

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

From College Park
to the Milky Way,
**Clark School
Engineers
Make their
Mark**



What's inside this issue?

The University of Maryland is helping to pioneer what is being called the 5th mode of transportation, in SpaceX's Hyperloop competition. Read more on page 15.



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"Many Clark School alumni have found that as volunteers they have the opportunity to re-engage with favorite faculty and current students, binding a new generation into the framework of this distinguished community."

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Dear Friends of the Clark School,

The strength that was forged during your years at the Clark School often created ties that bound you together as a community. Many Clark School alumni have found that as volunteers they have the opportunity to re-engage with favorite faculty and current students, binding a new generation into the framework of this distinguished community. There are many ways to volunteer: as career mentors, speaking to classes, or acting as professional advisors to some of our engineering teams like the Solar Decathlon or Alumni Cup. In our feature story, you'll read about a handful of volunteers who felt compelled to give back to the Clark School community.

In this edition of *E@M*, you'll also read about Dr. Bill Fourney, a man of many hats, who just completed his 50th year of service to the Clark School. Bill is a beloved mentor, advisor to many deans, and a friend to faculty, students, alumni, and staff. Bill cares for Clark School students like family, and has contributed dramatically to our retention rates through the Keystone Program, which he founded in 2007 and manages to this day. Bill has served as

the foundation of our college, never wavering on excellence. We all owe him a debt of gratitude for his incredible service to this college and institution.

We were delighted to learn of alumna Jeanette Epps's expedition to the International Space Station in 2018. We'll be tracking her journey closely in the next 18 months. You can find out much more about Jeanette in this issue and at eng.umd.edu, where we've revamped and redesigned your online experience. Clark School engineers continue to have a dramatic impact here in College Park and across the universe.

Go Terps!

Sincerely,

Darryll J. Pines
DEAN AND FARVARDIN PROFESSOR OF ENGINEERING

COVER IMAGE: Clark School alumna Jeanette Epps will be the first African American to live and work as a long duration crew member aboard the International Space Station. Read more on page 2.

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.

Letters to the editor and alumni notes are welcome. Please send them to *Engineering @ Maryland* Editor, 3228 Kim Engineering Building, 8228 Paint Branch Drive, College Park, MD 20742-2831. Information can be sent by fax to 301.314.6868 or by e-mail to mandreyc@umd.edu.

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.



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COVER PHOTO
Troy Fields



To the Stars! Clark School Alumna Makes History

FOR THE FIRST TIME EVER, AN AFRICAN AMERICAN WILL CALL THE INTERNATIONAL SPACE STATION (ISS) HOME.

Department of Aerospace Engineering alumna Jeanette Epps (Ph.D. '00, M.S. '94) will join Expedition 56 to the ISS in 2018. She will also remain aboard as part of Expedition 57. This milestone posting will make her the first African American, the 13th woman, and the first University of Maryland graduate to live and work as a long duration crew member on the station.

NASA selected Epps in 2009 as one of 14 members of the 20th NASA astronaut class. As a Flight Engineer aboard

the ISS, which circles the earth every 90 minutes at an altitude of about 250 miles, Epps will be responsible for supporting both research activities during the mission and onboard maintenance for the nearly 20-year-old station. In addition, crew members serve as experiments themselves, with data regularly collected on them providing insights into the effects of space on the human body.

The New York native has regularly returned to UMD for campus visits, speaking with undergraduate aerospace engineering classes to discuss her experiences as an astronaut and talking to students about what it takes to succeed as an engineer.

One of the most unexpected side effects of her position as an astronaut has been the level of responsibility she feels towards the public. According to Epps, astronauts are role models, and they have a responsibility to give back. As one of only two black female astronauts, Epps told UMD's *Terp* magazine she wants to expand the universe of possibilities for African-American girls interested in science and technology.

"I was raised in a way that there was really nothing I thought I couldn't do. The fact that I never saw anyone who looked like me doing this didn't really matter to me, but I think it does matter to a lot of young girls," she said. "So I do want to send them the message that if I'm doing this, there's no reason you can't do this too."

>> LEARN MORE, VISIT go.umd.edu/jeanette

Immigrant's \$2M Gift Supports Engineering, Business Students

THE KIMMY FOUNDATION INC. HAS PLEDGED \$2 MILLION TO

fund endowed and current-use scholarships for undergraduates in the University of Maryland's A. James Clark School of Engineering and Robert H. Smith School of Business.

Recipients of the Long Nguyen and Kimmy Duong Scholarships will qualify by being State of Maryland high school graduates with current or past work experience and a minimum 3.0 GPA. For engineering students, preference goes to students majoring in electrical and computer engineering. Awards will go to entering freshmen or community college transfer students, and are renewable for up to four years.

"This gift of financial support for students who are working hard to realize their career aspirations will inspire future generations of leaders to remain devoted to their passions and fearlessly dedicated to their dreams," said Alex Triantis, dean of the Smith School.

Similarly, Kimmy Foundation President Kimmy Duong emigrated, alone, in 1975 from Vietnam to the United States. She fled Saigon and her position with IBM as the city was about to fall to North Vietnamese forces. Today she is vice chair and CFO of Pragmatics, a Reston, Va.-based information technology consulting firm. Long Nguyen, her husband, is the company's founder and CEO. Many of the couple's nieces and nephews have graduated from UMD.

Darryll Pines, Clark School dean and Farvardin Professor, said the scholarships will help recruit and retain talented students who couldn't otherwise afford a



UMD education. "We are incredibly grateful to the Kimmy Foundation for creating these scholarships, motivated by Ms. Duong's appreciation for opportunities made possible by her immigration to the United States and her desire to help others to become self-reliant," he said.

Awardees will receive \$5,000 in the first year. "I want the scholarship recipients to grab this opportunity, then create their own opportunities later," said Duong. "This should only be a first step for them in long and productive careers."

>> LEARN MORE, VISIT go.umd.edu/kimmy

The Clark School is proud to welcome The Kimmy Foundation Inc. to the Dean's Circle.

FOR MORE INFORMATION ABOUT THE DEAN'S CIRCLE, SEE PAGE 11.

Welcome Pragmatics to the Clark School Corporate Partners Program and the Department of Electrical and Computer Engineering Corporate Affiliates Program.

FOR MORE ABOUT THESE PROGRAMS, VISIT go.umd.edu/partners AND go.umd.edu/affiliates

The Clark School Community: Bigger than a Classroom

The ties that bind Clark School engineers together are more than just academics. They're shared experiences, relationships built, and opportunities earned.

Clark School alumni have given back to the generations of students who follow them, inspiring Terps to do the same both during their time at the University of Maryland and after graduation. A degree from the Clark School is not just an education—it's a foundation for service and making a positive impact.

As members of the Clark School community, students are provided with the tools to make a difference. In recognition of the value of their UMD experience, some support students in need; some remain connected as mentors. Some use their talents to give back to the university's surrounding communities, and some use their successes to help others achieve their own brand of greatness.

Being a Clark School engineer means learning how to be fearless, how to do good, and how to give back to their community.

When Christopher Jones joined the Clark School as a Ph.D. student, he already was a Captain in the U.S. Air Force with two master's degrees under his belt.

What initially attracted him to the University of Maryland was its highly ranked Alfred Gessow Rotorcraft Center.

"I was working on missiles and space, and wanted to do something different in aerospace," he said. Specifically, he chose the Clark School to research helicopter flight dynamics.

Though he carried a heavy research load as a Ph.D. student, Jones made time for community outreach with elementary school students and tutored undergraduates through organizations such as the Clark School's Center for Minorities in Science and Engineering, the National Society of Black Engineers, and the American Institute of Aeronautics and Astronautics.

He was driven to help others because of the rigors he had been through with his earlier degrees. Moreover, he believes engineers should pay forward assistance they received during their studies. In his commencement speech to the Clark

Christopher T. Jones

UMD DEGREE: Ph.D. '97, Aerospace Engineering

OCCUPATION: Corporate Vice President, Northrop Grumman and President, Northrop Grumman Technology Services



JONES WITH A SWARM OF QUADROTOR HELICOPTERS.

School Class of 2016, Jones urged the graduates to do the same.

A big reason Jones was able to volunteer was the financial assistance he received from the Clark School and the National Science Foundation. Because he did not need to work while a student, he could instead spend his available time sharing his love of engineering. It's also why Jones stays connected to the Clark School and gives back as an alumnus.

"People had to have given money for me to have gotten a scholarship. Somehow, somewhere, someone gave money and that ended up in my pocket," Jones said. "Anyone who donated to me, I give back."

He also gives his time by mentoring students and alumni, as well as

serving on the Clark School Board of Visitors.

His participation as an alumnus is not just personal, but also practical. His employer, Northrop Grumman, hires a lot of Clark School graduates. Still, his affinity for the Clark School is primarily personal and in gratitude for the financial support that enabled his doctorate.

"If [Clark School Dean] Darryll Pines asks me to do something, I'm there. Whenever someone from Maryland asks me to do something, I try and do it," Jones said.

What's flying with Dr. Jones?
Read about them on the back cover.



Howard "Skip" Harclerode II, PE

UMD DEGREES: M.S. '71, B.S. '70, Chemical Engineering

OCCUPATION: President, KBD Engineering Company, Inc.

PHOTO: JOHN CONSOLI

HARCLERODE IN THE UNIT OPERATIONS LABORATORY.

Skip Harclerode was going to be in the Navy. He won an appointment to the U.S. Naval Academy, but was at the last minute disqualified for having an irregular electrocardiogram.

Harclerode said he then "scrambled" and was awarded a Delegate Scholarship to the University of Maryland. The dorms were already full, so his next challenge was finding housing. He ended up living in a trailer park and taking a bus to campus that first semester.

To cover expenses, he took a summer job with George Hyman Construction as a laborer in building construction on campus. Harclerode fondly recalls measuring for saw cuts of masonry blocks, mixing mud in pans for the masons, and working alongside a man nicknamed "Hoppy."

He is still hands-on in his work and worries that some younger engineers are missing out on what he views as fundamentals. To ensure they have experiential lab access, he and alumna Jennifer Carter established a fund to support the Department of Chemical and Biomolecular Engineering's Unit Operations Laboratory.

He and Carter—both members of the department's External Advisory Board—each committed to donating \$5,000 for five years to an endowment fund

for maintaining, improving, and expanding the lab. In addition, they hope their gift will inspire other alumni to make donations to the fund.

Harclerode and his wife have also given \$50,000 to establish the Fundamentals of Engineering (FE) Fund, which is designed to provide financial aid to students for the FE licensing exam fee of \$225. He hopes this gift too will inspire donations from the engineering community at large.

