG-ELUTING, EXPANDABLE CORONARY STENT

INVENTOR: ROBERT E. FISCHELL (M.S. '53, HONORARY SC.D. '95)

COMPANY: SVELTE MEDICAL SYSTEMS, INC.

Fischell's innovative coronary stent is mounted on a balloon catheter with an integrated wire to make the implantation of the device easier, safer, and lower cost.

3-D-PRINTED VASCULAR GRAFTS

INVENTORS: PROFESSOR JOHN FISHER (BIOE) AND ANTHONY MELCHIORRI

COMPANY: FormaSTEM, FOUNDED BY JOHN FISHER AND ANTHONY MELCHIORRI

Fisher and Melchiorri have engineered a polymer-based material resin that is biodegradable, biocompatible and supportive of cell and tissue growth, while degrading over time. Knowing this, FormaSTEM—the company they co-founded—uses this polymer to create vascular grafts, which act as artificial blood vessels and can be replaced by the patient's own tissue over time.

HUMAN FACTORS RESEARCH

MECHANICAL ENGINEERING ASSISTANT PROFESSOR MONIFA VAUGHN-COOKE studies the usability of glucometers and other handheld medical devices for patients with disabilities. Her research aims to identify the behavioral mechanisms associated with system risk propagation to inform the design of user-centric products and systems with the ultimate goal of improving productivity and safety.

IMPLANTABLE INSULIN PUMP

INVENTOR: ROBERT E. FISCHELL (M.S. '53, HONORARY SC.D. '95)

COMPANY: MEDTRONIC, FORMERLY PACESETTERS

The implantable insulin pump provides greater control of insulin delivery for people living with diabetes. The device lessens the burden of treatment by allowing patients to lead a more flexible life, without worrying about strict diet, exercise, and sleep regimens.

P-SERS™

INVENTOR: ASSOCIATE PROFESSOR IAN WHITE (BIOE) AND WEI W. YU (PH.D. '13, BIOENGINEERING)

COMPANY: DIAGNOSTIC ANSERS, FOUNDED BY ERIC HOPPMANN (PH.D. '13, BIOENGINEERING), BIOENGINEERING GRADUATE STUDENT SEAN VIRGILE, AND WEI W. YU

Diagnostic anSERS has developed a novel inkjet printing process to fabricate inexpensive sensors for surface enhanced Raman spectroscopy (SERS), a molecular fingerprinting technique. This technology has the potential to be an excellent, low-cost fit for diagnosis of pathogens, such as hepatitis, tuberculosis, and HIV.

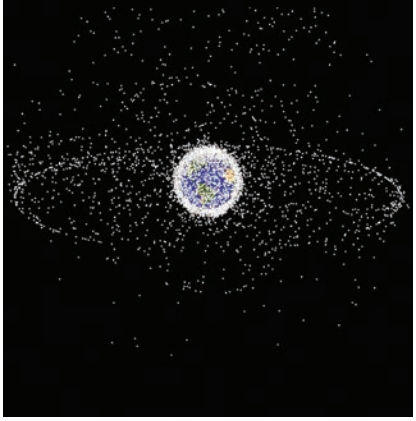
HEMOGRIP™

INVENTORS: PROFESSOR SRINIVASA RAGHAVAN (CHBE) AND MATTHEW DOWLING (PH.D. '10, BIOENGINEERING)

COMPANY: REMEDIUM TECHNOLOGIES, FOUNDED BY SRINIVASA RAGHAVAN AND MATTHEW DOWLING

Hemogrip is a high-pressure, sprayable foam that can expand into an injured body cavity, adhere to tissue and stop hemorrhaging within minutes during the expansion process.

University of Maryland Establishes Orbital Debris Research Center



The University of Maryland (UMD) has established the Center for Orbital Debris Education and Research (CODER) to address critical issues in orbiting space debris and serve as a hub for academic, industry and government research collaboration.

"CODER is the first academically led center established to address the full range of issues surrounding the orbital debris problem," said founding faculty member and Associate Professor of Aerospace Engineering Raymond Sedwick. "Most existing organizations focus on just one aspect of the problem—tracking, modeling, remediation, mitigation, policy, etc.—but CODER will serve as a research collective to provide expertise in all of these areas."

Orbital debris is a global issue. Increasing volumes of orbiting debris, which can travel more than three times the speed of a bullet, could significantly hinder future economy and national security as the world's reliance on satellites for communications, research and defense grows.

There are several existing government, industry, and academic organizations in the U.S. that already support critical functions for the orbital debris enterprise, but they are often limited by their authority, capacity, and budgets. Sedwick sees CODER as a nexus for bringing together resources and ideas from across government, industry and academic communities to advance research aimed at addressing the orbital debris issue.

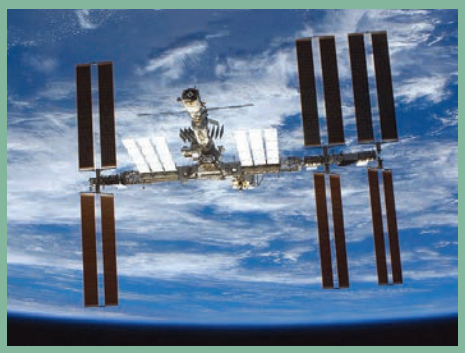
"The goal of the center is to raise awareness and financial support, help coordinate, conduct, and establish collaborative research and ultimately provide new funding streams to accelerate these efforts," said Sedwick, who is also Director of UMD's Space Power and Propulsion Laboratory. "The University of Maryland is well-positioned to take the lead in creating a multi-disciplinary, multi-organizational, collaborative research center to pursue orbital debris solutions."

CODER includes an interdisciplinary team at UMD that will conduct and coordinate research activities in science and technology as well as space policy and economics. The center will spearhead research in each area of orbital debris: modeling, tracking, mitigation, and remediation; assistance in developing international policies for orbital debris; and serving as a clearinghouse for orbital debris knowledge and findings.

The space community has worked hard to mitigate excess proliferation of debris by establishing voluntary rules for spacecraft manufacturers and operators to help minimize the creation of new debris, but there is no formal system in place to clean up near-Earth orbit and no program addressing the long-term environmental control of space.

So far, the threat has been "acceptable"—debris has been a nuisance and created only minimal damage—because the cost of cleaning space up is much greater than the damage to spacecraft and satellites. However, in the not-too-distant future, the cost of continuous damage may approach, and exceed, the cost of cleaning up space. While any cleanup program will take years to implement, and possibly decades to carry out, the future of orbital operations lies in tackling this critical issue. ■

Srivastava and Qu Lead UMD Efforts in Tri-University MURI



Researchers at the University of Connecticut, the University of Maryland, and Rice University have won a $7.5 million Air Force Office of Scientific Research Multiple-University Research Initiative grant to address "Security Theory for Nanoscale Devices." Researchers will analyze and upgrade security protections for nanoscale computer hardware and develop a universal security theory for them.

Professors Ankur Srivastava and Gang Qu, of the Department of Electrical and Computer Engineering (ECE) and the Institute for Systems Research (ISR), will leverage their expertise in hardware security, digital watermarking, and fingerprinting for VLSI design, circuit and design obfuscation, design and implementation of physical unclonable functions, 3-D integrated circuit integration, and manufacture-aware design.

