



ENGINEERING

AT MARYLAND





Who drew the cover?

David Plunkert is a Baltimore-based illustrator whose work has appeared in advertising campaigns, major newspapers, magazines, and recording labels. Plunkert designed the latest U.S. Postal Service stamps honoring American innovation and science, technology, engineering and math education along with art director Antonio Alcalá.

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PHOTO: AL SANTOS

"...student competitions are not simple academic exercises, but real rough-and-tumble opportunities for innovation and growth."

Dear Friends of the Clark School,

Anyone who has graduated from the A. James Clark School of Engineering within the past 20 years knows that our student competitions are not simple academic exercises, but real rough-and-tumble opportunities for innovation and growth. They have birthed numerous leaders, spin-off companies, and inventions, sparking incredible opportunities and solutions for people around the world.

This edition of *Engineering at Maryland* captures the energy and passion flowing throughout our corner of campus. It is alive in the brand new A. James Clark Hall, where students are testing a new device that could provide early detection of Alzheimer's disease, to the engineering field where Solar Gamera is piloting the feasibility of applying solar power to human helicopter flight.

It will take these fearless ideas and a competitive spirit to solve the intractable engineering issues of the 21st century—but that

depends on the support of a community that believes in this next wave of groundbreakers. This spring, the University of Maryland will officially begin *Fearless Ideas: The Campaign for Maryland*, the most ambitious fundraising effort in its history. I hope that you'll join us as we fearlessly lead engineering into the next 100 years.

Go Terps!

Darryll J. Pines
 DEAN AND FARVARDIN PROFESSOR OF ENGINEERING

Engineering at 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 at Maryland* Editor, 3228 Kim Engineering Building, 8228 Paint Branch Drive, College Park, MD 20742-2831. Information can be sent by email to mandreyc@umd.edu.

Please note that *Engineering at 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.

ENGINEERING AT MARYLAND

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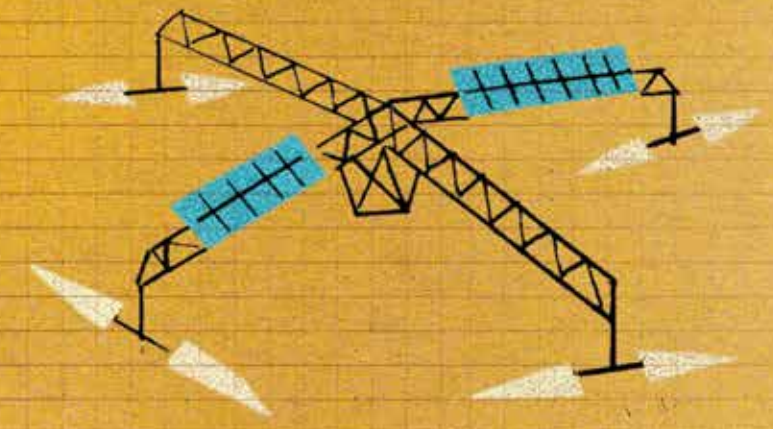
BUILD TO COMPETE

Clark School Student Teams Develop Tomorrow's Winning Solutions



Winning isn't everything. But competing to win just might be.

Contests and competitions are a pillar of the exceptional education provided by the University of Maryland's A. James Clark School of Engineering. For mechanical engineering student Paige Andros, one competition did more than change her student experience; it changed her life. "I was a makeup artist and hairstylist, but it wasn't stimulating for me," says the lifelong car lover with a knack for math. In 2011, while between salon jobs, Andros visited the U.S. Department of Energy (DOE) Solar Decathlon on the National Mall in Washington, D.C., spoke with the UMD team, and was inspired to return to school and pursue an engineering education.



"NOTHING SPURS CREATIVITY AND INNOVATION MORE

Six years later, Andros served as student project manager of UMD's entry into the 2017 Solar Decathlon. The collegiate DOE competition challenges interdisciplinary student teams to design and build full-sized, solar-powered houses. For Andros, the competition experience required a great deal of organization, coordination, and hands-on problem-solving long before the demanding 10-day event in Denver. "Working with multiple teams—and finishing on time—was challenging. We were very pleased with our U.S. win."

In 2017, the Solar Decathlon awarded cash prizes—totaling \$2 million—for the first time, spurring innovation by the next generation of energy experts. UMD's team received a \$225,000 prize for their second-place overall finish (see related story, page 13).

Andros reflects on the competition's impact on her student experience: "When University President Wallace Loh visited our team, he asked us, 'How many of you would say this is the most impactful educational experience you've had at the University of Maryland?' Every one of us raised our hands."

The Clark School emphasizes the importance of student achievement in national and international student contests with good reason. "Nothing spurs creativity and innovation more than a combination of incentive and challenge: a reward for achievement, combined with the urgency of a dare to succeed and

the reality that we must race against others," says Darryll Pines, dean and Nariman Farvardin professor of aerospace engineering at the Clark School. "We are at our best when we compete."

For example, the dean cites the Clark School's Gamera student team, which set the world record in 2012 for the longest human-powered helicopter flight. "The \$250,000 American Helicopter Society's Sikorsky Prize fueled the team's drive for success," he says.

Team Gamera reinvented itself as Solar Gamera in 2014 to test the feasibility of applying solar power in achieving human helicopter flight. Two years later, the team made two successful (unofficial) flights, flying for nine seconds and gaining more than a foot in height. Altogether, nearly 150 students from across the Clark School have worked on Gamera. Distinguished University Professor and Gamera faculty advisor Inderjit Chopra said of the project's hands-on opportunities: "This is about inspiring and educating students; that's our product here."

The aerospace industry provides a compelling case for collegiate contests—as a way to improve students' competitiveness, but also to boost the competitiveness of the nation as a whole. Aerospace prizes and competitions are key catalysts for innovations that have historically kept the U.S. at the forefront of aerospace technology advances and helped create offshoot industries, such as the commercial transport of people and cargo, unmanned aerial systems for civilian and military missions, and commercial space travel.

Other industries have likewise been influenced by collegiate competitions. Since the first Solar Decathlon in 2002, more than 18,000 students have participated—approximately 1,200 from UMD alone—with many going on to work in businesses that bring transformative technologies, including but not limited to solar photovoltaics, to consumers.

With their benefits to students, communities, and industry in our state and beyond, student competitions underscore *Fearless Ideas: The Campaign for Maryland*, launching this spring. This comprehensive and ambitious fundraising effort will endeavor to expand our mission of service, enhance our academic distinction, and elevate our leading-edge research enterprise, enabling us to solve the biggest problems facing our world.



UMD STUDENTS WORK ON SOLAR GAMERA.

PHOTO: JOHN T. CONSOLI



PHOTO: JOHN T. CONSOLI

THE UMD SOLAR DECATHLON TEAM WITH UMD PRESIDENT WALLACE LOH, NEAR CENTER.

THAN A COMBINATION OF INCENTIVE AND CHALLENGE."

Transforming Medicine, Impacting Health

While many freshmen were acclimating to college life, a team of first-year students from the the A. James Clark School of Engineering and College of Computer, Mathematical, and Natural Sciences was adjusting to life as biotech inventors.

Organized by the University of Maryland student chapter of the Biomedical Engineering Society, team Synapto developed a portable electroencephalogram (EEG) that uses a specially designed headset and a new software analysis tool to detect Alzheimer's disease before a patient displays clinical symptoms. For their efforts, they won first place and the top prize of \$20,000 in the 2017 National Institutes of Health (NIH) Design by Biomedical Undergraduate Teams (DEBUT) challenge.

The award money went toward Synapto's provisional patent for the device that exploits changes observed in the brainwaves of Alzheimer's patients. Having filed for an LLC in Maryland, the new startup's founders believe that being students gives them an edge.

"Students have to find the most efficient, cost-effective, and accessible way to solve a problem," says Synapto's co-founder and Chief Technology Officer, bioengineering and computer science student Christopher Look, who developed the machine-learning side of the device.

Synapto's co-founder and Chief Executive Officer, bioengineering student Dhruv Patel, reports the team is applying for grants and hopes to conduct a clinical pilot study to gather the



PHOTOS: JOHN T. CONSOLI

SYNAPTO TEAM MEMBER MEGHA GUGGARI.

EEG data necessary to build the product for use in doctors' offices as an alternative to costly brain scans. "The patterns and trends seen in neurologically diseased patients today could be applied to various other diseases in the future," says Patel.

Assistant Professor of Bioengineering Steven Jay, who served as faculty advisor for Synapto's challenge submission, praises the students for their resourcefulness. "They showed that you can apply knowledge gained from classes in the real world, and without major funding. Their success will help attract interest from industry and will inspire other students to take advantage of new resources." One such resource: A. James Clark Hall's Leidos Innovation Lab, an ideal collaborative environment for the next generation of bioengineers to address humankind's daunting global health challenges.

Competitions like the NIH DEBUT challenge help students discover new knowledge by spurring transformative engineering and biomedical technologies that can be applied for the betterment of our world. "It feels great to be validated, to get my name in *Forbes*," Look says of Synapto's success, "but I'm always thinking about the final impact on people."



SYNAPTO TEAM MEMBER MEGHA GUGGARI DEMONSTRATES THE HEADSET DESIGNED AND MANUFACTURED BY OPENBCI.

DRIVING SELF-DISCOVERY



PHOTO: JOHN T. CONSOLI

MEMBERS OF THE UMD CHEM-E-CAR TEAM WITH THEIR VEHICLE.