A registered Professional Engineer (PE) in nine jurisdictions, Harclerode has served in numerous leadership roles in the National Council of Examiners for Engineering and Surveying and advocates that all engineers should have PE after their names. He stays connected to the Clark School and enjoys giving back by making presentations about professional licensure. He emphasizes how students' engineering educations will serve them whether they become engineers or pursue other careers such as medicine, finance, or law.

"It teaches you how to attack and solve a problem. That is a valuable ability no matter what you do in life," he said.

As a child, Lucia Fernandez thought she wanted to be a physician. But then her father was diagnosed with an exceptionally rare form of cancer.

She was in high school when her dad, in his mid-40s, started feeling lethargic despite being fit. Suddenly, breathing difficulties landed him in the ER. An oncologist knew to test for the very rare Grey Zone Lymphoma, which strikes about 200 Americans per year. Her father's diagnosis of this aggressive cancer kick-started Fernandez's interest in how bioengineering can improve medicine and the treatment of diseases.

Fernandez credits her father's strength and capacity to endure heavy doses of chemotherapy with his recovery. Still, she notes that chemo targets rapidly proliferating cells, but

not the underlying gene mutation that causes the proliferation of cancer cells. That recognition also motivates her toward her chosen field.

"I have so much respect for doctors," she said, but in her academic pursuits, she seeks a way to serve many rather than individual patients. "Being a bioengineer, you can create something that could have an effect around the world."

Her goal of becoming a bioengineer is achievable thanks to the financial support she has attained at the University of Maryland, including the William Barotti, Presidential, and Clark Scholarships.

Fernandez grew up in New Jersey, the eldest child of immigrant parents. The scholarships mean her parents will not have to postpone retirement, she says, adding that "I hope to just pay it back."

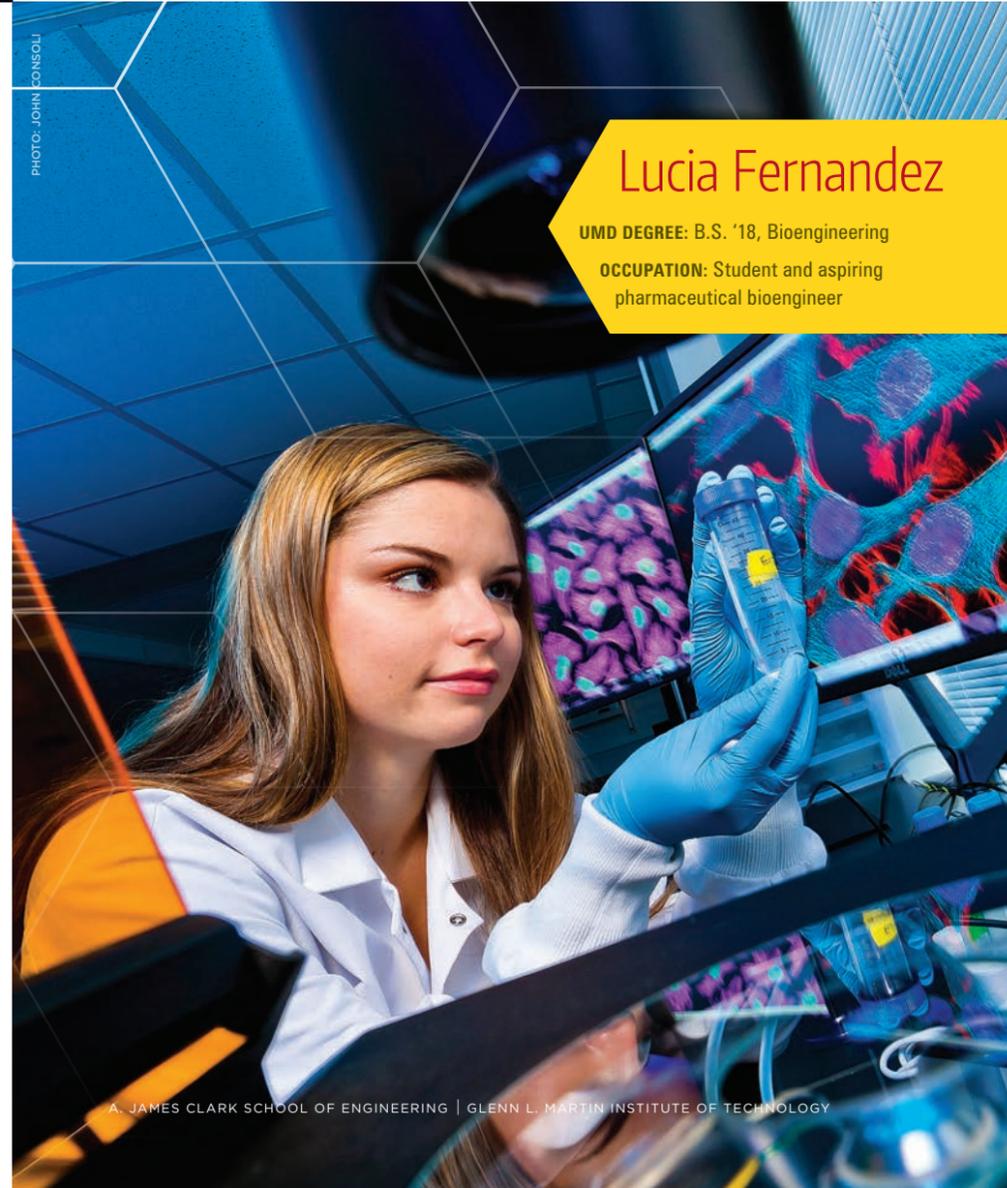
While extremely grateful for such generosity, her UMD experience is broader than the scholarships she's received. For example, as part of her Spanish minor, she has provided translation services at area high schools. She hopes this outreach can spark excitement for STEM learning among other young first-generation American students.

"I had never met one engineer before coming to UMD," Fernandez said. "My minor has allowed me to get more involved in the community [and to share] my passion for engineering and science."

After an internship this summer at Merck Pharmaceuticals, Fernandez is aiming to secure a full-time job in pharmaceuticals and pursue a master's of engineering. She says she would prefer to work and study at the same time because "you're gaining practical experience both ways."

Fernandez recognizes her education can shape the lives of others through engineering and outreach. "It's really opened my eyes to what is going on around me."

FERNANDEZ IN THE BIOINSPIRED ADVANCED MANUFACTURING LABORATORY.



Lucia Fernandez

UMD DEGREE: B.S. '18, Bioengineering

OCCUPATION: Student and aspiring pharmaceutical bioengineer

PHOTO: JOHN CONSOLI

Working summers as a student engineer at a nuclear power plant, Jeffrey Karceski was devoted to nuclear engineering—but then, something swung him in a new direction.

He took an elective course on patent law for engineers, and found himself immediately enamored with the subject during an arcane discussion about a conveyor belt innovation for chicken farming.

The discussion illustrated how engineering and patent law share a common purpose: problem solving. The course also changed Karceski's life by illuminating a different career path.

He completed his B.S. in nuclear engineering at the University of Maryland on a full ride as a Chancellor's Scholar, Maryland's most prestigious merit scholarship for academically talented students. While Karceski loved engineering, he also became riveted by patent law. He went on to earn his juris doctorate from George Washington University.

Now a registered patent attorney, Karceski maintains a deep appreciation for his engineering alma mater and serves on the Clark School's Engineering Network Board of Directors. He chaired the 2017 Alumni Cup competition, in which student teams compete to devise Rube Goldberg-inspired machines. This year's competition—won by the Fischell Department of Bioengineering team—was to build a machine that would take a "selfie." (See page 12 for more information about this year's Alumni Cup.)

The competition also gives students the opportunity to meet alumni who work in various engineering fields. And, likewise, participating alumni gain the benefit of seeing their industry from the students' eyes.

Karceski stays connected with paralegal students at Georgetown University, where he is an adjunct professor in intellectual property law, but it is his interaction with Clark School students that gets his engineering juices flowing. "[Engineering students]



Jeffrey Karceski

UMD DEGREE: B.S. '88, Nuclear Engineering

OCCUPATION: Partner, Karceski IP Law

KARCESKI WITH THE ALUMNI CUP TROPHY.

provide a certain optimism for what will and can be done," said Karceski. "It's intellectually very beneficial for me to be engaged with [them]."

He noted it was that patent law course for engineers that set him in a new direction. But unlike the complex maneuvers of a Rube Goldberg machine, the shift from engineering to law was an intuitive move, he said, likening it to the rapid sweep of a pinball machine.

"I feel a very strong affinity for the university; I would not be here today if I hadn't been a nuclear engineering student at UMD," Karceski said. It's like "the pinball machine in life ... bounced me in a different direction."

When Amy Murdock first started college in the University of Maryland's Department of Fire Protection Engineering (FPE), she moved into a nearby firehouse.

The housing experience was personally arranged by department founder John Bryan, who also recruited her to UMD in the first place.

FPE is small, and Murdock found herself within an even smaller cadre of students: women.

"It's tough being a female in this industry," Murdock said. "It's still very male dominated. There have been a lot of challenges that I've overcome."

Men and women communicate differently, she noted, adding that women tend to excel at verbalizing complex scenarios. But sometimes they don't speak up as much as men, she said. During school, Murdock "leaned in" by assisting with the management and maintenance of FPE lab equipment, working in the department office, and interning with a local FPE firm.

If it had not been for Bryan personally recruiting her in the mid-90s, Murdock would not have known it was possible for her to obtain in-state tuition due to a reciprocity agreement at that time with her home state of Virginia. The recruitment also entailed professor and current FPE Chair James Milke phoning her father to relate what the program had to offer.

Department administrators and faculty directly engaging on behalf of a student for everything from tuition assistance to housing shows how caring the FPE department is, Murdock noted. "That's the kind of family you have in fire protection," she said.

Murdock is in turn devoted to giving back to the program to pay forward the generosity she received while at the Clark School. She notes that UMD has the only

undergraduate fire protection engineering program that is ABET accredited. In the industry, there is a running joke about the "Maryland Mafia" of fire protection engineers.

Currently, she serves on FPE's Engineering Board of Visitors and Curriculum Advisory Committee and makes donations to the department's Legacy Campaign for a Professor of Practice, which brings hands-on field experience to the undergraduate curriculum.

Inspired by her professors' open door policy, Murdock herself now offers that openness to other engineers seeking career advice—especially other women.

"Sharing my experiences as a female in fire protection engineering provides younger engineers with the same fundamentals that my mentors gave me," Murdock said.

MURDOCK IN FRONT OF BALLPARK VILLAGE IN ST. LOUIS, MO., ONE OF CODE CONSULTANTS INC.'S PROJECTS.