Incredibly small nanoscale devices are increasingly used by the electronics industry to perform vital functions supporting national security, commerce, energy, and transportation. But "we currently lack the capability to fully explain the effectiveness of existing techniques and the metrics to predict the security properties and vulnerabilities of the next generation of these devices and systems," says Qu.

"Over the past decade, research into their security has been very limited," says Srivastava. "They pose both opportunities and challenges. Characterizing and modeling these devices, gaining an understanding of likely attacks, and developing security properties to foil them, is critical."

The principal investigator is Professor Mark Tehranipoor of the University of Connecticut. Domenic Forte, an alumnus advised by Srivastava, is on the UConn faculty and will also participate. Efforts at Rice University will be led by Professor Farinaz Koushanfar. ■

UMD Opens UAS Test Site For Business

The University of Maryland A. James Clark School of Engineering launched a new Unmanned Aircraft Systems (UAS) Test Site in Southern Maryland this August. With support from the University System of Maryland, the site will bring together leaders in academia, industry, and government to accelerate UAS research.

Located in St. Mary's County, the test site is just a few miles from Naval Air Warfare Center Aviation Division (NAWCAD) at Naval Air Station Patuxent River, Naval Air Systems Command (NAVAIR) headquarters, and NAWCAD Webster Field Annex, and will be a catalyst for UAS research and development.

Managed by UMD's Clark School of Engineering, the UMD UAS Test Site will will serve as a hub to focus the capabilities of the people and infrastructure in Southern Maryland, the University System of Maryland, government, and industry to address issues related to UAS technology and policy, and will deliver products and programs in support of workforce development and higher education goals.

PHOTO BY AL SANTOS

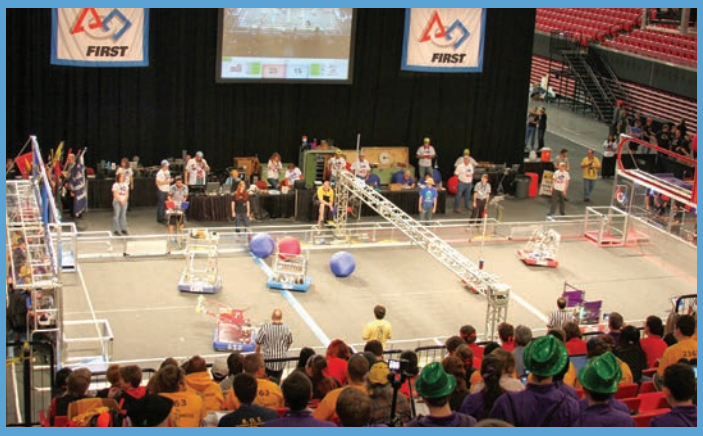
Nearly 200 people celebrated the launch of the UMD UAS Test Site at a ribbon cutting ceremony at the St. Mary's County Regional Airport in August.

The UMD UAS Test Site is part of the Mid-Atlantic Aviation Partnership, in consort with Virginia and New Jersey, under the Federal Aviation Administration (FAA) UAS Test Site program, and will help the FAA integrate UAS into the national airspace.

Matt Scassero, a former Navy captain who helped lead the Naval Air Warfare Center Aircraft Division, is Director of the new UMD UAS Test Site.

To learn more about the UMD UAS Test Site, visit http://uas-test.umd.edu.

UMD Hosts Regional FIRST Robotics Competition



The University of Maryland and the A. James Clark School of Engineering hosted the Chesapeake Regional FIRST Robotics Competition in April. More than 2,000 high school students, their mentors and teachers, family, and fans came to check out the action.

Clark School Dean and Farvardin Professor Darryll Pines helped to kick off the event by welcoming the competition to the University of Maryland for the first time, and announcing new scholarships for FIRST Robotics students who choose to attend the Clark School.

U.S. Sen. Ben Cardin, U.S. Rep. Donna Edwards, and NASA Associate Administrator and astronaut John Grunsfeld came to College Park to support the event. Almost 200 volunteers and judges from well-known corporations including Booz Allen Hamilton, Lockheed Martin, NASA, and Northrop Grumman supported the event. Clark School students and Science, Technology and Society (STS) scholars from UMD also volunteered their time to mentor FIRST Robotics teams.

Teams of students from seven states, the District of Columbia, and Ontario, Canada, spent six weeks preparing for the FIRST Robotics competition game, AERIAL ASSIST™. With guidance from technical mentors, the teams designed, built, and programmed robots to play the 3-on-3 game of passing balls to teammates and scoring goals.

Of the six teams that advanced to the championship round, three were from Maryland. The highest honor of the event, the Chairman's Award, was earned by Team 1629, Garrett Coalition, comprised of students from Northern and Southern Garrett High Schools in Garrett County, Md.

UMD and the Clark School plan to host the Chesapeake Regional FIRST Robotics Competition again next spring.

REDOX, UMD, MICROSOFT, TRANS-TECH TO DEVELOP TRANSFORMATIONAL NATURAL GAS FUEL CELLS THROUGH $5 MILLION IN ARPA-E FUNDING

Redox Power Systems LLC, the University of Maryland, Microsoft Corporation, and Trans-Tech Inc. (a subsidiary of Skyworks Solutions Inc.) are teaming to develop transformational fuel cells through a $5 million cooperative agreement funded by the Advanced Research Projects Agency—Energy (ARPA-E) Reliable Electricity Based on Electrochemical Systems (REBELS) program.

The goal of the project is to further advance Redox's high-performance solid oxide fuel cells and drive them to market-readiness for a broad range of applications, including low-cost distributed power generation and heating and cooling for homes, and for Microsoft—which is providing additional support for the project—energy-efficient datacenters.

Redox's existing 25 kW product, known as "The Cube," is designed for larger commercial structures and can comfortably power a gas station, moderately sized grocery store, or small shopping plaza.

Trans-Tech Inc., based in Adamstown, Md., will work with Redox and UMD to ramp up the commercial production of new cell materials and to reduce production costs and improve the product's time-to-market.

Redox will also redesign its fuel cell stacks to achieve ARPA-E performance targets and reduce costs even further, after which they go to Microsoft for integration and independent live testing in the company's server racks.

Co-founded by University of Maryland Energy Research Center Director Eric Wachsman (MSE) and Bryan Blackburn, Redox was a winner in the 2012 University of Maryland $75K Business Plan Competition, run by the Maryland Technology Enterprise Institute (Mtech). After winning the competition, the company entered Mtech's VentureAccelerator Program, which helps University of Maryland inventors get their research out of laboratories and into industry by creating successful companies. ■

PHOTO BY JOHN T. CONSOLI

Solar Decathlon Winning WaterShed Display Opens to the Public at Pepco Facility

Pepco and University of Maryland officials, members of the original UMD student Watershed team, the Maryland Department of the Environment, and the Chesapeake Bay Foundation joined together recently to open the Pepco WaterShed Sustainability Center, a "living classroom" dedicated to the education and research of sustainable energies, at the Pepco Holdings, Inc. Service Center in Rockville, Md.

Now open to the public, the Pepco WaterShed Sustainability Center serves as a "living classroom" for sustainable energy practices that can be shared with Pepco customers.

WaterShed, which includes an additional educational wing constructed by team members and Pepco this past year, combines hands-on learning and interactive displays that educate visitors with energy-saving ideas they can apply in their own homes.