CHEMICAL AND BIOMOLECULAR ENGINEERING STUDENT SOLIVER FUSI'S MOST MEMORABLE SPRING BREAK WAS SPENT NOT ON A BEACH BUT IN A LAB, BUILDING A ZINC MANGANESE BATTERY FROM SCRATCH. Fusi served as president of UMD's Chem-E-Car team, which placed fifth at the Mid-Atlantic Regional Competition and secured Maryland's spot in the 2017 National Competition.

Hosted by the American Institute of Chemical Engineers, the annual contest challenges college students to design and construct a car powered by a chemical energy source. Fusi chronicles the debates and troubleshooting among the kinetics, battery, structure, and electronics sub-teams over the year-long build. "It's very different than building something like this on paper for a class," she says—but the students were prepared. "Everything we learned in engineering we were able to apply."

As an A. James Clark School of Engineering Ambassador, she urges prospective students to get involved with competitions, "an integral part of the engineering experience."

Fusi credits the Chem-E-Car competition with boosting her confidence as she applies to graduate programs. "The competition made me comfortable being in a lab setting, working with others, and understanding how—and how not—to lead."

PRIZES



PHOTOS COURTESY: TECHNICA

TECHNICA ATTENDEES
COMPETE TO WIN
PRIZES FOR THEIR
INNOVATIVE HACKS.

Hacking Tomorrow's Tech World

Bioengineering student Akshaya Ganesh believes tech is the future, and biotech is *her* future. However, with the technology field being male-dominated, “it’s easy to feel intimidated,” she says. That’s why Ganesh and the other organizers of Technica, the University of Maryland’s student-run all-women hackathon, are sounding the call for a more egalitarian tech world.

In its third year, Technica drew women of all ages from around the U.S. and Canada to UMD’s campus. As with traditional hackathons, Technica attendees compete to win prizes for their innovative hacks—but they also attend workshops for coders at all levels, network with sponsors, and hear from female tech influencers. Facebook’s Chief Operating Officer Sheryl Sandberg recorded a welcome video exclusively for the 2017 event.



Technica was founded at UMD in 2015 to provide support for stronger gender diversification in tech. An opportunity for women to work together, ask questions freely, and create something unique, Technica became the largest all-women hackathon in the world in 2016 with more than 825 participants.

Electrical engineering student Trinish Chatterjee, one of many male volunteers, was drawn to the hackathon by the inclusivity of its atmosphere. Serving on the sponsorship team for Technica 2017, he connected with sponsors and coordinated prizes for winning hacks. The hackers’ showcase and prizes are important elements of the event, but the focus is less on competition and more on addressing challenges within a supportive community. “It’s more than your typical hackathon,” says Chatterjee. Beginner participants get acclimated to tech; the more experienced gain new skills. But it’s not all about tech know-how. Participants and organizers alike learn lessons related to inclusion and community. “I feel more confident in my ‘soft skills,’ having been exposed to new people and ideas,” he says.

Events like Technica transform the student experience by turning ideas into impact and preparing students to be leaders. “This kind of competition improves its participants and the tech field itself,” says Chatterjee, who looks forward to volunteering again for Technica 2018.

So does Ganesh, who feels it’s important to her engineering education and the education of her peers—both women and men—to see more women in the room. Technica is more than an extracurricular. “It provides a safe place to pursue your passion,” she says.



FLYING HIGH

DRONES ARE MUCH MORE THAN A HOBBY FOR MECHANICAL ENGINEERING STUDENT TOBY DILWORTH, WHO BUILT HIS FIRST UNMANNED AERIAL VEHICLE (UAV) AND STARTED AN AERIAL PHOTOGRAPHY BUSINESS WHILE STILL IN HIGH SCHOOL. “Building drones—learning how the motors and speed controllers work—got me interested in engineering,” he says.

While many drone owners fly for fun, UAVs may provide winning solutions for critical disaster search and relief operations and more. Last summer, Dilworth interned at the University of Maryland’s Unmanned Aircraft Systems Test Site in Southern Maryland. His ongoing independent research project with Department of Aerospace Engineering faculty is focused on high-speed UAV design optimization.

Speed is also key to sending the UMD Drone Racing Club, of which Dilworth is a member, to the Collegiate Drone Racing Championships. The recreational racing club hopes to form a collegiate chapter of MultiGP, a league with more than 1,000 chapters globally.

Recreational drone flyers and research groups alike benefit from UMD’s new Fearless Flight Facility (F²), the first university outdoor flight lab for testing drones in the D.C.–Maryland–Virginia region. (See related story, page 28.)



PHOTO: JOHN T. CONSOLI

TOBY DILWORTH (RIGHT).

MASTER'S STUDENT SABRINA CURTIS ('17 MATERIALS SCIENCE AND ENGINEERING) IS PASSIONATE ABOUT HELPING THE LESS FORTUNATE, AND HER NEW DESIGN FOR SOLAR CELLS, STRETCHABLE SILICON PHOTOVOLTAICS, MAY DO JUST THAT.

Curtis pitched the initial design idea for her undergraduate Advanced Micro-fabrication course. The use of silicon makes solar cells lighter and more flexible than traditional metal ones. Prototype built, she led a group from the Department of Materials Science and Engineering to compete in the finals of the 2017 Collegiate Inventors Competition, the first team from the university in 17 years to make it to that stage.

"For the fabrication, we thought like scientists. For the competition, we thought like inventors and demonstrated utility," says Curtis. One of these solar cells measures seven microns thick and one millimeter long; thousands would have to be combined to be usable in a material.

Curtis's group at the U.S. Army Research Laboratory, where she interns, is interested in the invention, but the potential applications don't stop there. "This technology could be life-changing to people where a constant source of power isn't always available, like in developing countries, or could be integrated into solar tarps and blankets to help this country's homeless."



PHOTO: ANTHONY SCHARF/NATIONAL INVENTORS HALL OF FAME

THE UMD TEAM AT THE COLLEGIATE INVENTORS COMPETITION.

Igniting Entrepreneurship

Never did Ryan Fisher ('12, M.S. '13 fire protection engineering) imagine as a University of Maryland student that one competition would spark his career—yet it did. "The A. James Clark School of Engineering is the entire reason I'm on this career path," says the co-founder and chief operating officer of Baltimore-based wood-burning stove startup MF Fire.

In 2013, Fisher and a multidisciplinary team of engineering students, including MF Fire co-founder and Chief Technology Officer Taylor Myers ('12 fire protection engineering and astronomy; M.S. '14 fire protection engineering), competed in the Alliance for Green Heat Wood Stove Decathlon. The competition sought to promote eco-friendly stove designs. The only university team to make it to the finals, the Clark School team won first place in the "Particulate Matter Emissions" category, and their almost emissions-free



IMAGE COURTESY: MF FIRE

wood stove design was featured by *Popular Mechanics* and *National Geographic*.

Fast forward to 2017, when the UMD-born wood stove company received \$1.2 million in funding, the first investment from the Maryland Momentum Fund offered by the University System of Maryland. "We are Maryland born and raised," Fisher says of himself and Myers, who is currently a doctoral student in the Department of Mechanical Engineering. "We are excited to continue the Maryland legacy."

Up until that first competition, Myers's knowledge of wood stoves was limited to the one in the house he shared off campus. "It was old and made a tremendous amount of smoke that upset the neighbors," he recalls. Using the resources of the Clark School and a Department of Physics machine shop, the student team created wood stove prototypes. "The biggest challenge was learning how the manufacturing happens," says Myers. "This put us outside of our comfort zones. But where students sometimes get tunnel vision, there was real power in integrating multiple skill sets and unifying them to make something new."

What MF Fire has built is the cleanest and most efficient wood-burning stove ever tested. It's also the first to use smart control technology. To bring the company's current model, Catalyst, to market, the student engineers teamed up with business veteran Paul LaPorte, MF Fire's chief executive officer. The company's second stove model, Nova, will be available before the 2018–2019 winter heating season begins.

Together, Fisher and Myers harnessed the power of competition to turn imagination into innovation and entrepreneurship into success, amplifying the Clark School's impact on global issues.



PHOTO: FAYE LEVINE

TAYLOR MYERS AND RYAN FISHER OF MF FIRE.



PHOTOS COURTESY: UMD CONCRETE CANOE

IT WAS ON HIS ADMISSIONS TOUR THAT CRAIG LAMPMANN ('15 CIVIL ENGINEERING) FIRST SAW THE CONCRETE CANOE TEAM, WHICH HE LATER JOINED AS A FRESHMAN. By his senior year, he had risen in team ranks to co-project manager, and the UMD team's 2015 canoe *Seabiscuit* won the American Society of Civil Engineers Mid-Atlantic Regional Concrete Canoe Competition before competing at nationals.

"It's less about the canoe," says Lampmann, "and more about the critical thinking required to build something so impractical." The cement mix and canoe mold are just the beginning. The biggest

hurdle: keeping the team together and working toward a common goal. This challenge takes leadership and time management skills, which Lampmann uses daily as a field engineer with Whiting-Turner, where he manages job site subcontractors, safety, and quality control.

The concrete canoe competition has long helped to build a strong cadre of committed alumni leaders like Lampmann, who has visited with current team members to provide guidance on mix and practice pour days and to discuss fundraising and team building. This year's team? "Well on their way," he says.



UMD STUDENTS COMPETE IN THE CONCRETE CANOE COMPETITION.

Building Efficiency, Sustainability—and Maryland Pride



PHOTO: JOHN DE LA ROSA/U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON

THE UMD TEAM TOOK SECOND PLACE OVERALL IN THE 2017 SOLAR DECATHLON.

Passionate about efficiency? Yes. Fearless? Yes.