Amy Murdock

UMD DEGREE: B.S. '98, Fire Protection Engineering

OCCUPATION: Principal, Code Consultants Inc.



Devang Shah

UMD DEGREE: M.S. '91, Electrical and Computer Engineering

OCCUPATION: Founder and CEO, InfiniPower Hospitality Group

SUNITA AND DEVANG SHAH AT THEIR HOME IN CALIFORNIA.

Devang Shah exemplifies University of Maryland pride.

More than 30 years ago, he took a chance to pursue an education half a world away and emigrated alone, and with limited resources, from Ahmedabad, India. He found opportunity at UMD—and, later, gave so much more in return.

Shah arrived in College Park for the spring semester in pursuit of a master's degree at the Clark School. Knowing he needed a job immediately, he secured a teaching assistantship in the chemistry department, giving him financial relief while he focused on studying electrical and computer engineering.

Learning how to adapt quickly from being an undergrad living at home in India to an independent graduate student in the U.S. with limited means was a maturing experience. "It definitely made me grow as a person and understand how real life works and what it takes to earn and spend money," Shah said.

His engineering program required that he complete summer coursework. Because Shah's teaching assistantship did not cover summer classes, it was imperative he find a summer job. The only opportunity available was to teach organic chemistry—although he had never studied the subject, he took the job. As an electrical engineer, he found organic chemistry completely foreign. Knowing he had to be creative, Shah discovered how to harness his students' capabilities.

PHOTO: KRISTINA RUST

"I learned that students can be your teachers, too," he said. Shah knew he had to stay one class ahead of his students, sharpening his ability to solve problems and think quickly in any new situation.

Currently, Shah—an entrepreneur and investor—is the founder and CEO of InfiniPower Hospitality Group in California. He relates his success after graduate school to the role UMD played. Despite following a non-traditional career path for an engineering graduate, he says that his studies in technology gave him the platform to migrate towards building startups, where he continuously applies the skills, knowledge, and abilities he acquired at the Clark School.

"What separates me from others in my field is my engineering training and analytical skills, because that helps me look at a problem and analyze it quickly and more quantitatively," Shah said.

Decades after graduation, Shah is still deeply connected to Maryland. His whole family—his wife Sunita and two sons, Parth and Kanaai—watch every basketball game even though both sons attend other universities.

Although Shah and his family live in the Bay Area, he remains engaged with UMD. He and Sunita have opened their home for UMD events and meet with Clark School Dean Darryll Pines when he's traveling out west. Many of his closest friends are those he met in his master's program. This fall, they gathered in Maryland from across the country for their own homecoming weekend and cheered on the Terrapins as they played against Ohio State University in football.

Success for Shah continues to grow, and his passion for UMD remains steadfast. The booming startup world of Silicon Valley provided him with the resources to become a philanthropist. He and Sunita sat down to discuss charitable giving and the many ways they could support their interests.

"That's when my experience and time spent at Maryland came to the forefront," Shah said. "Maryland was my first choice to give back to, because without their support, I wouldn't have completed my education in this country."

Shah remembered all the UMD students he worked with and decided he wanted to prioritize helping those who need financial assistance the most. He and his wife established the Devang and Sunita Shah Family Scholarship Endowment and the Devang and Sunita Shah Family Endowed TerpStart Scholarship in the Department of Electrical and Computer Engineering.

As the husband and wife team support students' futures in engineering, they hope that this contributive movement will transcend generations. Because of Maryland, Shah has been able to build a life that continues to provide for him and his family. He and Sunita are confident that their sons will recognize that, stay connected with the university, and follow in their philanthropic footsteps.

The Shahs' generous contributions have provided support to several undergraduate scholars in electrical and computer engineering. To these students, and others going out into the "real" world after college, Shah offers some advice.

"The sky's the limit," he said. "Don't be afraid of taking risks; without risk, you don't get reward."



The Dean's Circle recognizes and celebrates those individuals who have given \$100,000 or more during their lifetime to the A. James Clark School of Engineering.

The Dean's Circle is a community of philanthropists whose vision and contributions have empowered the Clark School's ascent.

Thank you, Devang and Sunita Shah, The Kimmy Foundation Inc., and all of our Dean's Circle donors!

To learn how you can make a charitable donation today and make a significant difference in the future of the Clark School, contact Leslie Borak, assistant dean for external relations, Clark School of Engineering.

EMAIL: lborak@umd.edu
PHONE: 301.405.0317



PHOTOS: FELICITY HANCOCK

The Fischell Department of Bioengineering team celebrates its 2017 Alumni Cup win.

Bioengineering Celebrates First Alumni Cup Win

"Take a team's picture, and they'll be happy for a day. Teach a team to build a selfie-taking machine, and they'll win the 2017 Alumni Cup," as the old saying goes. This year's Alumni Cup celebrated its sixth year with a unique challenge: build a machine that would take a selfie. And for the first time, the Fischell Department of Bioengineering celebrated a win over eight other department teams.

Alumni Cup is an annual engineering design competition that was started in 2012 by the Engineering Alumni Network. Teams of students from each Clark School department compete against one another for engineering dominance in a week-long challenge that tests their creativity, problem-solving, and teamwork abilities.

They must develop a Rube Goldberg-inspired machine that will complete a specific task within certain parameters.

This year's competition manager Jeffrey Karceski (B.S. '88, nuclear engineering) says the Alumni Network is extremely proud of the efforts by each team and their machines, which reflected the originality, creativity, and ingenuity of each engineering discipline. (See page 8 to read more about Karceski.)

Bioengineering team captain Shannon Larson competed in last year's Alumni Cup and incorporated what she learned into this year's win. Given the tight deadline, the team worked in shifts around

classes and late at night. Larson said this stressed the importance of refraining from overcomplicating the machine and focusing on the bigger picture.

Bioengineering's "BioBees" machine was the only machine during the competition that completed its tasks as predicted without interference. Larson credits the team's success to the support of other bioengineering students, and the department faculty and staff.

"I am very proud of our team for all of our hard work," Larson said. "Watch out for the bioengineering team continuing to grow stronger and remain competitive in years to come!"

>> LEARN MORE, VISIT go.umd.edu/alumni-cup

ALUMNUS ELECTED TO NATIONAL ACADEMY OF ENGINEERING



Department of Aerospace Engineering alumnus David Van Wie (Ph.D. '86, M.S. '82, B.S. '80) has been elected as a member of the National Academy of Engineering (NAE). Election to the NAE—which recognized Van Wie for his contributions to hypersonic technology enabling new classes of flight vehicles—is among the highest professional distinctions accorded to an engineer. Van Wie, along with fellow 2017 NAE members, will be formally inducted during a ceremony at the NAE's annual meeting on October 8, 2017.

Van Wie is the mission area executive for the Johns Hopkins University Applied Physics Laboratory's precision strike mission area. In 2016, the Clark School's Department of Aerospace Engineering inducted Van Wie into their Academy of Distinguished Alumni, which recognizes alumni who have made notable contributions to the field of aerospace engineering and/or achieved other significant accomplishments.

>> LEARN MORE, VISIT go.umd.edu/vanwie

Alumni Win NSF CAREER Awards

Four alumni of the Clark School's Department of Electrical and Computer Engineering have received a 2017 National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award. The NSF CAREER Program fosters the career development of outstanding junior faculty, combining the support of research and education of the highest quality and in the broadest sense.



SERBAN SABAU (Ph.D. '11) received a CAREER Award for "Novel Representations for Distributed Control of String Networks in Vehicle Platooning and Supply Chain Management." Sabau is now an assistant professor at the Stevens Institute of Technology.

>> LEARN MORE, VISIT go.umd.edu/sabau



ASWIN SANKARANARAYANAN (Ph.D. '09, M.S. '07) received a CAREER Award for "Plenoptic Signal Processing: A Framework for Sampling, Detection, and Estimation using Plenoptic Functions." Sankaranarayanan is now an assistant professor at Carnegie Mellon University.

>> LEARN MORE, VISIT go.umd.edu/aswin



RAVI TANDON (Ph.D. '10) received a CAREER Award for "Communication-Efficient Distributed Computation: Information-Theoretic Foundations and Algorithms." Tandon is now an assistant professor at the University of Arizona.

>> LEARN MORE, VISIT go.umd.edu/tandon



ASHOK VEERARAGHAVAN (Ph.D. '08, M.S. '04) received a CAREER Award for "A Signal Processing Framework for Computational Imaging: From Theory to Applications." Veeraraghavan is now an assistant professor at Rice University.

>> LEARN MORE, VISIT go.umd.edu/ashok

Alumnus Wins Alfred P. Sloan Foundation Fellowship

Amir Ali Ahmadi (B.S. '06, electrical engineering and mathematics) was selected this year as one of only 126 individuals in the United States to win an



Alfred P. Sloan Foundation Fellowship. These two-year, \$60,000 fellowships are awarded yearly to individuals in recognition of distinguished performance and a unique potential to make substantial contributions to their field.

Ahmadi, now an assistant professor at Princeton University, was an undergraduate researcher in the Department of Electrical and Computer Engineering. At Princeton, Ahmadi develops new algorithms and new understanding of optimization problems. He has also won the National Science Foundation Faculty Early Career Development Award, the Google Faculty Award, the Air Force Office of Scientific Research Young Investigator Program Award, and several best paper and teaching awards.

>> LEARN MORE, VISIT go.umd.edu/ahmadi



Alumnus Named to *Forbes*' "30 Under 30" List

Adam Behrens (Ph.D. '15, bioengineering; B.S. '10, chemical and bio-molecular engineering) was named to *Forbes*' prestigious "30 Under 30 2017: Healthcare" list in recognition of his recent efforts to advance the development of vaccines and diagnostic testing.

"Being selected for *Forbes*' '30 Under 30' is really an amazing honor," Behrens said. "The recognition equally speaks to the great people that I have worked with and

the opportunities they have afforded me." *Forbes* noted that Behrens is "taking on germs in the developing world with two projects: an effort to make vaccines that don't require refrigeration, and a push to develop diagnostic tests that can detect infectious diseases at patients' bedsides." Throughout his undergraduate and graduate years of study at the Clark School, Behrens worked under the guidance of Fischell Department of Bioengineering Professor and Associate Dean Peter Kofinas towards developing a hemostatic (blood-clotting) gel designed to quickly stop hemorrhaging, and a low-cost alternative

to sutures for use in a surgical setting. Today, he is a postdoctoral associate at the Massachusetts Institute of Technology's Langer Lab, which focuses on the interface of biotechnology and materials science. Behrens, a former Clark School Future Faculty Fellow, was recently awarded an honorable mention in the competition for the 2016 Council on Graduate Schools ProQuest Distinguished Dissertation Award in Mathematics, Physical Sciences, and Engineering.