The center is also a working laboratory for Pepco and the University of Maryland that focuses on energy efficiency and sustainable living. Showcasing new technologies, including smart thermostats, ground and rooftop mounted solar panels, electric vehicle charging ports, and smart meters, WaterShed will continue its mission to educate the public on the beauty and versatility of sustainable design. Also on display are the many hallmarks of its winning design: a dual purpose "butterfly roof" that captures both sunlight and rain water; an indoor, liquid desiccant waterfall for high-efficiency humidity control; edible landscapes that promote community-based agriculture; and constructed wetlands, which cleans both stormwater and greywater for reuse.

WaterShed took first place at the 2011 U.S. Department of Energy Solar Decathlon, an international competition that challenges collegiate teams to design, build and operate solar-powered houses that are cost-effective, energy efficient, and attractive. The Maryland team—the only finalist from the state and the Washington, D.C. area—combined the talents of UMD students, faculty, and professional mentors from a variety of disciplines and professions, including the A. James Clark School of Engineering, the School of Architecture, Planning and Preservation, and the College of Agriculture and Natural Resources. WaterShed wowed juries and audiences alike for its dual focus on both solar energy efficiency and water conservation. The house placed in the top four for all juried contests and finished the competition with the highest point percentage ever awarded at the Solar Decathlon. Since their win, WaterShed has received numerous awards and recognition on regional, national, and international stages for its sustainable and affordable design model.

The Pepco WaterShed Sustainability Center is located at 201 West Gude Drive in Rockville, Md. and is open for guided tours Monday through Friday 10 a.m. to 3 p.m. For larger groups, please contact Megan Kilgore at Watershed@pepco.com in advance of the visit. ■

AMERICAN PHYSICAL SOCIETY HONORS CLARK SCHOOL FACULTY

The American Physical Society (APS) has honored four University of Maryland Clark School of Engineering professors for outstanding achievements in research, education, and public service in its 2013-2014 awards cycle.

APS is a national and global organization representing over 50,000 members that works to advance and diffuse the knowledge of physics through an array of mediums.

EDWARD A. BOUCHET AWARD

LUZ MARTINEZ-MIRANDA
Materials Science and Engineering
"Research on liquid crystals, in particular on the interactions of ordered liquid crystals and nanoparticles and their applications and... mentoring... in physics and materials science."

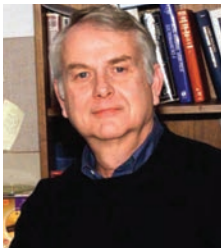
FLUID DYNAMICS PRIZE

ELAINE S. ORAN
Aerospace Engineering
"Contributions to the understanding of reactive flows through computational simulations, especially the deflagration-to-detonation transition in gases and supernovae."

JULIUS EDGAR LILIENFELD PRIZE

EDWARD OTT
Physics and Electrical and Computer Engineering
"Pioneering contributions in nonlinear dynamics and chaos theory... and for communicating the beauty and unifying power of these concepts."

JAMES CLERK MAXWELL PRIZE FOR PLASMA PHYSICS



PHILLIP A. SPRANGLE
Electrical and Computer Engineering
"Pioneering contributions to the physics of high intensity laser interactions with plasmas, and to the development of plasma accelerators, free- electron lasers, gyrotrons and high current electron accelerators." ■

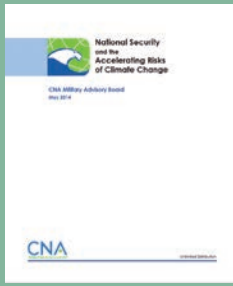
Galloway Contributes Expertise to Climate Change and National Security Report

Department of Civil and Environmental Engineering (CEE) Research Professor and retired Brigadier General Gerald Galloway played an integral role in the release of the "National Security and the Accelerating Risks of Climate Change" report issued by the CNA Corporation this summer.

As Vice Chairman of CNA Corporation's Military Advisory Board, Galloway joined 15 retired generals and admirals in examining new vulnerabilities posed by climate change, which, when set against the backdrop of increasingly decentralized power structures around the world, serves as a "catalyst for conflict," the group noted.

As a follow-up to CNA's landmark 2007 study on climate change and national security, the latest report reexamines the impact of climate change on U.S. national security in the context of a more informed, but more complex and integrated world. The report also addresses questions regarding emerging threats associated with projected climate change, and responses the national security community can take to reduce the risks posed to the United States and its security interests.

Prior to the report's release, Galloway was invited to Capitol Hill to speak before the Bicameral Task Force on Climate Change. Joined by retired Brigadier General Stephen Cheney, Chief Executive Officer of the American Security Project, and former Captain Jon Gensler, a Cambridge Leadership Associates consultant, Galloway discussed how climate change will act as a "threat multiplier" in the most volatile regions, stressing supplies and access to military installations around the world.



"The potential impact of climate change on our fixed [military] installations is real, and the impact will require increased attention for preparation for climate-related events," Galloway told the Task Force.

At the most basic level, rising temperatures will impact soldiers who are forced to train under intense heat with equipment that may not be resilient enough to handle the extreme temperatures, he noted.

"It's going to get hotter, wetter and drier," Galloway cautioned. "We saw what Superstorm Sandy and Hurricane Katrina did to the ability of the nation to move in and around those affected areas. Imagine if that happened at a time of great national crisis.

"When communities and installations are unaware of their vulnerability to these events—and that's one of the challenges—the results can be disastrous," he continued. "A failure to be prepared shifts the military's focus from being ready to deploy at a moment's notice, to recovering from the disaster that's just hit them." ■

FACULTY AWARDS

Associate Professor **EDO WAKS** (ECE/IREAP) and Professor **BENJAMIN SHAPIRO** (BioE/ISR) have received a National Science Foundation (NSF) Early Concept Grant for Exploratory Research to help better understand the complexities of the brain. Their research, "Wireless Measurement of Neuronal Currents Using Spin-Torque Nano-Oscillators," will be funded by the $300,000 grant for the next two years.

Institute for Systems Research Director and Herbert Rabin Distinguished Chair in Engineering **REZA GHODSSI** was selected as the University of Maryland's 2014-2015 Distinguished Scholar-Teacher. The Distinguished Scholar-Teacher program recognizes faculty members who have demonstrated outstanding scholarly achievement along with equally outstanding accomplishments as teachers.

Department of Aerospace Engineering Alfred Gessow Professor **INDERJIT CHOPRA** has been promoted to the rank of Distinguished University Professor at the University of Maryland (UMD). This is the highest scholarly rank attainable by a faculty member, and only 48 active faculty hold this position at UMD.

Clark School Professor **HOWARD MILCHBERG** (ECE/Physics) published work from UMD's Intense Laser Matter Interactions Group, in Physical Review X, the American Physical Society's (APS) online, open access peer-reviewed journal. The lab's research also received mention in articles in APS Viewpoint, Physics Today, Science News, and Nature News.

Women in Engineering Director Honored

The University of Maryland President's Commission on Women's Issues has honored Clark School Women in Engineering (WIE) Director Paige Smith, Ph.D., with the 2014 Outstanding Exempt Staff Member Award.

Smith, pictured at far right, and three additional honorees were recognized in March at the 2014 Celebration of Women.