Mechanical engineering student Paige Andros was a perfect fit to serve as student project manager for the University of Maryland's entry in the 2017 U.S. Department of Energy Solar Decathlon, called resilient Adaptive Climate Technology (reACT).

Team reACT used indigenous knowledge systems to minimize—and rethink—waste, from lost heat to wastewater. Innovative house features include modular construction, a GreenCourt (a marriage of a greenhouse and a courtyard), gardens for food production, a mechanical core, and a solar attic that uses the sun to heat water, dry clothes, and cook food. "People went crazy for the solar dryers," says Andros, who explained that the number one energy waster in a house is heat.

The team's broad range of disciplines helped diversify the house's many innovations. Doctoral student Alan Uy ('09, M.S. '17 chemical and biomolecular engineering) and the engineering team incorporated self-monitoring analysis and reporting technology so the homeowner can manipulate settings for efficiency. Focusing on energy modeling and automation, Uy began accumulating local weather data a year before the contest. A compilation of the modeling efforts, called the Virtual Solar Home Project, can be found online at reactvirtual.eng.umd.edu.

Raymond Adomaitis, professor with the Department of Chemical and Biomolecular Engineering and Institute for Systems Research, served as engineering faculty advisor to team reACT. "Solar Decathlon gives students a practical understanding of where their technological education is leading them, of what design means for professionals." This year's ambitious design led the team to another big win: achieving net

zero (energy production equal to its energy consumption), the scientific equivalent of waste not, want not.

Together, UMD students and faculty, along with committed alumni and industry sponsors, built more than an innovative house; they delivered on the university's land-grant mission of service by inspiring the next generation of energy experts—and inspiring Maryland pride. "If we can achieve net zero on campus, this technology is much more broadly applicable," says Adomaitis.

reACT is the university's fifth entry in the competition. UMD won the Solar Decathlon in 2011 and placed second in 2007. The winning 2011 house, WaterShed, was purchased by the regional electric service provider Pepco and converted into its Sustainability Center. Eager to share their expertise on energy and water efficiency and the built environment, Maryland's team hopes reACT will be used to educate students and the public about sustainability practices every one of us can implement, right in our own homes and gardens.



PHOTO: JOHN T. CONSOLI

UMD STUDENTS WORK AT THE REACT CONSTRUCTION SITE.

Competing for Maryland and the World, Together

“Competing brings out the best in us,” says Darryll Pines, dean and Nariman Farvardin professor of aerospace engineering at the A. James Clark School of Engineering.

And our best is what it will take to address the most critical issues facing society in the 21st century, from solving public health crises to engineering new machines to developing dependable sources of renewable energy.

The best relies on each and every one of us—alumni, parents, friends, and donors—working together to build winning solutions, fearlessly. *Fearless Ideas: The Campaign for Maryland*, the most ambitious and comprehensive fundraising effort in University of Maryland history, will propel the Clark School to

14 "THE CLARK SCHOOL HAS NEVER BEFORE BEEN IN SUCH AN EXCITING PLACE—AND ON SUCH A STEEP TRAJECTORY OF SUCCESS,"

the forefront of education and research worldwide. Built upon a transformative investment made by the A. James & Alice B. Clark Foundation in 2017 (see related story, page 16), the campaign invites donors to follow in the footsteps of the late A. James (“Jim”) Clark as a builder, philanthropist, and leader. “There is still much to be done to achieve our vision for engineering at Maryland,” says Leslie Borak, assistant dean for external relations. “As they always have, donors to the Clark School will play a critical role in this effort.”

Donors are integral to the unique Clark School student experience, which relies on the best in facilities, equipment, and programs. State-of-the-art campus spaces, such as A. James Clark Hall, the Leidos Innovation Lab, and the Rajan and Sandhya Mittu InTerp Suite, help today’s students adapt to the needs of an engineering education and emerging research areas. What’s more, these spaces, made possible through the investment of alumni, serve as inspiration—inviting further investment from Clark School donors.

Transforming facilities is just one way for donors to impact the student experience. Increasing college access, affordability, and excellence are also top priorities. Having an immediate impact on the lives of students, the Clark School Dean’s Fund enables Pines to support student programs that make the Maryland engineering experience unique. This unrestricted fund helps the dean solve problems and take advantage of opportunities that arise every day, such as purchasing equipment to improve a course, enabling a student to attend an important conference, or sending a student team to compete in a national or international collegiate competition. “Clark School competition teams do their own fundraising, but some of the high-profile competitions are very expensive to enter; this is where donor support is greatly needed,” says Borak.

The nature of an engineering education demands practical application, and collegiate competitions answer this call. These contests provide students with hands-on opportunities to apply their engineering knowledge, interact as a cross-disciplinary team, and develop leadership skills. Much more than an extra-curricular, participation in competitions often provides a capstone experience to the engineering degree. In many cases, these young competitors build upon their experience throughout their professional lives.

For students and alumni alike, this is a great time to be a Terp. “The Clark School has never before been in such an exciting place—and on such a steep trajectory of success,” says Pines. *Fearless Ideas* will join alumni, parents, friends, and donors in impacting students’ lives. By supporting the student experience through this campaign, we will develop tomorrow’s engineers, poised to deliver solutions for the challenges facing Maryland and our world. Working together, we will fearlessly compete.

And that’s a win.

15 WHAT'S YOUR FEARLESS IDEA?

Become a part of this amazing effort. Together, we can build opportunities for Clark School students, along with the many lives they will touch, while we help the university achieve its historic goal.

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JOIN US.



PHOTOS: JOHN T. CONSOLI AND DANIELLE TARR

Celebrating the Largest Investment in UMD History

New scholarships for incoming and transfer students that increase college affordability and access. Graduate fellowships and expanded scholarships for generations of promising University of Maryland students. Funding to recruit high-level faculty across campus who will pursue research opening new frontiers. New facilities that will cement the A. James Clark School of Engineering's stature among the world's finest.

This is what an unprecedented new investment of \$219,486,000 from the A. James & Alice B. Clark Foundation, announced October 4, will do to transform the university.

The largest gift ever given to a Washington metro area public institution, *Building Together: An Investment for Maryland* celebrates the legacy of the late A. James Clark '50, noted philanthropist and a builder of modern Washington, D.C., and his belief in the power of education.

Read the full story in our Fall 2017 issue of *Engineering at Maryland* magazine.

>> LEARN MORE, VISIT go.umd.edu/engr-mag



Introducing A. James Clark Hall

In November, the University of Maryland dedicated the new A. James Clark Hall, a 184,000-square-foot facility that will catalyze engineering innovation and bioengineering breakthroughs and serve as a hub for new partnerships and collaborations throughout the Baltimore–Washington region.

Made possible by the generosity and vision of the late A. James Clark '50, an alumnus and long-time supporter of the university, the State of Maryland, alumnus and biomedical pioneer Robert E. Fischell, and other donors, Clark Hall will help UMD attract the best and brightest students and faculty to make groundbreaking research possible. The building offers flexible classrooms, an innovation lab, capacity for collaborative student projects, and nearly 40,000 square feet of state-of-the-art research laboratories.

Clark Hall is the only space in the nation dedicated to bioengineering and the translation of health-related products that incorporates FDA-funded Centers of Excellence in both Regulatory Science and Pediatric Device Innovation.

>> LEARN MORE, VISIT go.umd.edu/clark-hall



PHOTOS: JOHN T. CONSOLI



THANK YOU TO
OUR DONORS AND
SUPPORTERS
WHO HELPED MAKE
A. JAMES CLARK HALL
A REALITY!



"The Pepco Holdings, Inc. Social Table is an integral part of Clark Hall's outdoor 'tributary' ecosystem, which resembles a river flowing through a landscape. It builds upon past collaborations and integrates our shared commitment to both engineering education and environmental sustainability."

DARRYLL PINES, DEAN, A. JAMES CLARK SCHOOL OF ENGINEERING

"Jim Clark was a builder. He leaves his mark on the building he built, the company that bears his name, the region he helped change, the personal values he passed down to those of us lucky enough to work for him, and the good works and young students he endowed and mentored."

LAWRENCE NUSSDORF



"As strong proponents of innovation to enhance human health, we were excited to invest in A. James Clark Hall. We are thrilled to be part of this spectacular building project and look forward to hearing about the many ways Maryland engineers will help improve the human condition through bioengineering solutions."

T.K. PATRICK & MARGUERITE SUNG



"I was pleased to be able to provide a substantial gift to the A. James Clark School of Engineering to start the Fischell Department of Bioengineering and the Robert E. Fischell Institute for Biomedical Devices to encourage future engineering students to create wonderful new medical devices for the benefit of all mankind."

ROBERT E. FISCHELL '53, '96 (HONORARY)



"The Leidos mission to make the world safer, healthier, and more efficient requires an innovative workforce. Leidos proudly supports the University of Maryland's *Fearless Ideas* campaign, further equipping the nation's future engineering labor pool by using our cutting-edge Leidos Innovation Lab on the first floor of the new A. James Clark Hall."

ROGER KRONE, CHAIRMAN & CEO, LEIDOS

"If you do it right, you will build structures that will be there for future generations."

A. JAMES CLARK '50



"When we were at the Clark School in the '80s, there was nothing like Clark Hall. We feel very fortunate that we are able to fund an InTerp Suite to help aspiring entrepreneurs build their companies."

RAJAN MITTU '90, '95 & SANDHYA MITTU '92, '96

"For an excellent program to continue to succeed, it needs to be continually enriched with the best students, a superior faculty, innovated ideas, and improved facilities. We are proud to be a small part of moving the Clark School forward to future success."