Behrens is among five University of Maryland alumni selected for *Forbes*' 2017 "30 Under 30" list.

>> LEARN MORE, VISIT go.umd.edu/behrens

Bill Billiet

CIVIL ENGINEERING, M.E. '13, B.S. '06

Bill Billiet describes the biggest difference between his undergraduate civil engineering classes and his Professional Master of Engineering program: "As an undergrad, I had no idea what I was going to do when I graduated. I started the master's program knowing what my future held, what skills were the most pertinent to my job. I was approaching it with real life experience."

As a geotechnical engineer for Schnabel Engineering, Billiet says he works "from the ground down" on things like retaining walls, soils, and bridge foundations. He recently traveled abroad to do subsurface exploration to strengthen U.S. embassy fortifications, and has worked on the Clark School's new Clark Hall as well as Maryland's InterCounty Connector and the Silver Line Metro.

After several years on the job, the Port Deposit, Md., native says, "I wanted more background in the application of my engineering knowledge. I looked at master's programs at a lot of places, but the Maryland program was the most highly recommended. The Professional Master's let me choose from a large selection of very relevant classes that complemented my professional practice. I was also still involved on campus with the capstone program, so it was a natural fit to return to Maryland."

Billiet took his courses on campus. "It was very convenient," he says. "It's tailored to people who work full-time. Two days a week I would leave work a little early to get to class."

His project management classes especially hit the mark for Billiet. "You're taking classes that you know will help you directly. When you're an undergrad, some things might roll off your back, because you don't have a way to apply them. In the master's program, you're like, 'Oh yeah, I know how to use this in my job.'"

Says Billiet, "You also get the benefit of what other people in the class bring to the table. My professional master's has enabled me to put all the pieces together."



ADVANCE YOUR CAREER

Offered through the Clark School's Office of Advanced Engineering Education, the Professional Master of Engineering and the Graduate Certificate in Engineering programs assist engineers in the development of their professional careers and provide the technical expertise needed in business, government, and industry. The online programs were ranked 16th in the nation by *U.S. News & World Report* for 2017.

>> LEARN MORE, VISIT go.umd.edu/oaee

>> EMAIL oaee@umd.edu

Reimagining Transportation



UMD Loop at the January 2017 SpaceX Hyperloop Pod Competition.

The University of Maryland team UMDLoop is helping to pioneer what is being called the 5th mode of transportation: a tube structure that would shoot pods filled with passengers at very high speeds, named Hyperloop. At the January 2017 SpaceX Hyperloop Pod Competition held in Hawthorne, Calif., UMDLoop won the Performance in Operations Award and placed in the top five for overall pod design.

During the three-day event, 27 teams from around the globe pitted pod against pod to earn the chance to test their creations in SpaceX's vacuum-sealed test track. UMDLoop's pod Prometheus featured a passive magnetic levitation control and braking using neodymium magnets, a unique chainmail braking system, and a multi-link suspension system for smoothing the ride.

Since their return from California, UMDLoop has received recognition, most notably from the NASA Goddard Space Flight Center in Greenbelt, Md. UMDLoop was featured in NASA Goddard's Engineering Colloquium on March 7, and presented on their two-year engineering odyssey.

UMDLoop has also received coverage from local news stations WUSA9 and WJLA, as well as in UMD's *Terp* magazine and *The Diamondback*.

SpaceX will host a second competition weekend during the summer of 2017. UMDLoop will be there with a redesigned pod that has already been accepted for the competition.

>> FOLLOW THE TEAM ON TWITTER AT [@umdlloop](https://twitter.com/umdlloop)

TERP RECEIVES FORD ALAN MULALLY LEADERSHIP IN ENGINEERING SCHOLARSHIP

Virginia native and mechanical engineering senior Austin Kendall was always interested in cars, but an introduction to designing in CAD by a high school technical drawing teacher really helped set him on a path to pursuing mechanical engineering. "Ever since then," he said, "I've been hooked."

This passion has led to Kendall's success both inside and outside the classroom at the University of Maryland. He is the current leader of UMD's Formula SAE team Terps Racing and a QUEST honors program student, and this year received the prestigious Ford Alan Mulally Leadership in Engineering Scholarship.

Kendall's proven leadership ability and strong academic skills were part of what

helped him win the Ford Scholarship, named for the former Ford Motor Company president and chief executive officer. Ford awards this competitive honor to only 10 students a year globally.

"Being from Virginia, I am very fortunate to have my family supporting me in my out-of-state academic pursuits," said Kendall. "This scholarship is a way I can give back to my family for taking on the financial burden of my education."

Throughout his time at Maryland, Kendall has consistently proven his commitment to automotive engineering, his Terps Racing team, and his university. He believes his experiences here have best prepared him for the next chapter of his life: the workforce. The automotive industry



has been Kendall's dream destination since high school, and we are excited to see where his passion for engineering will take him next.

>> LEARN MORE, VISIT go.umd.edu/kendall

QUEST Students Team Up with Becton Dickinson



IMAGE: DANIEL JENKINS

From left to right: Gopal Srinivasan, Chris Demek, Urvashi Dayalan, Sandra Soltz, and Basma Hamud.

Clark School students Urvashi Dayalan (bioengineering) and Sandra Soltz (bioengineering) can add “consulted for a Fortune 500 company” to their CVs—long before they receive their college diplomas.

Through the Quality Enhancement System and Teams (QUEST) honors program, students like Dayalan and Soltz work in cross-functional teams alongside students of business, mathematics, and the sciences to consult real-world clients. For Dayalan and Soltz, their capstone project meant teaming up with Robert H. Smith School of Business students Chris Demek, Basma Hamud, and Gopal Srinivasan and Department of Mechanical Engineering Professor and QUEST Academic Director Jeffrey Herrmann to evaluate the status of Becton Dickinson’s Lactinex™. The probiotic combines two naturally occurring human body bacteria

to aid digestion and balance bacteria in the stomach and intestines.

The team received QUEST’s Most Outstanding Capstone Project award in fall 2016.

To better understand the Lactinex™ business and its

marketplace, the team conducted interviews and focus groups involving a wide variety of internal and external stakeholders. Given that Lactinex™ is an over-the-counter dietary supplement with a good profit margin, the team set out to evaluate how remarketing the product could spell greater success.

Both Dayalan and Soltz used what they learned in the classroom to develop strategies for driving market penetration of the product with only a minimal increase in resources.

Currently, Lactinex™ is available as a chewable tablet or a packet of granules and requires refrigeration, which means that customers must request it from the pharmacist. Recognizing that this limits customer visibility of Lactinex™, Dayalan took what she learned about biomaterials to investigate new techniques for encapsulating the probiotic.

“In Dr. Martha Wang’s biomaterials class, we focused on drug delivery systems,” Dayalan said. “We researched different biomaterials that can be used to encapsulate probiotics or similar drugs, and so I was able to draw from the readings for class to brainstorm ideas for our project.”

“In engineering, there are so many opportunities for me to apply my technical skills,” Soltz said. “Through QUEST, I have strengthened my critical thinking skills and my communication skills.”

QUEST’s 25th ANNIVERSARY GALA

is coming up on October 7, 2017, at the brand new Hotel at the University of Maryland!

JOIN THE PARTY. For details visit: go.umd.edu/quest25

UMD Students Named Tomorrow’s Aviation Leaders

Four University of Maryland aerospace engineering students have been named “Tomorrow’s Engineering Leaders: The 20 Twenties” by Penton’s Aviation Week Network. The award, granted in partnership with the American Institute of Aeronautics and Astronautics, recognizes top students in engineering, math, science, and technology from across the country and globe, and connects the next generation of aerospace and defense talent with established leaders in the fields. They are:



BRIAN FREE | Free’s research interests are in the areas of underwater locomotion of robotic vehicles and bioinspired sensing that mimics the lateral lines and vestibular systems found in fish.



RUBBEL KUMAR | Kumar is a part-time master’s student specializing in aerodynamics and propulsion; he simultaneously works full-time at the Johns Hopkins University Applied Physics Laboratory.



WANYI NG | Ng’s research focuses on theoretical and experimental modeling of hybrid-electric rotorcraft propulsion; she is also a Pathways Intern at NASA Goddard.



ROSIE WEINSTEIN | Weinstein is pursuing graduate work in aerospace dynamics and controls. She is one of the founding members of UMD’s Women in Aeronautics and Astronautics organization, and currently serves as its vice president.

>> LEARN MORE, VISIT go.umd.edu/20twenties

CLARK SCHOOL STUDENTS COMPETE ON TEAM NINJA WARRIOR



IMAGE: ESQUIRE NETWORK

From left to right: Marcos Colon-Pappaterra, Kevin Merrick, and Delaney Jordan.

Clark School Student Named National Space Club & Foundation Keynote Scholar

The National Space Club and Foundation (NSCF) selected Department of Aerospace Engineering junior Evan Peaco for their 2017 NSCF Keynote Scholarship. The \$10,000 scholarship is aimed at supporting a student who intends to pursue a career in the engineering, math, science, and technology fields, and is both academically strong and excels in public speaking.

More than 7,000 students applied for this year’s award. According to NSCF, “Peaco rose to the top of the competition with his strong academic record and experience in aerospace,” as well as “his impressive list of honors and accomplishments includ[ing] being named a National Merit Scholar and receiving the school’s prestigious Banneker/Key Scholarship.”

Peaco is in the space systems track at the University of Maryland and is in the Aerospace Engineering Honors Program. In the future, he intends to pursue a graduate degree in aerospace engineering and then continue working in the spaceflight industry with an eye towards advancing the world’s manned spaceflight capabilities, particularly to Mars or the moon.

In addition to the financial scholarship, as a NSCF Keynote Scholar, Peaco presented the keynote address at NSCF’s Dr. Robert H. Goddard Memorial Dinner held March 10, 2017, in Washington, D.C.

>> LEARN MORE, VISIT go.umd.edu/peaco

Three University of Maryland students harnessed both brains and brawn in the popular obstacle course show *Team Ninja Warrior: College Madness*. Marcos Colon-Pappaterra (mechanical engineering), Delaney Jordan (materials science and engineering), and Kevin Merrick (computer engineering and mathematics) credited their competitive edge to their understanding of engineering principles.

“You don’t have to just pick one thing to be. You can be smart and you can be strong,” said Jordan in a November 21, 2016, *Inside Science* article. “I think that the three of us are good examples of that, especially for any kids watching the show.”