The President's Commission on Women's Issues aims to advocate for the interest of the entire community of women at the University of Maryland by advising University of Maryland President Wallace Loh on issues related to women, gender, and diversity.

In addition to leading WIE, Smith serves as a faculty advisor for the University of Maryland's Society of Women Engineers, the principal investigator for the Successful Engineering Education and Development and Support program (SEEDS), and the lead for the Mid-Atlantic Girls Collaborative (MAGiC). ■

Island Receives Provost's Academic Advisor of the Year Award

Assistant Director of Undergraduate Studies for the Department of Mechanical Engineering Terry Island was selected as the recipient of the 2012-2013 Academic Advisor of the Year Award for her role as a professional advisor to students. The award honors one advisor who has achieved excellence in advising undergraduate students.

Island has been an advisor for mechanical engineering undergraduate students since 2007 and was the driving force behind changing the department's advising process to give students more timely and personalized guidance.

"She cares about the students deeply, and takes their success and development personally," said Kenneth Kiger, director of undergraduate studies in the Department of Mechanical Engineering.

After students declare their major and enroll in introductory courses, more options open up for students to participate in other related activities, from student organizations to co-ops and internships. Navigating these options can be challenging for students, and help from advisors like Island can be vital to their success.

"She has a talent for presenting these options clearly to students to help them realize what they want to get out of their experience and how to go about doing that," said Kiger.

Island's efforts have achieved results—the department's retention and graduation rates have steadily improved since she started advising for the department. Retention rates have increased from 82 percent to 94 percent, and graduation rates have increased from 57 percent to 72 percent.

"I feel that our program would not be realizing the degree of success it has had without her direct involvement," Kiger said. ■

Shaping The Future of Virtual Reality

PHOTO BY BRANDI ADAMS

Facebook bought Oculus VR this spring for $2 billion, where former University of Maryland students Brendan Iribe, left, and Michael Antonov work as the CEO and Chief Software Architect, respectively.

After gaining $2.4 million in funds from a successful Kickstarter campaign, the Oculus VR team began designing and creating immersive visual virtual reality headsets. The company has a team of industry veterans and talented engineers.

Facebook CEO Mark Zuckerberg acquired Oculus VR because he stated that the virtual reality platform will continue to grow and expand in the future. "Their technology opens up the possibility of completely new kinds of experiences." ■

Out of the Box: ALUM RETHINKS WEBSITE DESIGNS

SQUARESPACE

Ten years ago in a dorm room, Anthony Casalena set out with a $30,000 loan from his father to change the way websites were built and make it easy for anyone to create one.

Squarespace was born.

Now an industry-leading website publishing platform provider, the company "helps set your website apart from the clutter we commonly find all over the web," said Casalena, CEO and founder of Squarespace.

Casalena was a member of one of the first cohorts of the Hinman CEOs Program, which places entrepreneurial students from all technical and non-technical academic disciplines together in a unique community where they live together, learn about entrepreneurship, and can launch new ventures.

With 259 employees and offices in New York and Dublin, Squarespace is one of the biggest publishing platforms on the Internet, serving as a basis for millions of websites. ■

3-D Printer Designed By Alums Attracts $3.3 Million From Kickstarter

Michael Armani, '05 and '10, and David Jones, '06, two University of Maryland graduates and co-founders of M3D, have designed The Micro, a consumer-friendly, sub-$300 3-D printer. They staged one of the most successful Kickstarter campaigns of all-time to produce it, hauling in $3.3 million with more than 10,000 backers.

The Micro raced past its $50,000 goal in just 11 minutes and hit the $1 million mark in 25 hours.

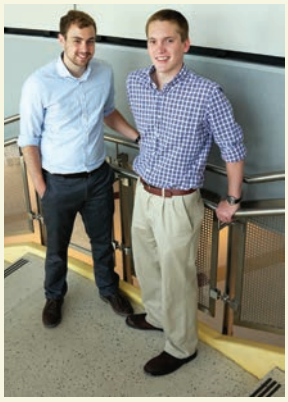
3-D printing, also called additive manufacturing, is a process of making a three-dimensional solid object of virtually any shape from a computer-generated digital model. "There's nothing on your desk one second, and the next you have it," said Armani.

The Micro is powered by what the company collectively calls Micro Motion Technology™, a series of next generation innovations that together create precision at a fraction of the cost. ■

FIRE PROTECTION STARTUP WINS MAJOR AWARDS

MF Fire, a startup company with roots in the Department of Fire Protection Engineering (FPE), has continued to develop and pitch Mulciber, a 93 percent efficient wood-burning stove with almost unmeasurable emissions.

Targeted at low-to-mid income households without access to natural gas, the Mulciber stove includes a forced air system, pressurized combustion chamber, self-cleaning filter, and a chimney-within-a-chimney that improves efficiency and reduces heat waste.



After winning the Lowest Emissions Award at the 2013 Wood Stove Decathlon, decathlon teammates and FPE alumni Taylor Myers (B.S. '12 and M.S. '14) and Ryan Fisher (B.S. '12 and M.S. '13) founded MF Fire, competed in the 2014 ACC Clean Energy Challenge, and received a TEDCO Maryland Innovation Initiative grant to create the stove's next prototype. In May, MF Fire won the $25,000 Energy Efficiency Track Prize and a People's Choice Award at the MIT Clean Energy Prize competition, and then went on to take second place in the RECESS Pitch competition. ■

Diagnostic anSERS Launches

AFFORDABLE TRACE DETECTION TECHNOLOGY

Diagnostic anSERS, a Fischell Department of Bioengineering (BioE)-based startup company founded by graduate student Sean Virgile and BioE alumnus Eric Hoppmann (Ph.D., 2013), has introduced a groundbreaking Surface Enhanced Raman Spectroscopy sensor—otherwise known as a SERS sensor—that enables trace chemical detection for only a few dollars per test.

This new technology—known as P-SERS™—is the first SERS sensor that is both cost-effective and highly sensitive, significantly outperforming the $100 market leader in independent testing.

SERS is a molecular fingerprinting technique that works at extremely small trace concentration levels. By applying a sample to a SERS substrate sensor and measuring the fingerprint with a handheld spectrometer, molecular identification can be carried out at the parts per billion level in less than a minute. These sensors can be used for detection of a wide variety of molecules including drugs, explosives, food contaminants, and taggants for anti-counterfeiting.

Both Virgile and Hoppmann are members of Associate Professor Ian White's (BioE/ISR) research group. ■

Tauros Engineering Sparks Commercial Potential

University of Maryland's Tauros Engineering LLC was formed in early 2013 to commercialize bridge scour sensing technology developed by University of Maryland Associate Dean of Research and Aerospace Engineering Professor Alison Flatau in partnership with Michigan Technological University Professor Andrew Swartz.

Tauros team members Tyler Flatau and Adrian Ross assists UMD graduate students in testing bridge scour near Annapolis.

Detecting scour—erosion at the base of bridge structures—is one of the most challenging bridge monitoring tasks since the environment beneath a bridge is often difficult to access and assess. Many bridges require constant and costly repairs because scour is not detected early enough. Tauros Engineering's sensor technology is designed specifically to detect early onset of scour. Very few monitoring options are currently available and Tauros' technology presents a one-of-a-kind solution that provides robust, accurate, and continuous 24/7 monitoring.

