2015

METRICS

DEPARTMENT OF MECHANICAL ENGINEERING MAGAZINE

A. JAMES CLARK SCHOOL *of* ENGINEERING

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Reshaping Research in Mechanical Engineering

Chair's MESSAGE

B. BALACHANDRAN

Dear Friends,

Mechanical Engineering at Maryland continues to set a high bar for excellence in its robust research and academic programs. As you will see in this latest issue of METRICS, the department's faculty, students, and alumni are achieving great success and recognition for the work they are accomplishing in driving the field of engineering forward. They are actively engaged in cross-disciplinary collaborations, which span fields from health and health care systems to robotics, sensors, energy, electronics, and beyond.

In just the past ten months, the U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) recognized some of our faculty innovators in the energy field by awarding four separate ARPA-E research awards totaling more than $10 million for research to improve energy efficiency through new technologies in personal climate control and power plant cooling.

Two of our research center leaders were recognized for their innovative and pioneering work. The Chinese Academy of Sciences (CAS) recognized Center for Advanced Life Cycle Engineering (CALCE) Director Dr. Michael Pecht with both a Distinguished Scientist 2015 President's International Fellowship and the Distinguished Scientist of 2015 Award. This marks a continuation of the strong collaboration efforts between the university and CAS. The University of Maryland and CAS signed a memorandum of understanding this year to encourage joint research activities, student exchanges, and other related mutually beneficial activities. Both the Institute of Refrigeration (IOR) and The International Institute of Refrigeration (IIR) recognized Center for Environmental Energy Engineering (CEEE) Director Dr. Reinhard Radermacher for his outstanding work and innovations in the field of refrigeration. He received the 2015 J&E Hall Gold Medal from IOR and the 2015 Gustav Lorentzen Medal from IIR. These recognitions are a testament to the far reaching impacts these faculty have both had in their fields and on the global stage. They are just a couple of the individuals you will read about in this issue.

And it is not just our faculty who are making a mark in their endeavors. Our students have continued to excel and be recognized for the work they are doing. Many of our undergraduates are directly involved in the research happening at Maryland. They are publishing work in some of the world's top tier journals and acquiring hands-on experience that will set them on the path to success in their chosen future pursuits, either graduate school or their careers. In addition, our students are participating in national competitions to solve some of the toughest challenges in areas such as wind energy and portable electronics. This spring, the department launched a new course, Engineering for Social Change, that connected young engineers with the ideas of philanthropy and how the work they may go on to do has broad reaching impacts, from their local communities to global society. Funded through a generous donation from the Neilom Foundation, this course demonstrates how philanthropic support can help expand our students' experiences to include new and innovative ideas beyond traditional engineering.

As we look ahead, we would like to take this opportunity to thank our alumni, friends, and donors. It is through their collaborative spirit and generous support that we are able to enhance and enrich the first-class educational and research opportunities possible here at Maryland and beyond. It is through partnerships with companies like Bell Helicopter, L-3, and Stanley Black and Decker that our students have access to internships and hands-on experience that set them on a path to future success. In turn, Terp alumni are paying it forward through their generous support of scholarship funds like the Bell Helicopter Engineers on a Mission Scholarship, taking time to share their experiences as speaker in our Career Paths course, or offering feedback as a guest judge during our annual student Design Day events. It is through these strong connections that we inspire, support, and educate the next generation of multi-disciplinary engineers.

B. Balachandran

Balakumar Balachandran
Chair and Minta Martin Professor

METRICS

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Your alumni news and comments are welcome! Please send them to: **umdme-comms@umd.edu**

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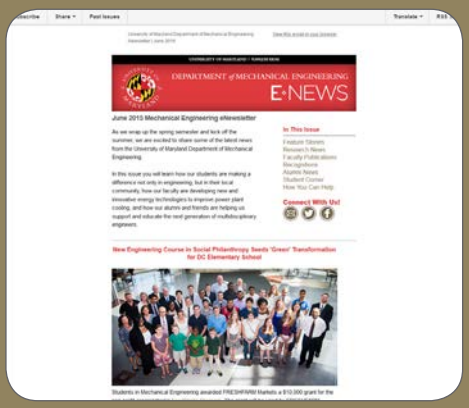
You can now stay in touch and up to date on the latest department news by signing up for our eNewsletter. Published four to six times a year, it highlights the success and achievements of our faculty, students, and alumni.