>> WATCH THE FULL EPISODE AT: go.umd.edu/college-ninja



PHOTO: JOHN CONSOLI



ARCHITECTURAL RENDERING OF reACT

UMD Achieves First Successful Solar-Powered Helicopter Flight

The Clark School has once again achieved new heights, this time by successfully lifting a helicopter and passenger through the sole use of solar power.

After successfully completing the longest duration flight for a human-powered helicopter in fall of 2013, UMD's Team Gamera—a student competition team originally inspired in 2012 by the American Helicopter Society's Sikorsky Prize—has continued raising the bar. In 2014, a team of undergraduate students took over Team Gamera, reinventing itself as Solar Gamera to test the feasibility of applying solar power in achieving human helicopter flight.

With materials science major Michelle Mahon in the cockpit, Solar Gamera achieved two successful flights, flying for nine seconds and gaining more than a foot of height.

While electronic controls offer an advantage over Gamera's human-powered predecessor, the challenge of lifting a 100-foot square craft solely through solar power has posed its own unique set of challenges.

"This is about inspiring and educating students,

that's our product here," explained Distinguished University Professor and Gamera faculty advisor Inderjit Chopra. "No one thought that solar energy could lift a person."

The solar-powered flight record is unofficial pending verification by the National Aeronautic Association. However, through involvement with this project, students gained immense hands-on experience and the chance to hone their engineering chops to solve a unique challenge.

More than 100 students from across the Clark School have worked on Gamera at some point in the more than six years the team has been active, offering unlimited possibilities to explore achieving the impossible in engineering and flight.

"This project has come a long way in the past six or seven years from human-powered to solar-powered," said Ph.D. student William Staruk, who assisted with the flight and was a member of Gamera's human-powered helicopter team. "So we are breaking barriers of all sorts in aviation with this one airframe, and we are very proud of that work here at the University of Maryland."

>> LEARN MORE, VISIT go.umd.edu/solar-flight

Engineering @ Maryland | Spring 2017

UMD Team Chases Another Solar-Powered Victory

Two years. Ten contests. One solar-powered house. The Department of Energy's Solar Decathlon is a biennial competition that challenges student teams from universities around the world to design and build a house powered entirely by the sun.

The University of Maryland's Solar Decathlon team will put their design and smart energy innovations to the test this fall in Denver, Colo., in the hopes of winning first place for the second time. Named reACT for "resilient Adaptive Climate Technology," UMD's entry is a modular design inspired by American Indian culture. The team's range of disciplines—from engineering to architecture and environmental science to communications—helped diversify the house's many innovations. Engineering team members have been making sure the house maximizes solar power, minimizes water usage and waste, and is informed by climate data. Alan Uy (M.S. '18, chemical engineering) focuses on the systems engineering aspects of the house by incorporating SMART (self-monitoring analysis and reporting technology) technologies. "We're trying to design a centralized interface to streamline data so the homeowner can manipulate whatever settings they need to," Uy said.

The focal point of the house is a centralized courtyard where residents can experience a community feel, interact with the earth and air, and have direct access to mechanical facilities. What sets UMD's entry apart from the rest of the competition is the automated systems of the home that are already live. Online, viewers can see how the house would perform in current environmental conditions. Check it out at: go.umd.edu/virtual

You can support reACT by becoming a member, donating materials, tools, and gifts, or partnering with the team through sponsorship. Solar Decathlon alumni can join the Clark School network by filling out the webform at: go.umd.edu/sd-alumni

>> TO LEARN MORE ABOUT HOW TO CONTRIBUTE, VISIT go.umd.edu/react

A. JAMES CLARK SCHOOL OF ENGINEERING | GLENN L. MARTIN INSTITUTE OF TECHNOLOGY



In 2014, Team Gamera was awarded the official U.S. record of 97 seconds for the duration of a human-powered helicopter flight.



The University of Maryland's WaterShed team placed first in the 2011 Solar Decathlon.

Aiming for the Stars Mars

Aerospace engineering major Hermann Kaptui Sipowa has long dreamed of climbing out of a spacecraft onto the surface of Mars, but as he struggled to pay rent and tuition at Montgomery College, the recent immigrant from Cameroon couldn't even see a path to a four-year degree, let alone NASA's astronaut program. Then a counselor at the community college posed what seemed like an odd question: Could he be an entrepreneur?

"She described it as someone who strongly wants to bring about change and apply their knowledge to make other people's lives better," he said. "I identified myself in that, and she filled out the application that changed my life."

Soon, Kaptui Sipowa was accepted into the Hillman Entrepreneurs Program, which helps students at Montgomery College and Prince George's Community College afford an education at the University of Maryland while fostering a dynamic community of motivated entrepreneur-scholars at all three locations.

He's one of dozens of Terps who are thriving through the David H. and Suzanne D. Hillman Family Foundation. It established the program a decade ago and has continued to support it, most recently with a \$3 million gift to fund scholarships and operation of the center.

From their own entrepreneurial success, the Hillmans wanted to nurture an "entrepreneurial ecosystem" to give students opportunities they otherwise wouldn't have had, and develop ethical, community-focused leaders. It leads to frequent internships—and jobs—with firms like Deloitte, PwC, Accenture, Ernst and Young, Morgan Stanley and more.

Kaptui Sipowa, who plans to start an engineering Ph.D. program next fall, says the experiences in the program have been just as critical as the scholarship support.

"To have that connection to a group of people with the same will to change things, it makes you push yourself," he says. "Any day you feel a little down, you just look around at this group."

If he walks on Mars, he says he'll remember the Hillman family helped put him there.

Learn more about supporting the Hillman Entrepreneurs Program by contacting Heidi Bruce, director of alumni affairs and development in the Office of Undergraduate Studies, at habruce@umd.edu or 301.405.6851.

This is an excerpt of an article by Chris Carroll originally appearing in *Terp* magazine.

>> LEARN MORE, VISIT go.umd.edu/hillman

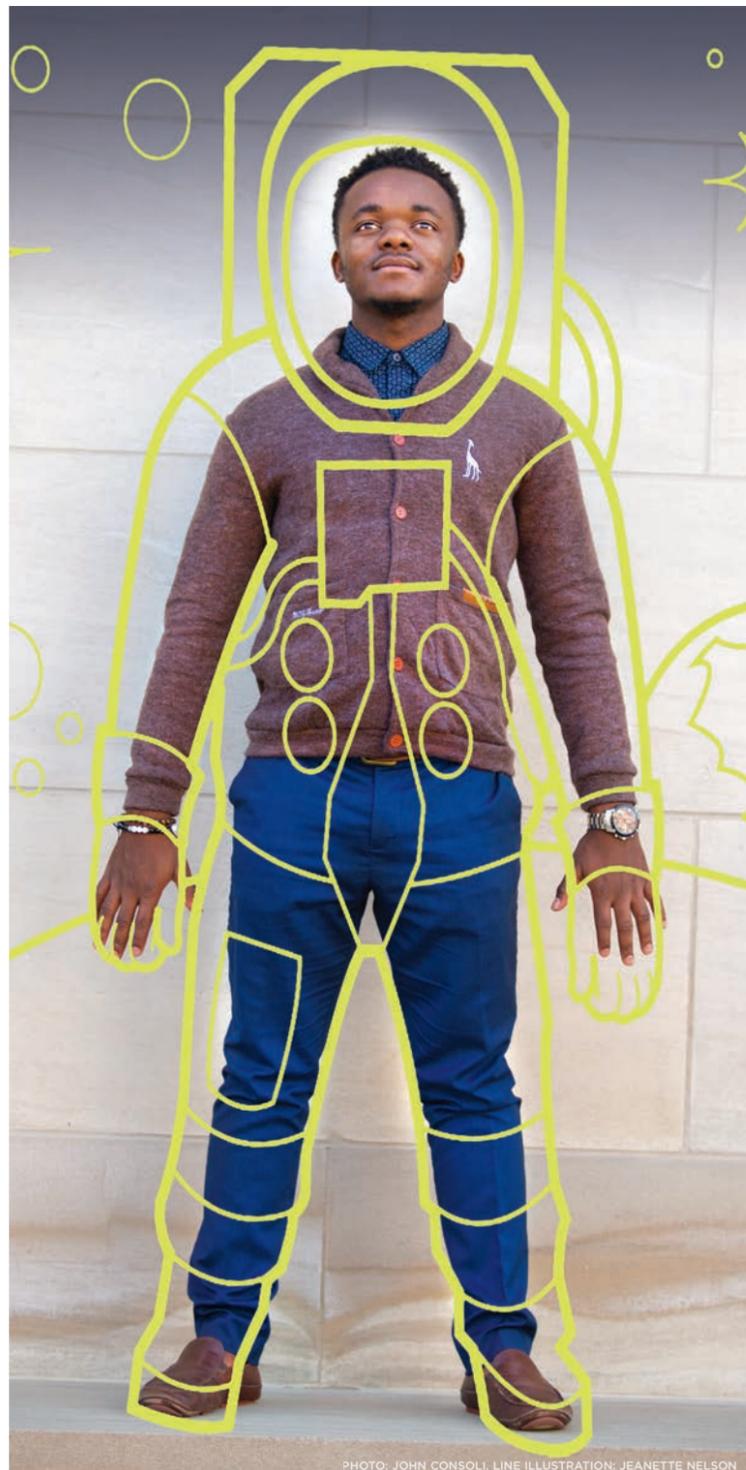


PHOTO: JOHN CONSOLI, LINE ILLUSTRATION: JEANETTE NELSON



From left to right: Conor Casey, Joshua Cocker, Brooke Nesselt, and Alexander Tran.

UMD STUDENTS TAKE TOP PRIZE IN NATIONAL DELOITTE CASE COMPETITION

Three engineering students in a four-person University of Maryland team won first place and a \$4,000 prize in the national Deloitte Consulting Undergraduate Case Study Competition, held in Westlake, Texas, from March 9-11, 2017.

Among 17 universities represented in the competition, the UMD team was challenged to develop a practical solution for an online clothing retailer to establish brick-and-mortar operations. Team solutions had to adhere to Deloitte's three-segment consulting method, which includes human capital, technology, and strategy and operations.

The event culminated with four finalist teams presenting onstage to an audience of more than 100 Deloitte employees and participating universities.

The UMD team included sophomores Conor Casey (aerospace engineering), Joshua Cocker (mechanical engineering), Brooke Nesselt (mechanical engineering), and Alexander Tran (finance and information systems). Clark School alumna Kimberly Berlic (B.S. '14, mechanical engineering), now a consultant with Deloitte, mentored the UMD team at the national competition.

"Kim told us that you have to learn to be comfortable being uncomfortable," said Nesselt. "You have to be confident in your intelligence and your abilities. This encompassed our entire experience in the competition."