Since its creation, Tauros Engineering, along with student members undergraduate Tyler Flatau and Adrian Ross, MBA candidate, Harvard Business School, was an inaugural winner of the UMD Business Model Challenge. The group also received a Maryland Innovation Initiative Grant, part of a new measure passed by the Maryland General Assembly that commits approximately $6 million to help increase the commercialization of university research. ■

Startup Shell Makes Space for Student Entrepreneurs

Many college students across the country who dream of starting up their own businesses begin working on ideas for their entrepreneurial ventures inside their dorm rooms.

Thanks to the A. James Clark School of Engineering and the Maryland Technology Enterprise Institute (Mtech), University of Maryland students have the opportunity to start building their businesses inside a designated workspace, designed especially for student entrepreneurs.

The University of Maryland Startup Shell is a newly formed, student-run technology collective that advances ventures while leading educational initiatives in the greater community. The Startup Shell is located in the Technology Advancement Program (TAP) Building and provides space and resources to students interested in launching their own startup businesses.

Students can apply to join the Startup Shell, which is now comprised of over 70 students. Startup Shell members gain access to:

- 24-hour swipe access to a decked-out co-working space
- Prototyping tools, including a 3-D printer and electronics device lab
- Funding opportunities and investor interactions
- Mentorship from entrepreneurial professionals
- Dedicated desk and workstation space, plus storage
- Subscriptions to various web products

The Startup Shell offers a lively co-working environment and a community of visionary and ambitious students. Many Startup Shell students participated in Bitcamp, UMD's first hackathon event, which drew over 700 students from across the country to College Park last April.

For more information about the Startup Shell, visit www.startupshell.org. ■

Student Intern Q&A

Caitlin Barr is a senior Civil and Environmental Engineering major. She spent the summer working for Unilever in Tennessee.

Q *Where are you completing your co-op experience, and what does your co-op entail?*

A During my co-op in 2013 at Ben & Jerry's Vermont Manufacturing, a Division of Unilever, I worked on the re-vamp of the allergen validation program. I also helped develop a new process to analyze the effects of environmental temperatures on finished ice cream products.

In the summer of 2014, I worked as a Product Group Quality Specialist for North American Ice Cream based in Covington, Tenn. My internship entailed elevating the temperature profiling process I created in Vermont. I created work instruction documents and training module videos, and I traveled to other ice cream plants to train quality assurance individuals.

Q *How has your co-op complemented your academic experience and future career goals?*

A Working at Unilever, I learned a lot about how to act in a professional environment. For the first time, I was held accountable for finding solutions to problems for projects I managed on my own.

Engineering provides the platform for a strong career by instilling in you the passion for working hard, while work experience provides an opportunity to combine all of the disjointed skills learned through higher education.

Q *What was the most challenging part of your co-op at Unilever?*

A The most challenging parts of my co-op and internship have been the final presentations. It's easy to give 100 percent effort working day-to-day, but it's difficult to sum up several months of hard work into a 10-minute presentation.

Q *What made your co-op experience unique?*

A I ate massive amounts of ice cream. Every factory worker gets three free pints of ice cream a day, or 15 per week.

There is something fun and indescribably rewarding about working in an industry where you create a tangible product whose number one goal is to make people smile.

Q *What's one thing people might not know about the company you worked for?*

A It's amazing to see how Ben & Jerry's gives back to the local community.

Working in Vermont, we donated time to paint an elderly person's house and plant trees in the local forest preserve. We also donated merchandise and pints of ice cream to the family of a 6-year-old girl who had been diagnosed with leukemia. Unilever's generosity knows no bounds. ■

Twelve Clark School Students Awarded NSF Fellowships

Twelve University of Maryland (UMD) A. James Clark School of Engineering graduate and undergraduate students have been awarded National Science Foundation (NSF) Graduate Research Fellowships, the most prestigious fellowship awarded by the NSF and the oldest fellowship of its kind. The Clark School students receiving NSF fellowships represented half of the awardees across campus, with another 12 receiving fellowships from other colleges and departments.

The NSF Graduate Research Fellowships are awarded to outstanding graduate students enrolled in NSF-supported science, technology, engineering, and mathematics (STEM) disciplines at accredited U.S. institutions and to undergraduate students who intend to pursue a research-based graduate degree in those disciplines.

The three-year NSF Fellowship provides an annual stipend of $32,000 plus a cost-of-education allowance for tuition and fees of $12,000. It also provides fellows with opportunities for international research and professional development.

Below are the names of the Clark School graduate and undergraduate students enrolled at UMD who were awarded 2014 NSF Graduate Research Fellowships:

CATHERINE IRENE BIRNEY
Environmental Engineering

SYLVIE ADAMS DELAHUNT
Aerospace Engineering

ROBERT FIEVISOHN
Aerospace Engineering

WILLA CLAIRE ELLISON FREEDMAN Materials Science and Engineering

ERIN SHANNON HYLTON
Environmental and Water Resource Engineering

SUDABEH JAWAHERY
Chemical and Biomolecular Engineering

CODY JACOB KARCHER
Aerospace Engineering

ERIC FRANCIS KAZYAK
Mechanical Engineering

ELAINE MARIE PETRO
Aerospace Engineering

THOMAS EDWARD PILLSBURY
Aerospace Engineering

LISA HOBAN TOSTANOSKI
Bioengineering

NELSON JAVIER YANES
Aerospace Engineering

Three UMD Undergraduates Win Top Prize at LAHacks

Three undergraduate electrical and computer engineering students won the grand prize and brought home the LAHacks trophy. Jake Rye, Charlie Hulcher, and Shariq Hashme built the winning hardware hack, "Tred," which immerses an individual in a virtual reality environment.

About 1,500 people convened in April for the second annual LAHacks. Hackathon participants collaborate to produce inventive hardware and applications for computers, mobile devices, or the Web.

Tred utilizes a slippery surface with ample friction to accomplish virtual reality immersion. The user is secured into a treadmill wearing the Oculus Rift Headset and special shoes. "We wanted to make virtual reality feel real by enabling a person to walk in their environment," said Rye. The Arduino microcontroller board and Unity game engine also created this visually intense experience.

Hulcher remarked, "For people to recognize our entrepreneurial spirit and the clever, time-pressured engineering behind our hack meant alot."

At hackathons, the passionate trio hones technical skills, learns teamwork, meets strict deadlines, designs and implements products under serious constraints, presents without planning, and gains other skills.

The Clark School and the Department of Electrical and Computer Engineering support a culture driven by innovation and entrepreneurship. "It is incredible to attend a university that promotes creative projects that may or may not be possible. We are privileged to attend UMD, we are Fearless," said Rye. ■

PHOTO COURTESY OF RAFTERMEN PHOTOGRAPHY

ECE Alumnus Bader Named Chair at Georgia Tech

Department of Electrical and Computer Engineering alumnus David Bader (Ph.D., '96) was named Chair of Georgia Tech's School of Computational Science and Engineering (CSE and assumed this role in July.)

"I'm thrilled that we found within our own ranks a candidate as viable as David to take the helm of the School of CSE," said Zvi Galil, John P. Imlay Jr. Dean of Computing. "We expect great things to continue in the school under David's watch."

During his time at UMD, Bader was advised by Professor Joseph JaJa (ECE/UMIACS.) He also founded and served as president of the Electrical and Computer Engineering Graduate Student Association (ECEGSA). Since graduating, Bader was named fellow of both IEEE and AAAS, and received a National Science Foundation (NSF) CAREER Award. Bader also received the ECE Distinguished Alumni Award in 2012.