RON LOWMAN '67 & KAREN LOWMAN



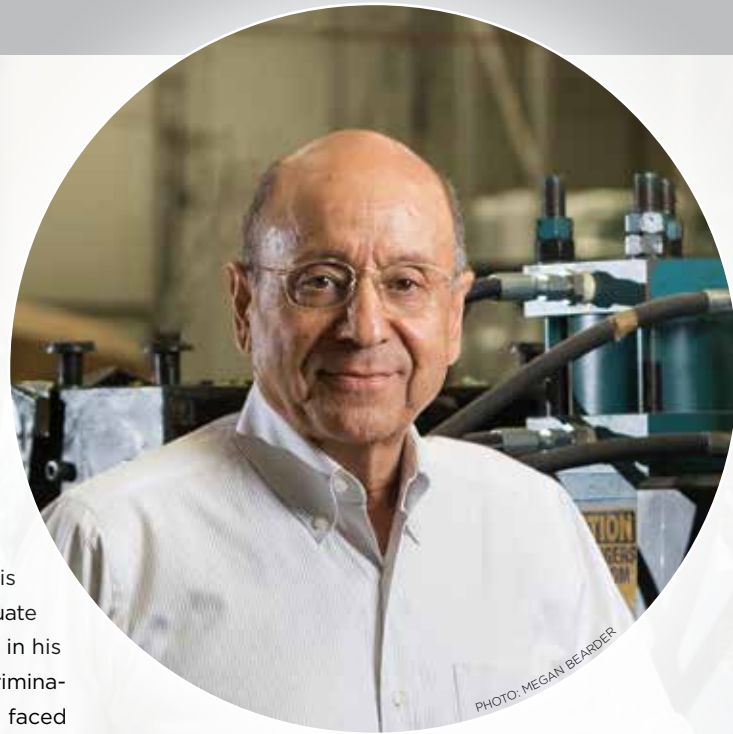


PHOTO: MEGAN BEARDER

ACTS OF KINDNESS CREATE A PHILANTHROPIST

RATTAN KHOSA (M.S. '71 STRUCTURAL ENGINEERING)

grew up in upper-middle class comfort in India, thanks to his father's job as a civil engineer. But after earning two undergraduate degrees in science and civil engineering and graduating first in his class, Khosa had difficulty finding work. He initially faced discrimination in his hometown because of religious differences, then faced discrimination elsewhere in India because he was not from the local community.

Thus began a string of challenges that would reframe his understanding of hard work, determination, and what success truly means.

Khosa knew the United States was a better option for the career and acceptance he sought. After several years of working toward this goal, he received a structural engineering fellowship at the University of Maryland.

Due to a foreign currency exchange crisis in India at the time, Khosa arrived with less than \$4 in his pocket. His first few semesters at Maryland were financially challenging, with fellow students lending Khosa money so he could afford basic necessities such as heating and food. "I lived below the poverty level," he recalls. "But coming to UMD got me out of where I was—feeling stuck in India with few career prospects—and helped me see that I could do anything."

Khosa credits the generosity he received with becoming the philanthropist he is today. Students gave him hand-me-downs, loaned him their cars, and taught him to cook, while faculty—particularly his adviser, former Professor Conrad Heins—offered exceptional mentorship and encouragement.

"I completely changed my attitude from 'success is all about me' to 'success is about helping others succeed,'" he says. "I wouldn't be who I am without the Clark School."

After obtaining his master's from Maryland, Khosa earned his MBA from the University of Chicago Booth School of Business and founded successful post-tensioning company AMSYSCO. In 2014, he funded the Rattan L. Khosa Graduate Endowed Scholarship in Structural Engineering at the Clark School, which provides awards for graduate students in the Department of Civil and Environmental Engineering.

"Education is a major catalyst to move forward for yourself, for your family, and for those around you," says Khosa. "By becoming better through hard work and dedication, you can better the lives of other people." |

THANK YOU, RATTAN KHOSA AND ALL OF OUR DEAN'S CIRCLE DONORS!

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.

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.

EMAIL: lborak@umd.edu

PHONE: 301.405.0317



Racing Toward Success

Balancing athletics and coursework isn't always easy, but Patrick Hanley and Aaron Barlev are two Terps who know how to excel on and off the track. The mechanical engineering majors—both New Jersey natives and Presidential Scholarship recipients—are members of the University of Maryland track and field team who have been recognized for their outstanding academics.

Hanley knew from a young age that he wanted to change the world, so it was no surprise that he chose to pursue a hands-on course of study in engineering. He has worked two co-ops and plans to complete another before graduating. Most recently he worked at K2M, a leading company in complex and minimally invasive spine technologies, where he gained experience that many other students his age haven't yet gotten, like working in a cadaver lab.

Hanley walked on to the track and field team as a junior, earning his spot by first training with UMD's running club. It's this same persistence and determination that have made him a standout in academics, too. In Spring 2017, during his first year on the track team, Hanley was awarded the Intercollegiate Athletics (ICA) Academic Achievement Award for earning the highest cumulative GPA on the team and was one of only eight male student athletes at UMD to be a Big Ten Distinguished Scholar for having a GPA above 3.7.

"Engineering keeps me really focused and motivated throughout the day," explains Hanley, "so I'm able to apply that motivation towards track and also the other way around."

When he arrived at the Clark School as a freshman, Barlev hit the ground running—literally and figuratively. He was recruited to the Maryland track team and accepted into the First-Year Innovation & Research Experience (FIRE), a program that provides mentorship and hands-on research experience.

"FIRE has been the most impactful and valuable thing I've done on campus," says Barlev, "because it provided a space to freely pursue my passion for robotics early in my undergraduate education."

In FIRE, he worked with Assistant Clinical Professor Derrick Yeo on autonomous unmanned systems and has continued his work with Yeo as both a peer mentor and research fellow. In his fellowship, Barlev integrated both his engineering and athletic passions. Inspired by attempts by Puma, he created a self-driving, mini pacer car that uses vision to guide itself around a running track.

Despite his demanding training schedule, Barlev stays involved on campus as the treasurer of the Pi Tau Sigma Mechanical Engineering Honors Society while also staying on top of classes, having received the Big Ten Distinguished Scholar Award. |



PHOTO: AL SANTOS

Patrick Hanley and Aaron Barlev.

Discovering Dreams and New Realities

His path to the A. James Clark School of Engineering wasn't direct. He didn't grow up with dreams of becoming an engineer, or even with an interest in science or mathematics. In fact, it wasn't until he enrolled at Baltimore City Community College (BCCC) that computer engineering student Shayan Hajiabadi discovered a talent—and passion—for engineering.

After living as an expatriate in Turkey for two years, Hajiabadi arrived in Maryland from his native country of Iran. At BCCC, he paid for classes and living expenses with personal savings and part-time wages. Through conversations with students and professors and partaking in college-level research, he realized he was both good at and interested in engineering. Hajiabadi kept an industrious schedule, adding Graduate Resources Advancing Diversity with Maryland Astronomy and Physics (GRAD-MAP) scholar and Institute for Genome Sciences intern to his resume.

His hard work paid off: in Fall 2016, Hajiabadi was awarded the A. James Clark Opportunity Scholarship for Transfer Students to study engineering at the University of Maryland.



PHOTO: AL SANTOS

"I am honored that I have been chosen," says Hajiabadi. "I think it was a great personal achievement that has given me more motivation and positive energy each semester."

With the cost of school no longer a worry, he has been able to concentrate on engaging his mind in and out of the classroom. Last summer Hajiabadi undertook another 10-week internship, this time at UMD's Losert Lab exploring the area of biodynamics—specifically, how to image the brain to diagnose diseases—to gain more hands-on experience.

But it was his classes with Associate Professor Timothy Horiuchi and Assistant Professor Behtash Babadi and their work in computational neuroscience and machine learning that have inspired Hajiabadi to add "Ph.D. in electrical engineering" and "full-time researcher and professor" to his professional goals.

For a motivated student who traveled more than 6,500 miles to pursue an education, the future now seems full of possibility. "I very much feel like the American Dream is now achievable," says Hajiabadi. |

The Gift of Time

When it was time for Maryland native Danny Kim ('14 electrical engineering) to look at colleges, he knew affordability was going to be an issue. His parents—who immigrated to the United States from South Korea before Kim was born—were already helping his older sister at the University of Maryland, and there wasn't much to spare in the college savings fund.

Thanks to Kim's A. James Clark Scholarship, he was able to not only attend the well-respected school that had been one of his top choices all along, but also alleviate some financial burden.

"What my scholarship really gave me was the gift of time," says Kim. "Because I didn't have to work to support myself, I was able to do things that were important for my education, like focus on my studies and get hands-on experience."

A Surprise Connection to A. James Clark

Born in Tokyo and raised on the West Coast, chemical engineering student Nina Uchida took an unconventional route to the A. James Clark School of Engineering—but her surprise connection back to its eponym makes her feel as though she's come full circle.

After graduating from the University of Washington with a degree in Japanese, Uchida moved back to her home country, working in the journalism and education industries for nearly a decade. Upon deciding she wasn't satisfied with the career options that lay ahead, she moved to Maryland—where her mother grew up and still resides—to go back to school.

Uchida chose engineering because she wanted technically challenging coursework that would set her up for employment success. After earning her associate's degree at Maryland's Anne Arundel Community College, she decided to enroll at the University of Maryland—a choice only reinforced when she received news that she had been awarded an A. James Clark Opportunity Scholarship for Transfer Students.