The team also drew from lessons learned through the Entrepreneurship and Innovation Program (EIP) and Quality Enhancement Systems and

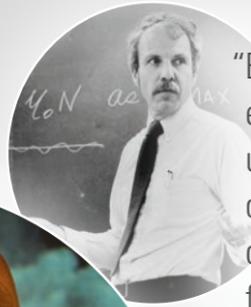
Teams (QUEST) honors initiatives.

"We were the only team to have a wireframe prototype," said Nesselt. "We learned how to do this in QUEST, and it is emphasized in EIP."

But the biggest takeaway for the UMD team was the value of true teamwork. "A team isn't necessarily a sum of the individuals but how they work together as a cohesive unit," said Nesselt.

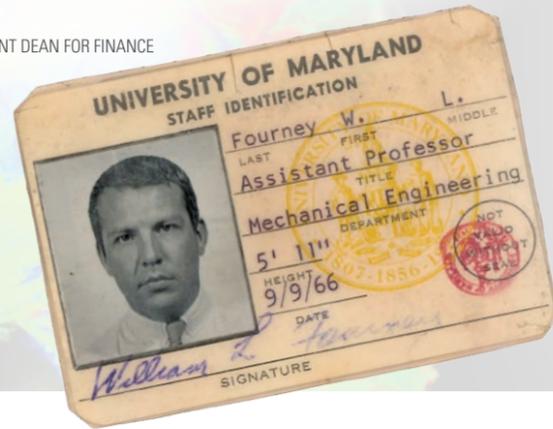
The event was the team's second trip to the national competition after winning the local competition two years straight.

"We were up against the best business schools in the country," said Casey. "We had to tell ourselves we can do this. We've been here before. It was a rewarding feeling once we did end up winning. It was a powerful learning experience."



“Bill Fourney’s dedication to the students is extraordinary, and his strong advocacy for staff is unprecedented. Bill and I have worked closely for over 20 years, and I am proud to have him as a colleague and friend. He doesn’t know this, but I fondly refer to him as the Clark School’s ‘ace’ because he always delivers outstanding results using a passionate, rationale, and fair approach.”

— Maureen Meyer
CLARK SCHOOL ASSISTANT DEAN FOR FINANCE



“Dr. Fourney encouraged group discussions and dialogues, and his door was always open to ask questions or just to talk. He is truly one of the professors who inspired me to continue through the engineering program, and I know for a fact he has touched the lives of countless engineering students.”

— Marissa Monardo
B.S. '13, MECHANICAL ENGINEERING,
TECHNOLOGY CONSULTING SENIOR ANALYST AT ACCENTURE



“It was clear Dr. Fourney genuinely cared about the program, the students, and their success. I greatly appreciate having known and worked with him at the start and beginning of my academic career, as he helped me with my decision to pursue my Ph.D.”

— Kristen Cetin
M.S. '10, B.S. '09, CIVIL ENGINEERING,
ASSISTANT PROFESSOR AT
IOWA STATE UNIVERSITY



50 YEARS OF FOURNEY

FOUNDING FATHER OF KEYSTONE PROGRAM CELEBRATES MILESTONE ANNIVERSARY AT UMD

William Fourney contains multitudes. Professor of mechanical and aerospace engineering. Department chair. Associate dean. Program director. Teacher, mentor, friend. Throughout his 50 years at the Clark School, Fourney has worn numerous hats and touched the lives of countless Terp engineers.

Of his many roles, perhaps the most significant is that of an educator dedicated to the freshman and sophomore student experience. It’s those foundational years, he says, that can make or break a student’s future in engineering.

Long before arriving in College Park, Fourney was born in a small coal mining town just outside of Beckley, W. Va. The youngest of 13 children, his parents couldn’t afford to send him to college, but they were adamant that he get a higher education to secure a more comfortable future. So he did, working his way through West Virginia University and the University of Illinois Urbana-Champaign to

earn his bachelor’s, master’s, and doctorate degrees. None of it would have been possible, he said, without the support and mentorship he received from each of his professors.

“From day one, I had professors that cared about me. You knew you had not just a teacher, but a friend,” explained Fourney.

He arrived at the University of Maryland in 1966 as an assistant professor—and he’s never left. Fourney says it’s the people that kept him at the Clark School for five decades. The innovative deans who invest in new ideas. The dedicated staff who power the school’s programs and initiatives. And of course the students, who continue to inspire him with their eagerness and creativity.

Fourney wanted to guarantee that every one of those students had the very best foundational education to ensure their success through graduation and into their careers. Which is why, 10 years ago, he put forth a simple idea: if the Clark School places outstanding faculty members in front of first and second year engineering students in smaller, experiential learning classes, those students are

more likely to thrive and graduate from the engineering program.

Conceived and directed by Fourney, now Keystone Director, associate dean, and full professor, the Keystone Program is supported by the Clark School’s best resources to provide students with the strongest foundation possible in their formative academic years.

For example, the Keystone Program’s Introduction to Engineering Design (ENES 100) course is mandatory across all engineering disciplines and requires student teams to design and build an autonomous product using computer software, mechanics, and electronics. ENES 100 isn’t easy, but students learn a lot. Past classes have produced hovercrafts or over-sand vehicles that follow a track and complete a task.

“We challenge our freshman from the very beginning to work in a team, to conceptualize and implement innovative

design, and to overcome unexpected hurdles. Our students complete this course with many tangible accomplishments in hand, in only their first or second semester of college,” Fourney said.

The Keystone Program has helped the Clark School retain more of its students. Twenty to 30 years ago, only about a third of students who started in engineering would graduate with an engineering degree. But since the Keystone Program was implemented, retention rates have increased to 72.8 percent of students graduating in five years. Compared to private universities, the Clark School graduates five percent more students, and 20 percent more students when compared to public universities.

The Keystone Program fosters exemplary undergraduate teaching and a commitment to enrichment in fundamental engineering courses. Keystone faculty members are some of the best teachers in

the Clark School and are hand selected for the program. Being a Keystone Professor or Instructor is a great accomplishment and reflects an educator’s excellence and dedication to their students.

Fourney celebrated his 50th year at UMD in 2016, and is still making his mark at the Clark School as an open-door professor dedicated to the success of his students. He dedicates time for students, faculty members, and administrators seeking help and guidance, and advises groups on campus.

“He’s just an unbelievable mentor to so many—you know that his door is open, that he’s receptive, and that he’s honest and open with his thinking,” said Kevin Calabro, associate director of the Keystone Program and senior lecturer, who has worked with Fourney for 15 years.

>> LEARN MORE ABOUT THE KEYSTONE PROGRAM, VISIT go.umd.edu/keystone

President Obama Names Michael Rotkowitz a PECASE Recipient



On January 9, 2017, President Barack Obama named Assistant Professor Michael Rotkowitz, of the Department of Electrical and Computer Engineering and Institute for Systems Research, one of 102 recipients of the Presidential Early Career Award for Scientists and Engineers (PECASE).

This is the highest honor bestowed by the federal government on science and engineering professionals in the early stages of their independent research careers. Rotkowitz's award was one of 19 that were nominated by the National Science Foundation (NSF).

Radhakisan Baheti, program director in the NSF Directorate for Engineering, said, "Michael Rotkowitz has made pioneering contributions in the decentralized implementable control of massively interconnected systems. His work has been cited by over 1,200 researchers and has led to new insights and several important results. Michael has also contributed to the education of undergraduate and high school students using innovative engineering test-beds."

>> LEARN MORE, VISIT go.umd.edu/pecase

CHBE CHAIR SHERYL EHRMAN DEPARTS FOR SAN JOSE

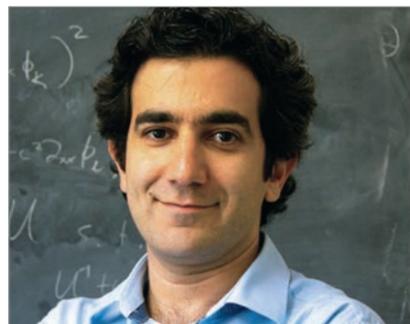
After seven years as chair of the Department of Chemical and Biomolecular Engineering (CHBE) at the University of Maryland, Sheryl Ehrman will step down in summer 2017. Ehrman, a native Californian who joined the Clark School in 1998, accepted the position of Don Beall Dean of the Davidson College of Engineering at San Jose State University, effective July 3.



Ehrman will be remembered for her countless hours of dedication, passion, and leadership, both in and out of the classroom. Over her tenure, CHBE roughly doubled its external research expenditures, increased the size and diversity of its faculty, improved the transition for undergraduate transfer students, developed two new B.S./M.S. programs, and increased the size of its graduate program by one third.

"Dr. Ehrman has been a truly strong leader for the Department of Chemical and Biomolecular Engineering. Her presence will be greatly missed, but she has provided a strong foundation from which to build the future. I wish her much success in her new role as Dean of Engineering at San Jose," said Darryll Pines, Clark School dean and Nariman Farvardin Professor of Aerospace Engineering. |

Mohammad Hafezi Receives Competitive DURIP Grant



Mohammad Hafezi, associate professor of electrical and computer engineering and fellow in the Joint Quantum Institute and Institute for Research in Electronics and Applied Physics, has been awarded the highly competitive Defense University Research Instrumentation Program (DURIP) grant by the Department of Defense (DOD). DURIP supports the acquisition of major equipment to augment current or develop new research capabilities in support of DOD-relevant research and associated graduate student research training. Only 160 researchers from 84 institutions all over the country received DURIP grants this year.

Awards are administered through a merit competition jointly conducted by the Army Research Office, Office of Naval Research, and Air Force Office of Scientific Research. Hafezi's award will support a project on a cryogenic system for quantum optical measurement.

Johnpierre Paglione, UMD professor of physics and director of the Center for Nanophysics and Advanced Materials, also received a 2017 DURIP grant for a project on a materials genome approach to the search for superconductivity. |

Fellowships, Societies, Honors, & Awards

Professor **MOHAMAD AL-SHEIKHLY** (MSE) was named a Laureate of the International Irradiation Association at the 2016 International Meeting on Radiation Processing (IMRP), which took place in November 2016 in Vancouver, British Columbia, Canada.



Professor and Lockheed Martin Chair in Systems Engineering **JOHN BARAS** (ECE/ISR) was selected to receive the Institute of Electrical and Electronics Engineers 2017 Simon Ramo Medal, which recognizes exceptional achievement in systems engineering and systems science and technical leadership in a major innovative engineering project.



Professor **BILAL AYYUB** (CEE) was elected treasurer of the Society for Risk Analysis (SRA). Established in 1980, SRA is a multidisciplinary, interdisciplinary, scholarly, international society that provides an open forum for those interested in risk analysis.