"I am amazed at the speed with which David has achieved national prominence in high performance computing and and big data analytics, and in leadership roles for major national and international professional organizations," said JaJa. "I am confident that David will lead the Georgia Tech School of Computational Science and Engineering to higher levels of national prominence."

The Clark School and the Department congratulate Bader on his accomplishments and wish him the best of luck in his new leadership position. ■

ALUMNUS ADVOCATES ENHANCED FIRE SAFETY IN NEW CONSTRUCTION

Montgomery County, Md., Fire Chief Steven E. Lohr (B.S. '90, fire protection engineering) has many goals for his department, including boosting EMT staff and promoting community resiliency in extreme weather events. But the issue that concerns him the most is firmly rooted in engineering and materials science. Lohr feels the building code that governs the design and construction of many apartment buildings and offices has pushed dangerously close to, and perhaps beyond, an acceptable standard of fire safety.

Structures under 75 feet high are governed by one set of building codes, while those 75 feet high and beyond are subject to those established for high-rise buildings. High-rise buildings have stricter fire protection requirements, including a commercial sprinkler system, a backup generator to keep it pressurized if the power goes out, compartmentation, noncombustible construction, and protected stairwells.

Newer buildings are often made with high-performance, engineered materials that lower construction costs while offering greater strength and structural stability.

But many of these materials burn much faster than wood, increasing the risk of premature collapse. This makes the buildings' fire protection measures even more critical.

"The codes meant to protect us can become a liability when builders want to save money," says Lohr.

Lohr feels it is his duty to educate both the construction industry and the general public about these risks, which are neither new nor unique to Montgomery County. "My concern is that we, as a community, a system...have stretched the practical limits of good fire protection strategies," he says. "It is really an unacceptable risk to both citizens and to the firefighters." ■

CLASS NOTES

D. CALEB SARGENT, M.S. '08, PH.D. '12, aerospace engineering, joined Sikorsky as a Senior Engineer.

BAHMAN ABBASI, PH.D. '10, mechanical engineering, accepted a new position as Science and Engineering Advisor at Booz Allen Hamilton.

PAUL WHITE, B.S. '06, civil and environmental engineering, received the Professional Engineer license.

DR. KHALED SALEH, PH.D. '12, mechanical engineering, became Principal Engineer at Goldman Manufacturing Company, LP.

DR. VIDA KIANZAD, M.S. '03, PH.D. '06, electrical engineering, joined Carbonite, Inc. as a Software Engineer.

NATALIE HERDER, B.S. '13, civil engineering, joined Greeley and Hansen as a Civil Engineer.

PETER MICHAEL, B.S. '66, electrical engineering, won two national prizes in 2013 for his biographical book, *Remembering John Hanson*.

DR. LESA ROSS, M.S. '04, PH.D. '09, reliability engineering, became a Manager at Maxim Medical Service, Inc.

LEON CHAO, B.S. '12, mechanical engineering, is working at the National Institute of Standards and Technology on next-generation Watt Balance to redefine the kilogram SI unit in terms of Planck's constant.

GEORGE CRAIG, JR., B.S. '97, electrical engineering, is working in Business Development at Cubatic Technology Corporation.

ANDREW HOWARD, B.S. '06, aerospace, is working as a Principal Engineering at ManTech.

DENNIS NOLAN, PH.D., B.S. '77, fire protection engineering, is Chief Fire Prevention Engineer at Saudi Aramco, and the third edition of his book, *Handbook of Fire and Explosion Protection Engineering Principles, Third Edition: for Oil, Gas, Chemical and Related Facilities*, was published in June. ■

Yep Receives Full-Time Position through Boeing Accelerated Hiring Program

Recent graduate Rebecca Yep (B.S. '14, mechanical engineering) was hired by Boeing through the company's Accelerated Hiring Program, and began there there in August as a manufacturing engineer working on military helicopters. Yep, along with 10 other engineering Terps, received full-time positions with the company.

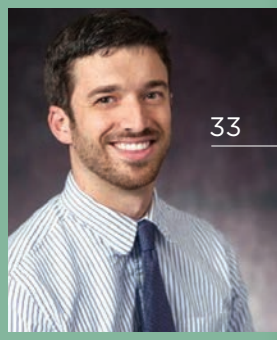
Yep chose Boeing not only because of her interest in aerospace engineering, but because she really liked Boeing's accelerated hiring program mission, and what it stood for. "They were looking for people that they thought would be a good fit to the company as a whole," said Yep, "[If you were accepted] they would match you to a job (instead of us applying to each of the individual jobs). That to me showed me that they were invested in me as a person, and not just a faceless asset."

Yep accomplished a great deal in her four years at Maryland. In addition to interning at General Electric Healthcare and Lockheed Martin, she captained the Varsity Cross Country and Track and Field teams, swore the oath of the Order of the Engineer, was accepted into the University Medallion Society and gave the commencement speech for the Clark School spring 2014 graduation ceremony.

Based on her success, Yep had the following advice for undergraduates looking to jump-start their careers, "Use all of the resources afforded to you by campus and just put yourself out there...applying to a position that you're even mildly interested in (even if it's not your dream job) you can get your foot in the door and set yourself up for success in the future." ■

CLARK SCHOOL ALUMNI NETWORK BOARD UPDATE

HELLO CLARK SCHOOL ALUMNI!



My name is Jeff Williams, your new Director of Alumni Relations. It is my job to help you stay connected with your alma mater, get involved in our programs, and enjoy all the benefits of being a graduate of the Clark School. I will be working with the Alumni Network Board to offer you outstanding events and volunteer opportunities that build a better, stronger Clark community.

I'd like to take this opportunity to thank outgoing Board President Dr. Kimberly Brown (Ph.D. '05, M.S. '98, chemical engineering) for her fantastic leadership and vision. I'd also like to welcome Kevin Schoonover (B.S. '06, aerospace engineering) as our new President.

We hope to see everyone at a Clark alumni event soon. Go Terps!

Kevin Schoonover

Kimberly Brown

SIKORSKY & UNITED TECHNOLOGIES

Pledge $1 Million to UMD's Clark School of Engineering

Sikorsky Aircraft Corp., along with its parent company, United Technologies Corp., have pledged $1 million to the University of Maryland to endow a fund for the creation of the Igor Sikorsky Distinguished Professorship in Rotorcraft at the A. James Clark School of Engineering. Sikorsky Aircraft (NYSE: UTX), is a world leader in helicopter design, manufacture and service, headquartered in Connecticut and a subsidiary of United Technologies.

The Igor Sikorsky Distinguished Professorship in Rotorcraft will be part of UMD's Department of Aerospace Engineering and will support enhanced research specialization in areas related to rotorcraft engineering such as autonomous flight operations, control and system identification, aeromechanics, composite structures, and computer-aided manufacturing.

Sikorsky's donation will help expand UMD's rotorcraft education and curriculum, research programs and intellectual capital to support a continuous source for the best rotorcraft engineers in the world. The endowment is part of an ongoing effort between Sikorsky and the Clark School to enhance UMD's robust rotorcraft program, and provide for continued support in developing not only cutting-edge technology for future helicopters, but also the next generation of innovative rotorcraft engineers.