Uchida was having lunch with her mother when she found out about her scholarship—and was floored to learn that her grandmother had been friends with alumnus and beneficiary A. James Clark and his wife, Alice.

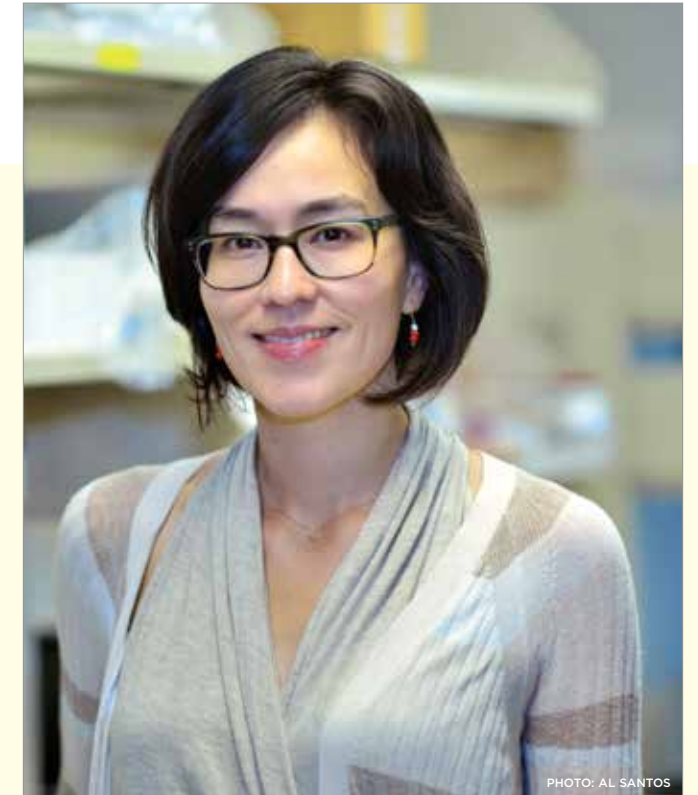


PHOTO: AL SANTOS

"To find out that my family had a connection back to Mr. Clark himself was a complete surprise! It really made me feel like my journey had led me to the university," she says.

Now in her senior year at UMD, Uchida says that her scholarship—and others funded by *Building Together: An Investment for Maryland* (see related story, page 16)—gives students from diverse socioeconomic and academic backgrounds access to an education that may be otherwise out of reach. "Thinking outside the box is an important part of engineering, and I believe that a more diverse pool of qualified engineers will bring greater innovation to the institutions that tackle the world's problems," she says. |

As an undergrad, Kim interned as an electrical engineer for product design and prototyping company Key Tech and worked as a teaching assistant (TA) for the first-year course Introduction to C Programming.

Now a fourth-year Ph.D. student at UMD researching cybersecurity, Kim focuses on using advanced program analytics to understand how malicious software, or "malware," behaves so it can be more easily detected and halted. He also continues his TA duties in upper level electives such as Computer Organization and Design.

Kim was one of several scholarship recipients to attend the *Building Together: An Investment in Maryland* event last fall (see

related story, page 16). Of the history-making announcement he says, "This investment is vital for engineering students and the engineering industry, because it allows students from all types of backgrounds to have a chance at getting an education at one of the best engineering schools in the country."

After graduation in Spring 2018, Kim hopes to work on the applied and research side in industry, continuing to ask the questions about cybersecurity to which we don't yet have answers.

"As my career progresses, I hope to be able to contribute to scholarship funds so that I can help young students like I was helped," he says. "My scholarship helped set me up for success, and I want to be able to do the same for someone else." |



PHOTO: AL SANTOS

TOMORROW'S TECHNOLOGY LEADERS

Two engineering students at the University of Maryland—Matthew Marcus and Rosemary Davidson—have been named “Tomorrow’s Technology Leaders: The 20 Twenties” by The Aviation Week Network in collaboration with The American Institute of Aeronautics and Astronautics. The awards program recognizes top students from across the country and globe and connects the next generation of aerospace and defense talent with established leaders in the fields.

Matthew Marcus (’13, M.S. ’15), a Ph.D. student in aerospace engineering, conducts his research on satellite design optimization and the removal of space debris from low Earth orbit. He is an aerospace engineer at NASA’s Goddard Space Flight Center, a student research affiliate for UMD’s Center for Orbital Debris Education and Research, a NSF Graduate Research Fellow, and a 2016 recipient of the Society of Satellite Professionals International Innovation Award.



PHOTO: CHRIS ZIMMER

Rosemary Davidson is a senior in the Aerospace Honors Program. She works with researchers on the design of an attitude control system for a CubeSat—a type of miniaturized satellite for space research—proposal at NASA’s Goddard Space Flight Center. Davidson is president of Women in Aeronautics and Astronautics, vice president of Sigma Gamma Tau, and a member of both Tau Beta Pi and the Women in Engineering program.

Since The Aviation Week Network first launched the program in 2013, the organization has recognized 12 UMD students and alumni as 20 Twenties.

»» LEARN MORE, VISIT go.umd.edu/20-20s

Class Awards \$10K to Oyster Recovery Partnership



PHOTO: LISA HELFERT

At the intersection of engineering, philanthropy, and social change is the Engineering for Social Change course, established to encourage students to consider the social impact of engineering. Last semester, the University of Maryland class addressed the unintended consequences of waste. Student groups worked with nonprofits—selected for their activities in mitigating waste in the State of Maryland—to create proposals for the prevention or mitigation of waste.

The winning proposal was that of the Oyster Recovery Partnership (ORP), which is based in Annapolis and works within the Chesapeake Bay to increase its overall oyster population. With the \$10,000 Engineering for Social Change grant, the organization plans to implement a large hopper and conveyor belt to alleviate shell breakage in the cleaning stage of their spat deployment process. ORP estimates that 15% of their shells become broken and unusable in the cleaning process. To decrease shell loss, the new hopper will increase the quantity of shells that could be fed into the cleaning system and limit excessive handling of shells.

»» LEARN MORE, VISIT go.umd.edu/oyster



Mote Named National Academy of Inventors Fellow

C.D. (Dan) Mote, Jr.—President of the National Academy of Engineering and a University of Maryland Regents’ Professor, Glenn L. Martin Institute Professor of Engineering, and former president of UMD—has been named a Fellow in the National Academy of Inventors.

Colleagues say that throughout his career, Mote has made tangible, positive impacts on the quality of people’s lives and advanced economic development and the welfare of society through his work as a researcher, inventor, educator, and mentor and as a leader who has advanced higher education, research and innovation, and the profession of engineering.

“Dan’s many patents and innovations have earned this great honor,” says UMD President Wallace Loh. “The entire campus community sends its congratulations, good wishes, and thanks for his many contributions to the university.”

»» LEARN MORE, VISIT go.umd.edu/mote-nai

FELLOWS, SOCIETIES, HONORS AND AWARDS



Professor **PAMELA ABSHIRE** (ECE/ISR) was elected a Fellow of the Institute of Electrical and Electronics Engineers. Her areas of specialty are in the fields of very-large-scale integration circuit design and bioengineering. Her research focuses on better understanding the tradeoffs between performance and resources in natural and engineered systems.



Professor **AMDE AMDE** (CEE) was presented with the 2017 John B. Scalzi Research Award by The Masonry Society for outstanding, lifetime contributions to masonry research. He was also recognized for outstanding leadership as editor for *The Masonry Society Journal* for the last 10 years.



Professor **BILAL AYYUB** (CEE) was named by the National Academies of Sciences, Engineering, and Medicine to a new committee charged with reviewing the Fourth National Climate Assessment (NCA) during the public comment period. Mandated by Congress in 1990, NCA is a quadrennial report summarizing the best-available science on observed and projected climate changes, as well as impacts on human health, regions of the country, and tribal communities.

AYYUB was also named a Top 25 Newsmaker by Engineering News-Record for his leadership on a new manual of practice that will help engineers design infrastructure to be more resilient to extreme weather.



Igor Sikorsky Distinguished Professor in Rotorcraft **OLIVIER BAUCHAU** (AE) was promoted to Fellow of the American Institute of Aeronautics and Astronautics for his exceptional contributions to nonlinear and multi-body dynamics of composite rotor blades applied to rotorcraft, wind turbines, morphing aircraft, and flexible space structures.



Distinguished University Professor **AVRAM BAR-COHEN** (ME) was elected as the inaugural president of the newly renamed Institute of Electrical and Electronics Engineers (IEEE) Electronic Packaging Society (EPS). He is an internationally recognized leader in thermal science and technology, Life Fellow of IEEE, and an honorary member of the American Society of Mechanical Engineers.



Distinguished University Professor and Alfred Gessow Professor **INDERJIT CHOPRA** (AE) was selected by AHS International for its prestigious 2018 Alexander A. Nikolsky Honorary Lectureship. The Lectureship is awarded to an individual who has a highly distinguished career in vertical flight aircraft research and development and is skilled at communicating technical knowledge and experience.



Associate Professor **QINGBIN CUI** (CEE) and Adjunct Professor **JOCELYN DAVIS** (CEE) were awarded the Emerald Research Methodology Award at the Association of Researchers in Construction Management Conference. Along with CEE alumna Clara Cheung (Ph.D. ’16, M.S. ’10), the team was recognized for their investigation of the relationships between organizational factors, personal resources, and project manager happiness.



PHOTO: DOUGLAS GRITZMACHER

NASA Selects Hartzell for Asteroid Mission

Christine Hartzell, assistant professor in the Department of Aerospace Engineering, is one of 13 participating scientists selected by NASA for the agency's first asteroid sample return mission, OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, and Security - Regolith Explorer).