AYYUB received from the American Society of Naval Engineers the 2016 Solberg Award for his research in the field of ship survivability. Presented annually since 1967, the Solberg Award recognizes significant contributions to naval engineering.

AYYUB was elected a Distinguished Member of the American Society of Civil Engineers, the highest honor bestowed by the organization.

AYYUB was also named chair of the Infrastructure Resilience Division of the American Society of Civil Engineers for fiscal years 2017-18. Established in 2014, the division develops resources for improving the hazard resilience of civil infrastructure and lifeline systems.

Distinguished University Professor, Minta Martin Professor of Engineering, and Department Chair **RAMA CHELLAPPA** (ECE/UMIACS) was honored in Bangalore, India, with the Indian Institute of Science Distinguished Alumnus Award.



Research Professor **GERALD GALLOWAY** (CEE) was awarded the Karl Mohr Distinguished Service Award for National Activities by the Floodplain Management Association. The award recognizes individuals who have influenced national floodplain management policies or activities through their long-term efforts.



Professor **REZA GHODSSI** (ECE/ISR) was honored by the University of Wisconsin's Department of Electrical and Computer Engineering as one of its "125 People of Impact" (alumni and faculty who have made significant contributions to the department, university, and industry).



Assistant Professor **MICHAEL GOLLNER** (FPE/ME/AE) will receive the International Association of Fire Safety Science (IAFSS) Proulx Award for his major scientific contributions to the understanding of flame spread, wildland/wildland-urban interface fire spread, and fire whirls. He will receive the award at the IAFSS 12th Symposium, which will take place at Lund University in Sweden in June 2017.



Distinguished University Professor **ASHWANI GUPTA** (ME) has been named an American Association for the Advancement of Science Fellow for his distinguished contributions to combustion, propulsion, energy, and environmental sustainability and for contributions to education, outreach training, and services to industry.



GUPTA was also named the 2017 recipient of the American Institute of Aeronautics and Astronautics Pendray Aerospace Literature Award. The award is presented for an outstanding contribution to aeronautical and astronautical literature, with an emphasis on the high quality or major influence of the piece.

Christine Kim Eminent Professor of Information Technology **K.J. RAY LIU** (ECE) was selected to receive the 2016 Institute of Electrical and Electronics Engineers Signal Processing Society Meritorious Service Award for exemplary service to and leadership in the Signal Processing Society.



Distinguished University Professor **EDWARD OTT** (ECE/Physics/IREAP) and colleagues were selected as 2016 Thomson Reuters Citation Laureates in physics. The Citation Laureates program mines scientific research citations annually to identify the most influential researchers who are likely to win the Nobel Prize.



OTT was also selected to receive prestigious awards from two professional societies in recognition of his decades-long career in nonlinear science and chaos theory: the Richardson Medal awarded by the European Geosciences Union and the Jürgen Moser Award awarded by the Society of Industrial and Applied Mathematics.

Assistant Professor **CHARALAMPOS PAPANANTHOU** (ECE/CS) won a National Science Foundation Faculty Early Career Development award for a project designed to improve security in cloud-computing systems.



Professor **MIROSLAW SKIBNIEWSKI** (CEE) was named a Distinguished Visiting Fellow of the Royal Academy of Engineering to support his visiting professorship at Cardiff University.



SKIBNIEWSKI was also elected Honorary Lifetime Member of the International Association for Automation and Robotics in Construction for his lifetime contributions to scholarly research, teaching, and professional service.

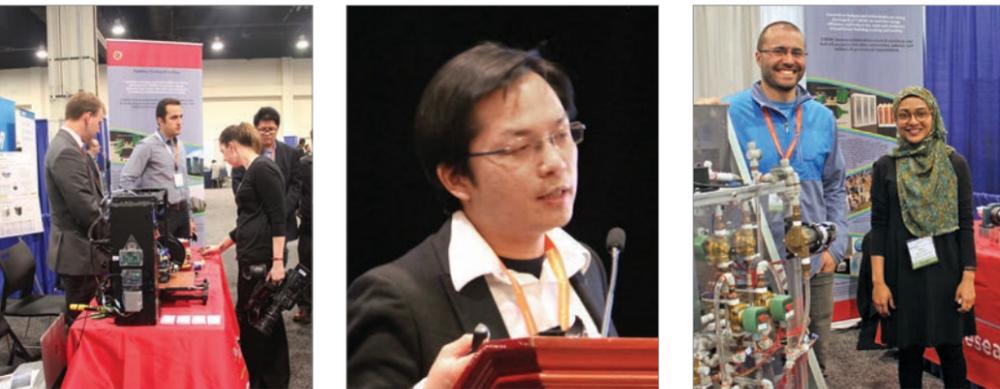
Department Chair and Minta Martin Professor of Aerospace Engineering **NORMAN WERELEY** (AE) was recognized by the University of Maryland Office of Community Engagement with their "Making a Difference" Award for his efforts in building local outreach activities in the College Park community. |



KEY TO DEPARTMENTS, INSTITUTES, AND CENTERS

- AE:** Aerospace Engineering
- CEE:** Civil & Environmental Engineering
- CS:** Computer Science
- ECE:** Electrical & Computer Engineering
- FPE:** Fire Protection Engineering
- IREAP:** Institute for Research in Electronics & Applied Physics
- ISR:** Institute for Systems Research
- ME:** Mechanical Engineering
- MSE:** Materials Science & Engineering
- UMIACS:** University of Maryland Institute for Advanced Computer Studies

UMD Represents at ARPA-E Summit



Initiated in 2009 with \$400 million appropriated by Congress, ARPA-E (Advanced Research Projects Agency-Energy) is tasked with “identify[ing] the most urgent challenges the U.S. faces in maintaining leadership in key areas of science and technology.” And at its 2017 Energy Innovation Summit, ARPA-E highlighted some of the recent energy advances in basic science, innovation, and commercialization it funds—including several led by experts at the University of Maryland.

Since the agency’s inception, UMD has received 16 ARPA-E awards, nine of which were showcased at the 2017 summit—more than any other university or commercial enterprise. On display in the UMD technology showcase booths were projects focused on energy storage, such as solid-state lithium-ion batteries and aqueous batteries; dry cooling systems for power plants; thermally responsive fabrics; personal cooling devices; and multi-modal transportation systems. Of note, members of the armed

service laboratories were extremely interested in the noncombustible batteries produced at the UMD Energy Research Center (UMERC) through the ARPA-E Robust Affordable Next Generation Energy Storage System (RANGE) project.

Technology showcase booths were not the only indication of the prominence of UMD at the summit. Liangbing Hu, associate professor of materials science and engineering with a joint UMER appointment, was selected as one of six from more than 80 applicants to pitch his transparent wood technology at the summit’s Shell Game Changer contest.

From the opening day to the summit’s closing, it was clear that ARPA-E funded innovation is the key to generating cleaner, more affordable energy and the creation of transformative U.S. energy industries. Moreover, UMD’s tremendous presence at the 2017 summit confirmed its role as a leader in energy research, development, and innovation.

>> [LEARN MORE, VISIT go.umd.edu/arpae](http://go.umd.edu/arpae)

CHEAPER, FASTER, & LONGER LASTING BATTERIES

Without any moving parts, batteries convert chemical energy into electricity, making everyday life more expedient. Rechargeable lithium-ion batteries power our daily lives, from cell phones to computers and even electric vehicles. These batteries provide numerous benefits, but are not without disadvantages. Lengthy charging times and short overall battery life, for example, can be a burden.

Chunsheng Wang, professor of chemical and biomolecular engineering with a joint appointment at the University of Maryland Energy Research Center, and his team have developed an alternative to current technology. This new battery chemistry is based on the coupling of a magnesium cathode and an iodine anode. Magnesium batteries have the potential for much higher energy density: roughly 10 times current technology.

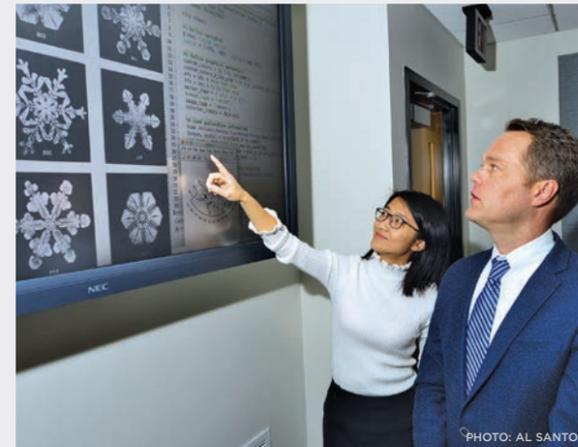
However, development of rechargeable magnesium batteries has been slowed due to a lack of a compatible cathode.

“We have demonstrated that the magnesium-iodine battery can be recharged within five minutes,” said Ph.D. candidate Tao Gao. “This is very important for the direction of next generation battery chemistry, because it dramatically decreases the charging time while significantly increasing the energy stored in the battery.”

>> [LEARN MORE, VISIT go.umd.edu/magnesium](http://go.umd.edu/magnesium)



Scanning electron microscopy images of the active carbon cloth/iodine cathode, scale bar: 1mm.



Yuan Xue, left, and Barton Forman, right.

Counting Snowflakes

More than a billion people worldwide rely on meltwater from snow and ice for their freshwater supply. For Canada, northern Europe, Russia, Afghanistan, and others, effectively managing this icy resource is crucial for long-term economic, environmental, and social stability. There’s just one problem.

“We don’t really know how much snow is out there,” said Barton Forman, Deborah J. Goodings Professor in Engineering for Global Sustainability. “It is highly dynamic in space and time and difficult to fully characterize.”

Forman has developed novel techniques for synthesizing data from satellite images and global models to determine the mass of snow on Earth at any given time and to estimate how much water will be released when it melts. The results could drive policy improvements on everything from sustainable agriculture practices to energy production to securing potable drinking water.

Forman’s approach takes advantage of advances in machine learning and the computing power of the University of Maryland’s DeepThought2 High-Performance Computing cluster. The research has already garnered interest from policy makers and natural resource managers at home and abroad—including India, where underground aquifers depend heavily on snow melt and officials are exploring harnessing snow-fed Himalayan waters for hydroelectric power.

>> [LEARN MORE, VISIT go.umd.edu/snow](http://go.umd.edu/snow)

INTERDISCIPLINARY RESEARCH TEAM MAPS IMPACTS OF TRADITIONAL FARMING IN BELIZE

University of Maryland anthropologist Sean Downey and Jacob Moschler, an engineer with UMD’s Unmanned Aircraft Systems (UAS) Test Site, are working together to understand how villages in Belize sustainably manage shared natural resources using sometimes controversial “slash-and-burn” agricultural practices.