"We are very grateful to Sikorsky and UTC for this generous investment in the Alfred Gessow Rotorcraft Center and our aerospace engineering program," said Clark School of Engineering Dean and Farvardin Professor of Aerospace Engineering, Dr. Darryll Pines. "Our partnership with Sikorsky has been a tremendously successful one, advancing innovation in rotorcraft education, research and technology development through our shared commitment to excellence."

Sikorsky is a committed Corporate Partner of UMD's Clark School of Engineering. Since 2011, the company has donated nearly $400,000 to support programs for Clark School students, such as scholarships, fellowships and the Sikorsky Aircraft Colloquium Series in Aerospace Engineering. To date, 42 Sikorsky awards have been made to UMD students.

"Sikorsky has seen a direct benefit from many of the best and brightest alumni of the University of Maryland who now are exceptional engineers and senior leaders at our company. As Sikorsky continues its leading role in redefining the future of vertical flight, what better way to extend the legacy of our founder than by supporting this professorship so that future innovators may join the broader mission of rotorcraft engineering," said Mark Miller, Sikorsky Vice President of Research & Engineering.

PHOTO BY AL SANTOS

VP of University Relations Peter Weiler, Sikorsky VP of Research & Engineering Mark Miller, and Clark School Dean Darryll Pines

The Clark School is home to one of the world's leading programs in helicopter engineering. In 2013, Clark School students continued to set U.S. and world records for flight duration of a human-powered helicopter and UMD students have won the American Helicopter Society's graduate student design competition for 12 of the last 15 years. ■

AGILENT TECHNOLOGIES & UNIVERSITY OF MARYLAND PARTNERSHIP SPANS MORE THAN A DECADE

Since 2000, Agilent Technologies has donated over $45.5 million to the University of Maryland, College Park. The company's support has been received in the form of research grants, as well as donations of educational tools for student and instructor use.

Agilent University Research Grants pair an Agilent mentor with a faculty member at the University of Maryland to form a working relationship with the end goal of research that mutually benefits both the company and the school.

Most recently, the university received a donation in the form of licensing for Agilent's EEsof Electronic Design Automation (EDA) Software. The software is designed for "the development of better products using design flows built on our device modeling, electro-thermal, electromagnetic, circuit and system design, and simulation tools," states the Agilent website.

Agilent, a measurement company, is headquartered in California with offices worldwide. According to the Agilent website, the company is "the world's premier measurement company and a technology leader in chemical analysis, life sciences, diagnostics, electronics, and communications." ■

Morris Family, Friends Contribute $250,000 to Establish Graduate Fellowship

In memory of Lt. Gen. John W. Morris II, former adjunct professor with the Department of Civil and Environmental Engineering, his children, John Morris III and Susan Nelson, and friends endowed a fund to provide merit-based scholarships for graduate students in the A. James Clark School of Engineering.

Established this spring, the Lieutenant General John W. Morris II Graduate Fellowship supports students who have served, have committed to serve, or have a relative who has served in the military. Morris III and Nelson contributed $250,000 to establish the fund.

Morris II fulfilled more than 37 years of military service, during which he played a major role in many critical public works assignments and earned selection as the Army's 44th Chief of Engineers in 1976. From this post, he worked on such projects as Lock and Dam 26 on the Mississippi River, the Tennessee Tombigbee Waterway project, and the Saudi Arabian Military Assistance Program. Morris II is also largely credited with modifying the organization of the Corps of Engineers and shifting its focus to more environmental objectives.

Upon retirement from the military, Morris II started an engineering consulting firm that assists companies, many from overseas, in developing corporate plans in environmental and engineering construction matters. Among the many awards he received in recognition of his outstanding career, Morris II was one of only 31 engineers to ever receive the National Academy of Engineers' Founders Award.

Along with his military and professional achievements, Morris II showed a strong commitment to education. In addition to receiving the first endowed chair in construction management at the University of Maryland, he was also Honorary Professor at East China Technical University and Trustee of the Association of Graduates of the U.S. Military Academy. The inaugural General Morris Graduate Fellowship was awarded to Matthew Robinson (B.S. '13, civil engineering), who is currently pursuing a master's degree in Project Management and is an Army Veteran. ■

Fire Protection Engineering Appoints First Clinical Professor

The Clark School's Department of Fire Protection Engineering (FPE) has named its first endowed Clinical Professor, Kenneth E. Isman (B.S. '86, fire protection engineering).

Isman's appointment was made possible by FPE's Legacy Campaign for a Professor of the Practice. Launched in 2012 by a group of FPE alumni, departmental, and Clark School leadership, the campaign has raised almost $1.3 million toward its $2.5 million goal.

"As the only ABET-accredited undergraduate FPE program in the world, and one of only three graduate FPE programs in the United States, the continued strength of the department depends on our ability to maintain a balance between applied science and contributing to research advances in our field," says FPE Professor and Chair Jim Milke. "Ken will be responsible for teaching a group of applied courses, including the design of fire protection and suppression systems."

The addition of a Clinical Professor to the FPE faculty, he adds, will ensure that the department cultivates future generations of industry-savvy graduates and strengthens its ties with industry.

From 1987 to 2014, Isman was an engineer with the National Fire Sprinkler Association (NFSA), where he ultimately rose to the position of Vice President of Engineering. He is a Licensed Professional Engineer in the State of Connecticut and is an elected Fellow of the Society of Fire Protection Engineers (SFPE). Isman has represented the fire sprinkler industry on over a dozen of the National Fire Protection Association's (NFPA) technical committees. From 2000 to 2006 he was a member of the NFPA Standards Council. In addition to his B.S. in fire protection engineering, Isman earned his M.S. in management from the University of Maryland University College in 2003.

A noted author and lecturer, Isman has written, co-written, and edited numerous books and publications for the NFSA and SPFE, including the textbook *Layout, Detail and Calculation of Fire Sprinkler Systems* and the *Fire Pump Handbook*. He has been a speaker at over 500 seminars and workshops on fire protection systems.

To learn more or to contribute to the Legacy Campaign, visit fpe.umd.edu/legacy-campaign, or contact Allison Corbett at 301-405-5841 or acc@umd.edu. ■

Scholarship, Friendship, and Gratitude

In 1974, a 49-year-old woman unexpectedly appeared at the University of Maryland with a very specific request: She wanted to pursue a Ph.D. in chemistry—if Professor Jan Sengers would be her advisor.

Sengers, now Distinguished University Professor Emeritus (joint, Department of Chemical and Biomolecular Engineering and the Institute for Physical Science and Technology), had never met her, but she impressed him. He helped her enroll.

Her name was Frances Balfour, and her visit marked the start of a unique relationship that lasted over 35 years and ended with a bequest that established the Robert Franklin and Frances Riggs Wright Distinguished Chair in Chemical Engineering, named in honor of her parents.