OSIRIS-REx launched in September 2016 and is currently on a seven-year journey to rendezvous with, study, and return a sample of Bennu, a carbonaceous asteroid, to Earth. This sample of a primitive asteroid will help scientists understand the formation of our solar system more than 4.5 billion years ago. The spacecraft will arrive at Bennu in August 2018 and begin surveying the surface.

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

TORERO SERVES IN BRITISH PUBLIC INQUIRY

José Torero, John. L Bryan Chair and director of the A. James Clark School of Engineering's Center for Disaster Resilience, was named an expert witness to the Grenfell Tower Inquiry's examination of the circumstances leading up to and surrounding the Grenfell Tower fire, which killed 71 people and destroyed Grenfell Tower in London in June 2017. A report is expected in April 2018.

An internationally renowned expert in the fields of fire safety and resilience, Torero specializes in the behavior of fire

in complex environments, including tall buildings, novel architectures, tunnels, and aircraft and spacecraft. He is the only person in the fire safety field who holds fellowships in the Royal Society of Edinburgh, the Royal Academy of Engineering, the Australian Academy of Technology and Engineering, the Queensland Academy of Arts and Sciences, the Society of Fire Protection Engineers, the Building Research Establishment, and the Institution of Civil Engineers.



PHOTO: JOHN T. CONSOLI

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

FELLOWS, SOCIETIES, HONORS AND AWARDS CONT.



Professor and Charles A. Irish Sr. Chair **ALLEN DAVIS** (CEE) was selected by the National Academies of Sciences, Engineering, and Medicine to chair a new study committee charged with advising the U.S. Environmental Protection Agency on needed improvements to the national industrial stormwater permitting program.



Department Chair and Fischell Family Distinguished Professor **JOHN FISHER** (BIOE) was named co-Editor-in-Chief of *Tissue Engineering Parts A, B, and C. Tissue Engineering* is the preeminent biomedical journal advancing the field with cutting-edge research and applications on all aspects of tissue growth and regeneration.



Glenn L. Martin Institute Professor of Engineering **GERALD GALLOWAY** (CEE) was recognized by the American Water Resources Association with the Henry P. Caulfield Medal for Exemplary Contributions to National Water Policy. The award honors those who have achieved a status of eminence in shaping national water policy.



Associate Professor **DIMITRIOS GOULIAS** (CEE) has been selected to chair the Athens Institute for Education and Research Sustainable & Resilient Infrastructure symposium. Sponsored by the *Athens Journal of Technology & Engineering*, the symposium will feature presentations on the status of sustainability and resilience of civil infrastructure, international case studies, and a roundtable discussion.



Associate Professor **LIANGBING HU** (MSE/MEI²), Christine Kim Eminent Professor **K. J. RAY LIU** (ECE), and Professor **SENNUR ULUKUS** (ECE/ISR) were named

to the 2017 Highly Cited Researchers list by Clarivate Analytics. These researchers have distinguished themselves by publishing a high number of papers that rank in the top 1% most-cited in their respective fields over a recent 11-year period, according to Clarivate Analytics.



Assistant Professor **JOHAN LARSSON** (ME) was named to the editorial board of *AIAA Journal*. The publication from the American Institute for Aeronautics and Astronautics (AIAA) publishes papers on technical topics including aeroacoustics, aerodynamics, combustion, and fluid mechanics, to name a few.



Professor and Ben Dyer Chair **RICHARD MCCUEN** (CEE) received the 2017 President's Award for Outstanding Service from the American Water Resources Association. The award was established in 1979 to recognize those who have made significant contributions to the association.



Glenn L. Martin Institute Professor of Engineering **ELAINE ORAN** (AE) and John L. Bryan Chair **JOSÉ TORERO** (FPE/CEE) were designated Fellows of The Combustion Institute in recognition of their outstanding contributions to the discipline of combustion research and/or application.



Patrick and Marquerite Sung Professor **SRINIVASA RAGHAVAN** (CHBE) received the 2017-18 Distinguished Scholar-Teacher Award conferred by the University of Maryland Office of Faculty Affairs. This award honors a small number of faculty members each year who have demonstrated notable success in both scholarship and teaching.



Professor **PAUL SCHONFELD** (CEE) was awarded the 2018 James Laurie Prize by the American Society of Civil Engineers (ASCE). The award bears the name of ASCE's founding president and recognizes significant contributions to the advancement of transportation engineering.



Professor **SHIHAB SHAMMA** (ECE/ISR) was elected a Fellow of the Institute of Electrical and Electronics Engineer. His primary research focus has been on studying the computational principles underlying the processing and recognition of complex sounds (speech and music) in the auditory system, and the relationship between auditory and visual processing.



A. James Clark Endowed Chair Professor **MIROSLAW SKIBNIEWSKI** (CEE) was appointed co-editor-in-chief of *Frontiers of Engineering Management*, an international scholarly research journal sponsored by the Chinese Academy of Engineering.



Assistant Professor **KIMBERLY STROKA** (BIOE) was named a winner of the 2017 Outstanding Young Scientist award by the Maryland Academy of Sciences and the Maryland Science Center. Stroka was one of four honorees who were recognized for their contributions to science and engineering at a ceremony hosted by the Maryland Science Center.



Professor **EDO WAKS** (ECE/IREAP/JQI) was elected a Fellow of the American Physical Society. He was nominated for the honor by the society's Division of Laser Science for significantly advancing the field of quantum photonics and for developing new concepts to strongly interact solid-state quantum emitters with nanophotonic devices.



Professor **MIN WU** (ECE/ISR/UMIACS) was named a Fellow of the American Association for the Advancement of Science. She is a noted expert in information security and digital forensics and was selected for distinguished contributions to the field of signal processing, particularly for multimedia security and forensics.



Research Professor **ZHONGJUN "JON" WU** (BIOE/School of Medicine) was named an inaugural recipient of the Peter G. Angelos Distinguished Professorship in Entrepreneurial Surgical Sciences by the University of Maryland School of Medicine (UMSOM). Wu was recognized for his contributions to UMSOM patients served through outstanding research and clinical care, as well as to students on their way to becoming tomorrow's physicians.

KEY TO DEPARTMENTS, INSTITUTES & CENTERS

- AE:** Department of Aerospace Engineering
- BIOE:** Fischell Department of Bioengineering
- CEE:** Department of Civil & Environmental Engineering
- CHBE:** Department of Chemical & Biomolecular Engineering
- ECE:** Department of Electrical & Computer Engineering
- FPE:** Fire Protection Engineering

- IREAP:** Institute for Research in Electronics & Applied Physics
- ISR:** Institute for Systems Research
- JQI:** Joint Quantum Institute
- ME:** Department of Mechanical Engineering
- MEI²:** Maryland Energy Innovation Institute
- MSE:** Department of Materials Science & Engineering
- UMIACS:** University of Maryland Institute for Advanced Computer Studies



PHOTOS: FELICITY HANCOCK

Opening Frontiers for Testing UAS

In September, the A. James Clark School of Engineering opened the first university outdoor flight laboratory for testing unmanned aircraft systems (UAS) in the D.C.-Maryland-Virginia region. Located in the University of Maryland Discovery District, the netted Fearless Flight Facility (F³) will serve as a catalyst for innovation in the areas of flight control, sensing, autonomy, collaboration, and counter-UAS.

Student and faculty researchers who were confined to testing UAS in a lab—or not at all—due to Federal Aviation Administration (FAA) rules on outdoor flight will now have room to iterate on the fly. The 100-foot-wide, 300-foot-long, and 50-foot-high facility also serves as a critical nexus between the Clark School's College Park labs and its UAS Test Site in Maryland's St. Mary's County.

The airspace over the greater D.C. area is the most restricted in the country, with all UAS flights within a 15-mile radius of Ronald Reagan Washington National Airport prohibited without authorization from the federal government. Though technically outdoors, F³ is classified as indoors by the FAA because of the facility's netting. At the same time, this netting allows researchers to experiment in real-world wind and weather conditions.



Advances to equipment and algorithms made possible by F³ have a host of applications. New vehicle configurations can improve the efficacy of UAS in search-and-rescue operations, for example, while progress in the field of cooperation could lead to surveys of large swaths of farmland quickly and at low cost.