Earlier this year, they used drones to scan 10,000 acres in and around the Q’eqchi’ Maya village of Crique Sarco in Belize and captured

31,000 images in five discrete wavelengths. It was the first time a UAS Test Site operator has flown using only instrumentation and onboard cameras. With clearance from the Belize Department of Civil Aviation, Moschler scanned jungle more than four miles away from a makeshift ground control station at an altitude of 1,500 feet.

Downey and his research team will spend the next several months stitching the images together into landscape-scale maps they will use to analyze social and ecological dynamics related to slash-and-burn practices.

>> [LEARN MORE, VISIT go.umd.edu/farming](http://go.umd.edu/farming)

Magnets to Energize the World

Manfred Wuttig, professor of materials science and engineering, and his former student Harsh Deep Chopra (Ph.D. '93), now a professor at Temple University, have discovered a new class of magnets. When certain iron-based alloys are heated at approximately 760 degrees Celsius for 30 minutes, then rapidly cooled, the thermally-treated materials expand their volume when

placed in a magnetic field and generate negligible amounts of wasteful heat during energy harvesting.

These alloys “will enable researchers to develop new materials with similarly attractive properties,” Wuttig said. For example, conventional magnets can only be used as actuators for exerting forces or causing displacements in one direction. Actuation, even in two directions, requires bulky stacks or composites, which increase size and reduce efficiency. Since these newly discovered magnets spontaneously expand in all directions, compact omnidirectional actuators can now be easily realized.

“Our findings fundamentally change the way we think about a certain type of magnetism that has been in place since 1841,” said Chopra.

>> [LEARN MORE, VISIT go.umd.edu/magnets](http://go.umd.edu/magnets)



Jacob Moschler and a Q’eqchi’ villager who assisted with the aerial scan.



Clark School Professor Manfred Wuttig.

Researchers Develop Electro-genetic Device for Activating Gene Expression

Researchers from the University of Maryland are working to develop an electro-genetic device to direct gene expression, an achievement that holds promise for controlling biological systems and could help shape the future of biosensors, as well as wearable—and possibly implantable—bio-hybrid devices.

The team, led by William Bentley, UMD Distinguished University Professor and director of the Robert E. Fischell Institute for Biomedical Devices, is using redox biomolecules—tiny cellular messengers that are vital to the health of all body cells—to carry electronic information to engineered bacterial cells. To do this, the group has developed a patent-pending

electro-genetic device that uses an electrode and engineered cells to control how and when genes are expressed from a synthetic gene circuit.

“There have been increasing efforts to ‘connect’ devices to biology, such as with glucometers or fitness trackers that access biological information,” said Professor Gregory Payne of the Fischell Department of Bioengineering and Institute for Bioscience and Biotechnology Research, who is also involved in this research. “But, there are far fewer examples of electronics communicating in the other direction to provide the cues that guide biological responses. Such capabilities could offer the potential to apply devices to better



Research lead William Bentley.

fight diseases such as cancer or to guide inflammatory responses to promote wound healing.”

The group believes their system can be tailored to produce a variety of responses, guide various cell behaviors, and further the use of other electronic and redox-based systems to access and affect biomolecular information transfer, such as in microbial fuel cells or bioelectrosynthesis systems.

>> LEARN MORE, VISIT go.umd.edu/gene

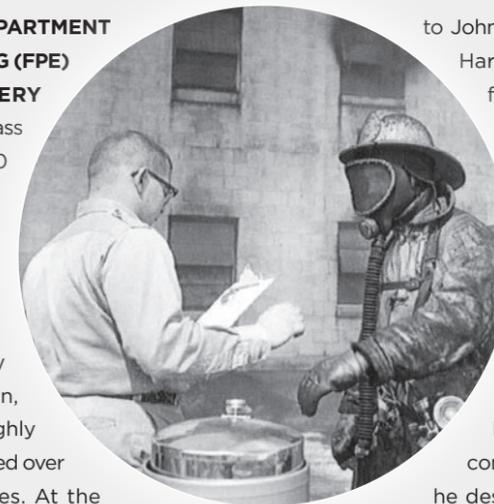
FPE Celebrates 60 Years

IN 1957, THE CLARK SCHOOL'S DEPARTMENT OF FIRE PROTECTION ENGINEERING (FPE) OPENED ITS DOORS TO ITS VERY FIRST FRESHMEN. This inaugural class of seven has blossomed into 100 undergraduate and 100 graduate students enrolled today, with more than 1,600 degrees conferred by the department throughout its six decades.

FPE celebrated its 60th anniversary March 10-12, 2017, with a reception, lab tours, a seminar, and more. Roughly 300 alumni, family, and friends gathered over the weekend to enjoy the festivities. At the Saturday night dinner, FPE Professor,



Chair, and alumnus Jim Milke (class of 1976) provided an overview of the past, present, and future of the department, including a discussion of the steps taken in the early 1950s that led to the establishment of the program. Memorial tributes



to John Bryan, founding FPE chair, and Harry Hickey, the second full-time faculty member of the department, were provided by alumnus Art Cote (class of 1965). Graduates Orville “Bud” Slye and Dave Hammerman (both class of 1962), two of the four initial graduates from the program, were present and recognized.

In a letter received by FPE from University of Maryland President Wallace Loh to commemorate the milestone, he described the program as

“the little department that could—a dynamic, close-knit, collaborative community.” Indeed, FPE continues to flourish thanks to the proactive leadership of its current chair and faculty members, but most importantly, to its enthusiastic alumni cohort who, much like A. James Clark himself, remain faithful to their educational roots. |



EMPOWERING LEANER BUS SYSTEMS FOR SCHOOLS

Transportation experts at the University of Maryland have developed a mathematical model that can pinpoint the smallest bus fleet needed to serve a school district under any start and dismissal time schedule.

Created to aid Howard County Public School System (HCPSS) officials considering a change in school start and dismissal times, the model uses data on route locations and schedules to group compatible routes into what transportation administra-

tors call tours. The result is a suite of tours offering on-time pick-up and dropoff with the fewest possible buses. The pioneering tool also limits the distance traveled between routes without students onboard.

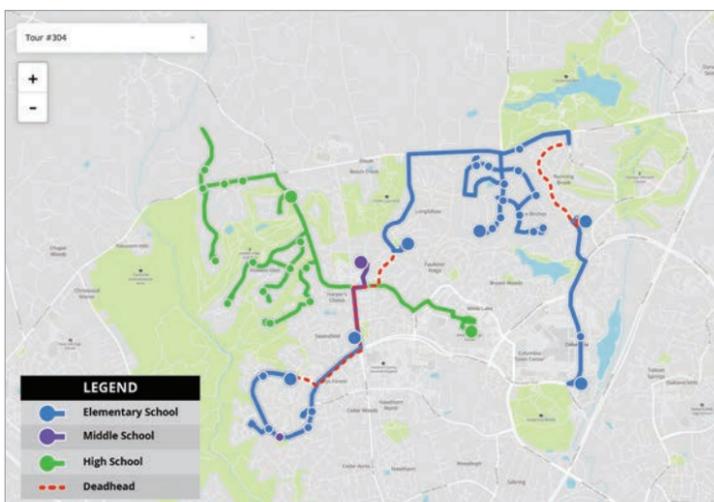
“School bus routing and scheduling is a difficult problem to solve. It generally takes a significant amount of computation time to solve these types of problems to optimality,” said Ali Haghani, professor of civil and environmental engineering. “Our model and solution algorithm enables us to solve the problem in a matter of seconds, and therefore we are able to analyze numerous scenarios very effectively.”

Haghani and Ali Shafahi, who recently received his Ph.D. from the Clark School, provided the school board with a breakdown of the minimum number of buses needed to transport HCPSS’s roughly 40,000 students to and from school for each of the schedules under consideration.

Development of the tool began in 2015 after HCPSS officials sought help from UMD’s QUEST honors program to create a method for analyzing the efficiency of their transportation system.

Haghani and Shafahi presented their optimization tool to the Maryland Association of Pupil Transportation last fall and have begun initial conversations with other school districts interested in improving bus systems.

>> LEARN MORE, VISIT go.umd.edu/bus



Example optimized tour from the model development phase.

The Value of International Collaboration

THE DEPARTMENT OF FIRE PROTECTION ENGINEERING (FPE) PROVIDED AN INTENSIVE SHORT TRAINING COURSE FOR SIX FACULTY MEMBERS FROM THE BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET). The course, which was conducted January 3-25, 2017, was designed to give BUET engineers basic information on fire safety and train them on where to find additional information and resources independently.

The idea for the training was in response to a series of factory fires that have occurred in Bangladesh over the last seven years, many of them fatal. These factories contain numerous safety hazards such as a lack of fire exits, fire doors, and sprinkler systems; insufficient smoke alarms; and electrical safety risks.

The intent of the course is to enable participating BUET engineers to run training programs in Bangladesh based on what they learned at the University of Maryland. Tanvir Manzur, a professor with BUET’s Department of Civil Engineering who attended the training, said the ultimate goal of the course is to “build a state-of-the-art Fire Safety Institute at BUET, which will act as a center of excellence for fire safety related training, education, and research in Bangladesh.” Additionally, the BUET team plans to develop a post-graduate curriculum on fire protection and safety designed to accommodate local needs.

“This extensive training program is anticipated to be the first of many areas of collaboration between UMD and BUET,” said FPE Professor and Chair Jim Milke.

The Alliance for Bangladesh Worker Safety, which was formed in 2013 to improve safety in Bangladeshi textile factories, sponsored UMD’s initial visit to, and subsequent research in, Bangladesh. UMD, the United States Agency for International Development, and the National Fire Protection Association are partners of the Alliance.

>> LEARN MORE, VISIT go.umd.edu/factory-safety





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PHOTO: JOHN CONSOLI

SWARM

WHAT'S IN THIS PHOTO? Quadrotor helicopters fly in a mosquito-inspired swarm. Daigo Shishika, an aerospace engineering Ph.D. student, is researching bio-inspired coordinated control of unmanned aircraft. His muse? Mosquitoes. Shishika models the flight trajectories of male mosquitoes within a swarm, and of male mosquitoes in pursuit of female mosquitoes (which fly faster than males). He then uses the results of his model to design strategies for a swarm of "guardian" aircraft that could protect an area against fast "intruders." Shishika works with Derek Paley, Willis H. Young Jr. Professor of Aerospace Engineering Education and Director of the Collective Dynamics and Control Laboratory, on this research.

Visit go.umd.edu/swarm to watch a video.

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