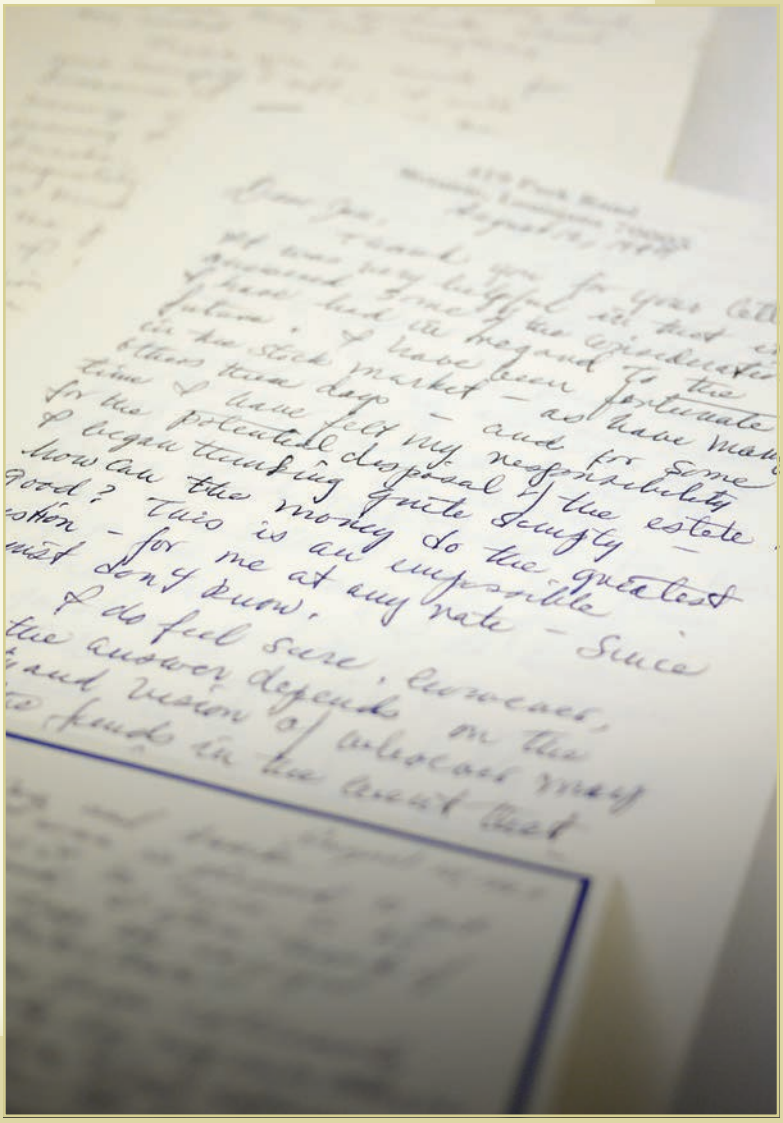
Balfour's grandfather, a surgeon, had encouraged her interests in science and math, unusual pursuits for a woman in the 1940s. She received a B.S. in chemistry from Duke University in 1947. Widowed at a young age, Balfour had no children and never remarried. She continued her studies in chemistry at Tulane University from 1958–1964, where she became familiar with Sengers' published work, but left without receiving a degree.

Not everyone at Maryland was so welcoming of a middle-aged woman whose academic knowledge was, Sengers says, "a bit rusty." Supported by Sengers and his wife, physicist Dr. Anneke Levelt Sengers, Balfour persevered and earned her doctorate in 1982. She worked as a physical chemist in Mississippi, eventually returning to her family's home in Louisiana.

After decades of exchanging letters, Balfour talked to Sengers about a very personal matter: her legacy. "I was totally naïve," he admits. Instead of suggesting a donation to the Clark School, he replied that finding a recipient who shared her values should influence her decision. "Then she said, 'I knew I had the right Ph.D. advisor!' Later on I realized she was testing whether her money would be in safe hands at the University of Maryland."

Ultimately, Balfour chose to leave an endowment to the then-Department of Chemical Engineering, where Sengers was serving as Chair.

"This was done in gratitude," Sengers says of his remarkable friend, who passed away in 2011. "She has entrusted her financial and spiritual legacy to us, because she knew that we would be worthy of it." ■



Mpact WEEK OCT. 16-22, 2014 DISASTER RESILIENCE

RSVP AT clark.umd.edu/mpact

THURSDAY, OCTOBER 16, 2014

FISCHELL FESTIVAL IN BIOENGINEERING: BIOMEDICAL EMERGENCY RESPONSE

JEONG H. KIM ENGINEERING BUILDING, COLLEGE PARK, MD

FRIDAY, OCTOBER 17, 2014

MORNING SESSION: **UAVs & ROBOTICS FOR DISASTER RESPONSE**
AFTERNOON SESSION: **RESILIENT COMMUNICATIONS**

JEONG H. KIM ENGINEERING BUILDING, COLLEGE PARK, MD

SATURDAY-SUNDAY, OCTOBER 18-19, 2014

UNIVERSITY OF MARYLAND HOMECOMING WEEKEND ACTIVITIES

COLLEGE PARK CAMPUS
homecoming.umd.edu

MONDAY, OCTOBER 20, 2014

ENERGY SOLUTIONS FOR GRID RESILIENCE

NOAA CENTER FOR WEATHER & CLIMATE PREDICTION, COLLEGE PARK, MD

TUESDAY, OCTOBER 21, 2014

"RESEARCH ON THE HILL" EVENT ON DISASTER RESILIENCE:
DISASTER RESILIENCE: THE INTERSECTION OF RESEARCH AND POLICY

U.S. CAPITOL VISITOR CENTER, WASHINGTON, DC

CO-SPONSORED BY THE UNIVERSITY OF MARYLAND DIVISION OF RESEARCH AND THE BIG TEN COMMITTEE ON INSTITUTIONAL COOPERATION

SPECIAL RELATED VTOL UAS WORKSHOP: ter.ps/vtoluas

WEDNESDAY, OCTOBER 22, 2014

MORNING SESSION: **MULTI-HAZARD RESILIENCE**
AFTERNOON SESSION: **COASTAL INFRASTRUCTURE**

JEONG H. KIM ENGINEERING BUILDING, COLLEGE PARK, MD

MPACT WEEK SPONSORED BY:

A. JAMES CLARK SCHOOL OF ENGINEERING

UNIVERSITY of MARYLAND RESEARCH

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3228 Kim Engineering Building
University of Maryland
College Park, Maryland 20742-2831

UNIVERSITY OF MARYLAND

A. James Clark Hall Groundbreaking

NOVEMBER 21, 2014, 10:00 AM

A. JAMES CLARK HALL WILL PROMOTE WORLD CLASS RESEARCH AND EDUCATIONAL PROGRAMS THAT ADVANCE HUMAN HEALTH INNOVATION, OFFERING STATE-OF-THE-ART LABORATORIES, STUDENT PROJECT SPACE, AND A NEW HOME FOR THE ROBERT E. FISCHELL INSTITUTE FOR BIOMEDICAL DEVICES. JOIN US TO LEARN MORE ABOUT HOW THIS NEW FACILITY WILL SPUR THE DEVELOPMENT OF TRANSFORMATIVE NEW BIOMEDICAL TECHNOLOGIES AND ENGINEERING ADVANCEMENTS.

LUNCH TO FOLLOW IN THE KIM BUILDING.

FOR MORE INFORMATION, CONTACT NANCY GAY AT NGAY@UMD.EDU OR 301.405.5776.

FUTURE SITE OF CLARK HALL: PAINT BRANCH DRIVE, BEHIND JEONG H. KIM ENGINEERING BUILDING, UNIVERSITY OF MARYLAND, COLLEGE PARK