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

CLEARING A PATH FOR QUANTUM LIGHT

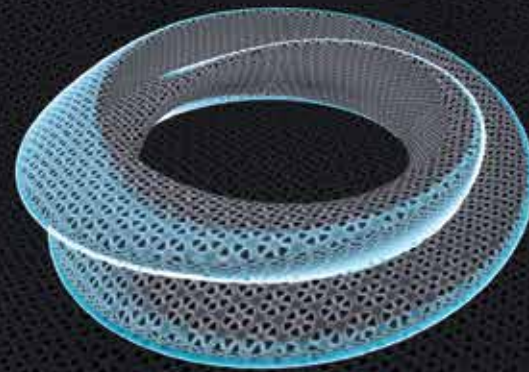
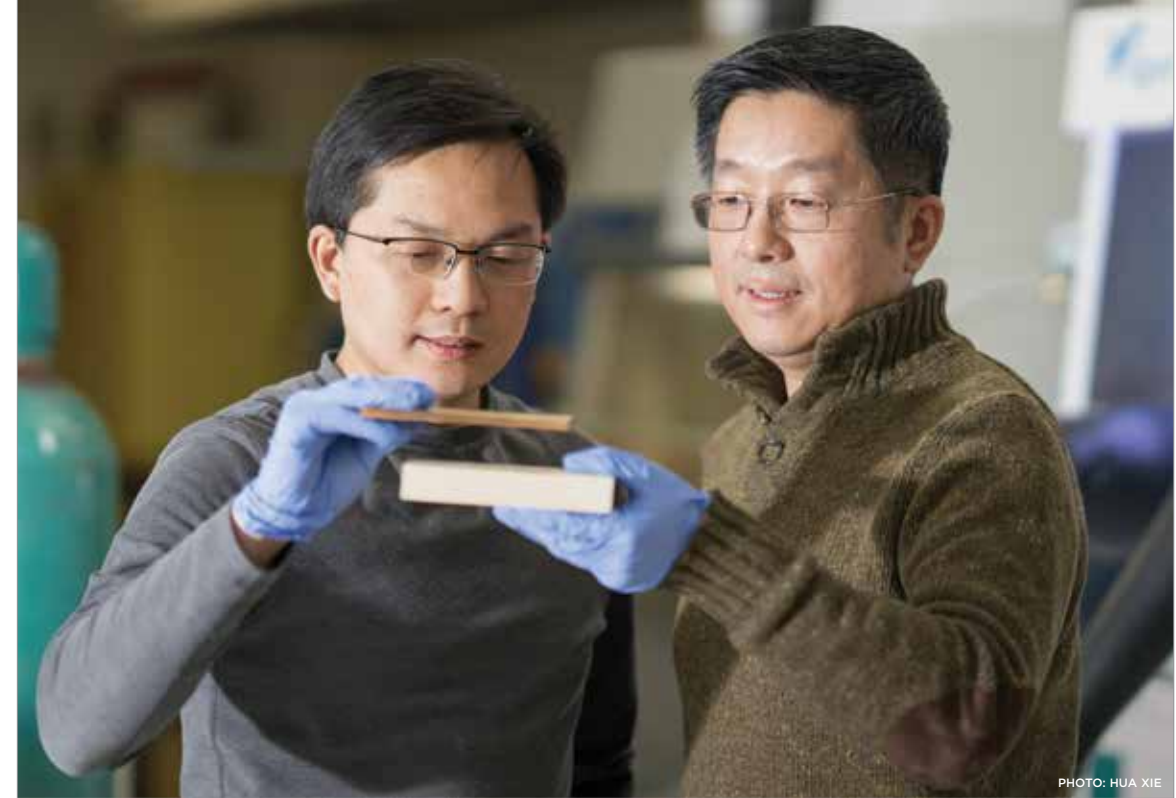


IMAGE: E. EDWARDS/JQI

Optical highways for light are at the heart of modern communications. But when it comes to guiding individual blips of light called photons, reliable transit is far less common. Now, a collaboration of researchers led by Associate Professor Mohammad Hafezi and Professor Edo Waks has created a photonic chip that both generates single photons, and steers them around. The device, described in *Science*, features a way for the quantum light to seamlessly move, unaffected by certain obstacles.

Hafezi and Waks are both affiliated with the Departments of Electrical and Computer Engineering and Physics, the Institute for Research in Electronics and Applied Physics, and the Joint Quantum Institute.

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



Liangbing Hu and Teng Li.

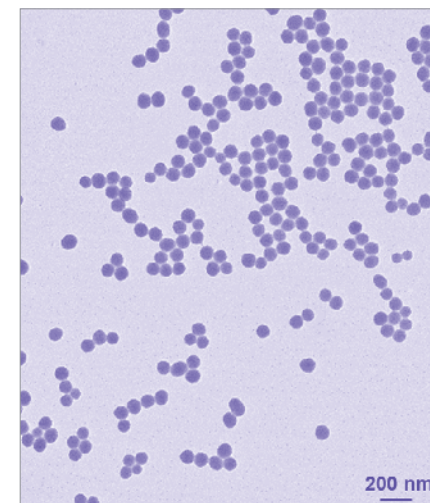
PHOTO: HUA XIE

Wood Stronger than Metal?

Engineers at the University of Maryland have found a way to make wood more than 10 times stronger and tougher than before, creating a natural substance that is stronger than many titanium alloys. The research team tested the new wood material alongside natural wood by shooting bullet-like projectiles at them. The projectile blew straight through the natural wood; the fully treated wood stopped the projectile partway through.

"It is both strong and tough, which is a combination not usually found in nature," says Teng Li, co-leader of the research and Samuel P. Langley Associate Professor of Mechanical Engineering at the A. James Clark School of Engineering. "It is as strong as steel, but six times lighter. It takes 10 times more energy to fracture than natural wood."

>> LEARN MORE, VISIT go.umd.edu/super-wood



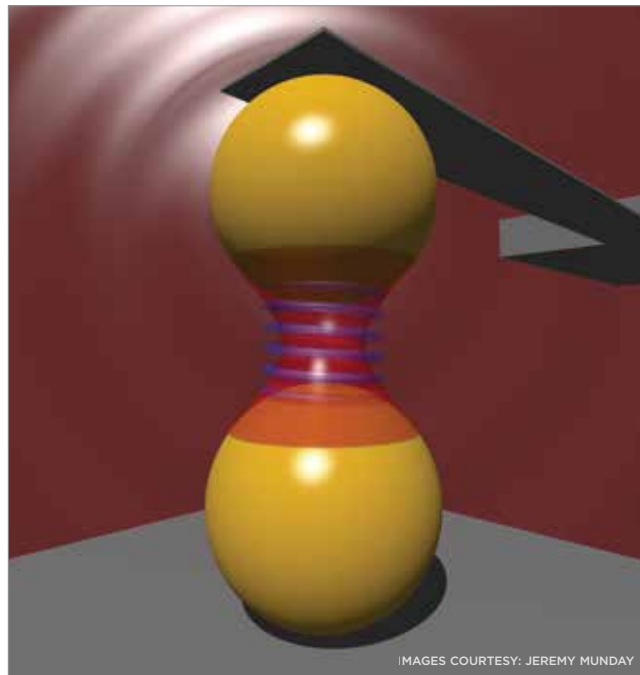
Combatting Cancer Drug Resistance

The ability for cancer cells to develop resistance to chemotherapy drugs—known as multidrug resistance—remains a leading cause for tumor recurrence and cancer metastasis, but recent findings offer hope that oncologists could one day direct cancer cells to "turn off" their resistance capabilities.

New findings put forth by Fischell Department of Bioengineering Professor Xiaoming "Shawn" He and researchers from five other academic institutions point to a technique that uses specially designed nanoparticles and near infrared laser treatment to cause cancer cells to lose their multidrug resistance capabilities for days at a time. This creates a therapeutic window for chemotherapy to combat even the most drug-resistant cells left behind after surgery or earlier treatment. The group's findings were published in *Nature Communications*.

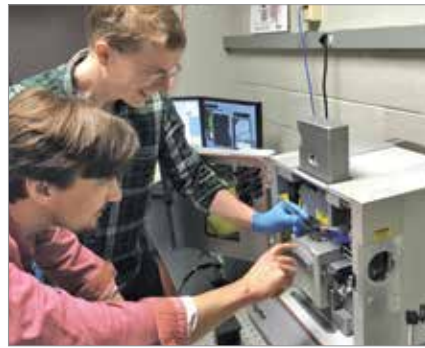
>> LEARN MORE, VISIT go.umd.edu/cancer-drug

SPHERES OF ATTRACTION



The Casimir force pulls two closely spaced spheres together.

IMAGES COURTESY: JEREMY MUNDAY



University of Maryland researchers have made new measurements of a practically imperceptible effect, known as the Casimir force. In contrast to more familiar forces like gravitation, scientists didn't even really know of its existence until the mid-20th century. Rarely, they have caught glimpses of the Casimir force as it pulls two closely spaced objects together.

Led by Associate Professor Jeremy Munday of the Department of Electrical and Computer Engineering and Institute for Research in Electronics and Applied Physics, the research team has employed a high-resolution microscope to probe the attractive force between two spheres. The study is ongoing, and spheres are only the beginning. This advancement could facilitate a better understanding of the force itself and even guide future designs of accelerometers and other nano- and micro-devices.

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

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

Tian Li (Ph.D. '15 electrical engineering), a postdoctoral researcher in the Department of Materials Science and Engineering, has been named to *Forbes*' prestigious "30 Under 30 2018: Energy" list in recognition for her contributions to what the magazine

describes as the "remarkable scientific breakthrough" of transparent wood.

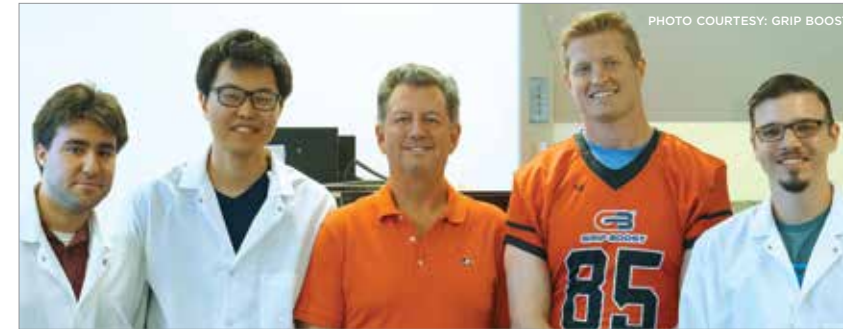
Li and a research team led by Associate Professor Liangbing Hu removed the molecule in wood that makes it rigid and dark in color (lignin), and replaced it with epoxy, which reinforces the wood's channels—making it stronger and colorless. This new "transparent wood" material, which is a highly efficient insulator and more biodegradable than plastic, could eventually replace glass in building materials and optical equipment.

>> LEARN MORE, VISIT go.umd.edu/li-forbes



IMAGE COURTESY: TIAN LI

Grip Boost Goes Global

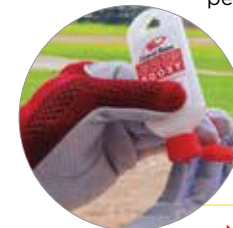


The Grip Boost team.

PHOTO COURTESY: GRIP BOOST

University of Maryland start-up company Grip Boost Inc., which developed its grip-enhancing gel technology at the university, will now distribute Grip Boost Batting Gel worldwide. The company has announced that Lizard Skins, a global manufacturer and distributor of sports accessories, has become the product's exclusive worldwide distributor.

A product of the UMD entrepreneurship ecosystem, Grip Boost's patent-pending technology was originally invented by the Complex Fluids and Nanomaterials Group in UMD's A. James Clark School of Engineering. Former Maryland Football tight end Matt Furstenburg teamed up with engineering graduate students Chanda Arya and Kevin Diehn to spearhead the creation of Grip Boost.



>> LEARN MORE, VISIT go.umd.edu/grip-global

BlueVoyant Comes to Discovery District

BlueVoyant, a global cybersecurity firm, announced plans in early 2018 to establish a Global Cyber Analytics Center in the University of Maryland's Discovery District. Currently operating out of a temporary site in College Park, the company will



employ 25 highly-skilled analysts and data scientists and plans to add more team members with the move to the new facility. The new center will analyze internet traffic data as well as insights on dark web activity to help defend companies against external cybersecurity threats. BlueVoyant's tools and capabilities enable companies to predict, detect, and respond to known and emerging cybersecurity threats well outside of their own systems. The company expects to launch its new generation of commercial products this year.

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

PREVENTING HEARING LOSS FROM CHEMOTHERAPY



Benjamin Shapiro.

PHOTO: FAYE LEVINE

A. James Clark School of Engineering spinout Otomagnetics announced the development of a magnetic drug delivery system to enable prevention of a major side effect of chemotherapy in children: hearing loss. Late last year, the company was awarded a \$2.3 million Fast Track National Institutes of Health National Cancer Institute Small Business Innovation Research contract to support these efforts.

"There should not have to be a choice between effective chemo and lifelong hearing loss. Our technology has the potential to allow treatment by chemotherapy without the attendant risk of hearing loss," says Fischell Department of Bioengineering and Institute for Systems Research Professor Benjamin Shapiro, the company's president and chief executive officer.

>> LEARN MORE, VISIT go.umd.edu/hearing-loss

2017 IHOF Inductee

The A. James Clark School of Engineering named alumnus Hamid Jafarkhani (Ph.D. '97 electrical engineering) as the 2017 inductee to its Innovation Hall of Fame. At the November 27 induction ceremony, Jafarkhani was honored for pioneering different space-time methods and algorithms for multi-antenna wireless communication systems and networks. He was a primary contributor to the development of space-time block codes, which are used to improve wireless transmission quality. The codes have created an active area of research and are used in billions of wireless devices worldwide. His collective work has profoundly influenced the commercialization, standard specifications, and fundamental advancement of the theory of space-time processing and multiple-input multiple-output (MIMO) for wireless communications.



PHOTO: GREG FIEME

>> LEARN MORE, VISIT go.umd.edu/ihof-17

Grad Launches App to Raise Money for Hungry Kids



PHOTO: JOHN T. CONSOLI

With a new app and business to help feed the hungry, Luke Roberts (M.S. '16 mechanical engineering) asks you to wear your heart not on your sleeve, but on the front of your shirt.

My Phone Feeds Kids invites the charitable-minded to spend \$25 to support the Maryland Food Bank and receive a T-shirt that reads "My Phone Feeds Kids. Does Yours?"

It raises additional money as wearers spread awareness and refer friends, family, and passersby to the app, while tracking the total amount of money they have helped raise through referrals.

He hopes to eventually expand to other causes, such as cancer and disease research, stopping human trafficking, and any others that users want to get involved in. "Our core thing is about empowering people to make a difference. It's not about T-shirts, it's not about technology. It's about how do we empower you as an individual."

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

CONNECTING WITH STRANGERS, DIGITALLY

While attending the University of Maryland, Jameel Francis ('08 electrical engineering) noticed how hard it is for college students to connect. He couldn't find others with similar interests to join him in on-campus research and share startup ideas with. To strengthen communication among students, Francis co-founded the app ComYoot, which launched in the iOS App Store last fall.



PHOTO COURTESY: JAMEEL FRANCIS

ComYoot uses machine learning and text and data analytics to help users build connections, according to its website. While many similar apps, such as Slack, are invite-based, ComYoot places users in networks based on information they provide when they download the app.

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

NEW CHAMPION CLAIMS ALUMNI CUP

Every year since 2012, teams from each of the A. James Clark School of Engineering's eight departments have built a Rube Goldberg machine designed to complete a mundane task in the most entertaining way possible. This year, the teams set up their contraptions with the goal—which they learned one week prior to the February 23 competition—of sinking a one-meter putt. For the first time, the Department of Electrical and Computer Engineering claimed first place. Team members were particularly proud of the power supply built from scratch rather than purchased.

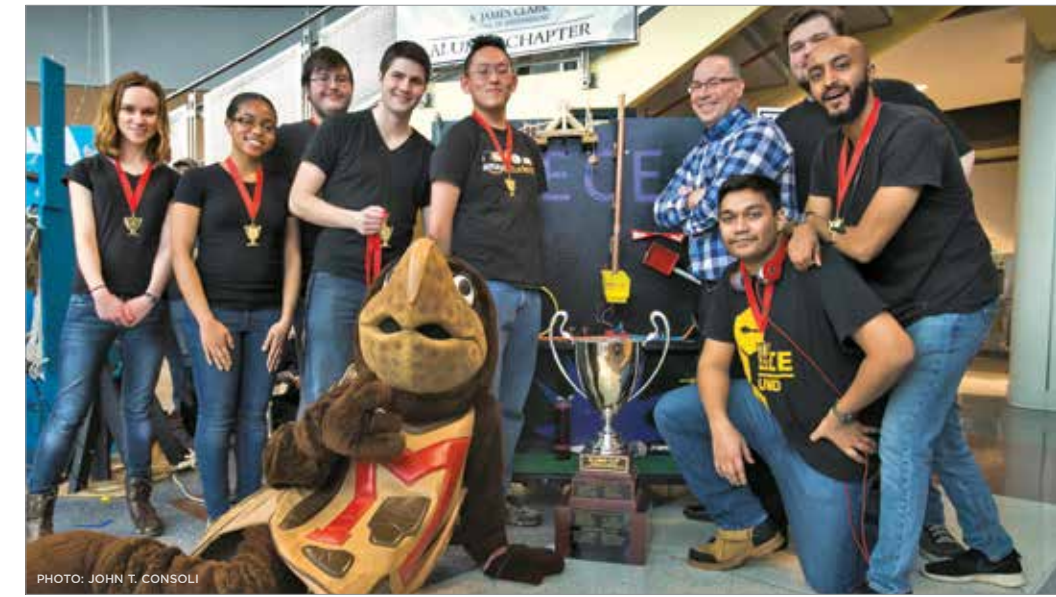


PHOTO: JOHN T. CONSOLI

>> LEARN MORE, VISIT go.umd.edu/hole-in-one

Solving Construction Delays

At LitCon Group, Ryan Witters (M.Eng. '16 civil and environmental engineering; graduate certificate in project management) implements his advanced engineering and organizational skills by retracing the past. When construction projects don't finish on time or on budget, Witters is called on to review the project's history, decide who is at fault, and testify during the litigation process to hold those responsible accountable.

"At the most basic level, engineers are problem solvers," says Witters. "We're taught to be efficient, develop detailed plans, and cut the fat so we can maximize productivity and minimize waste and cost."

While Witters learned some of these abilities as an undergraduate at the

University of Evansville, he further sharpened them at the A. James Clark School of Engineering. He was drawn to the University of Maryland's Master of Engineering program partly because he could specialize in environmental and water resources. He had been interested in water as an important resource for the future since college, and his professional degree was the perfect opportunity to delve deeper into that passion.

In addition, Maryland appealed to Witters because of the personal connections he knew could foster with professors.

"Ultimately, the relationships I developed with my instructors led to an independent study with Research Professor Gerald Galloway, a highly regarded engineer in

his field, which encompassed a statistical analysis of nationwide flood deaths from 2015-16," says Witters.

Eventually, he aims to bring on more projects from the water resources sector—such as levees, dams, and watershed management—to LitCon Group.

"It's been gratifying to use the knowledge gained from my Maryland degree to help explain some of these complex processes to my bosses and peers alike. Thanks to the Clark School, I have created the foundation to become an expert in this field."



PHOTO: MIKE MORGAN

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.

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



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PHOTO: LISA HELPERT

25 Years of QUEST

THE QUALITY ENHANCEMENT SYSTEMS AND TEAMS (QUEST) HONORS PROGRAM celebrated 25 years of hands-on education in quality management, process improvement, and system design on October 7 with a gala at The Hotel, the brand new luxury hotel and conference center at the University of Maryland. More than 420 students, alumni, faculty and staff, and QUEST family and friends attended the event celebrating the program, students of which represent majors within three colleges of the university: the A. James Clark School of Engineering, Robert H. Smith School of Business, and College of Computer, Mathematical, and Natural Sciences.

LEARN MORE, VISIT go.umd.edu/quest-25

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