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MECHANICAL ENGINEERING TEAM WINS 2015 ALUMNI CUP
The anticipation and rivalry surrounding the 2015 Clark School Alumni Cup Competition culminated in a win for Mechanical Engineering on Friday, February 27 as students, faculty, staff, and alumni gathered to support their teams in the Kim Engineering Building Rotunda. The Alumni Cup is an annual engineering design competition that takes place each year during National Engineers Week.

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Assistant Professor Monifa Vaughn-Cooke is researching ways to improve patient care using the Hybrid-Systems Integration and Simulation Lab's CAVE, a virtual reality environment.
image credit Tony Richards

Assistant Professor Johan Larsson is improving understanding of non-equilibrium turbulence.
image credit Jennifer Figgins Rooks

Assistant Professor Jin-Oh Hahn and his team are improving systems for critical patient care and blood pressure monitoring.
image credit Lisa Helfert

ON THE WEB AT
ENME.UMD.EDU

Using Virtual Reality to Improve Health Care Systems & Patient Care

Located behind two non-descript doors in the Clark School's Kim Engineering building is the Hybrid-System Integration and Simulation (HSIS) Lab. Co-directed by Assistant Professor Monifa Vaughn-Cooke, the lab houses one of the only virtual reality (VR) systems that uses a full suite of integrated human input tools—headset, cyber glove, joystick, mouse, keyboard—to study human factors engineering. Known as the CAVE—for cave automatic virtual environment—Vaughn-Cooke and her team use the system to create and test simulations that could lead to improving patient outcomes, and potentially save lives.

Projected onto the CAVE's three walls are images that include banks of computer monitors blinking with simulated patient vital signs. People periodically move in and out of the scene's background, and two walls show other people calmly working at other stations. It seems simple enough, then one of Vaughn-Cooke's research assistants turns on the audio feed. Suddenly, the space is awash in beeps and alarms, background voices, and footsteps. The racket is quickly overwhelming. This is the environment a typical hospital telemetry operator finds themselves in daily.

For many hospital patients, their lives depend on a telemetry operator's keen observation and quick response in the event of an emergency. If a patient flatlines, or their blood pressure plummets, how quickly an operator responds could mean life or death for the patient. And when an operator experiences multiple crises or has reached cognitive overload, understanding what happens, and how operators respond cognitively and physically can help researchers find ways to improve workstation designs and procedures.

Typically monitoring anywhere from 20 to 64 patients, it is critical for hospital telemetry operators to maintain a constant state of vigilance. However, long periods of inactivity, background distractions, false alarms, competing alarms, and even the configuration of the telemetry station itself, can impact an operator's ability to respond quickly and effectively.

This is exactly what Vaughn-Cooke and her team are interested in getting to the bottom of. They want to better understand factors in both the human system and the technical system that can impact a technician's vigilance, cognitive load, and response time, and improve the system to save lives.

"It may not be the number of patients an operator is monitoring, but the number of critical tasks a technician needs to immediately respond to. How they respond to or handle that situation could impact a patient's outcome," Vaughn-Cooke explains. "Especially if there has been a long period of reduced activity. The technician can become less vigilant during that time."

Through a collaboration with Medstar Washington Hospital Center, Vaughn-Cooke and her team have simulated a real-world telemetry station that allows them to test a variety of scenarios without impacting a hospital's working environment. Here, they can tinker with the system without distracting acting technicians or impacting patients. In addition, they can change or adjust variables quickly in response to user feedback.

The lab currently runs four different scenarios that vary cognitive load on the user such as alarm frequency, overlapping alarms, and visual and auditory distractions. As the user works at the station, Vaughn-Cooke and her team collect

PHOTO: TONY RICHARDS

PHOTO: TONY RICHARDS

neurophysiological data via heartrate monitors and electroencephalography (EEG) to determine users' stress levels and response times. Instead of asking users a subjective question, such as "how stressed out are you?" this sensor data can be collected and analyzed to provide more objective measures of their cognitive load.

"If a technician is experiencing either a multitude of alarms, or has reached a point where their stress levels and cognitive load are extremely high, we could perform task switching such as re-routing some of their patient load to operators with less load to see how this effects the situation," Vaughn-Cooke explains. "This is one of the next experimental steps in our research."

The work that Vaughn-Cooke and her team are performing on telemetry monitoring extends beyond the hospital. Other high risk monitoring environments such as air traffic control stations and power plant operations could benefit from the research performed in the CAVE to improve safety.

In addition to telemetry monitoring work, Vaughn-Cooke is investigating how virtual reality can be used in medical therapies to help smokers, particularly those with certain mental health conditions, such as schizophrenia, quit the habit. Among individuals suffering from schizophrenia, heart disease from tobacco use is one of the leading causes of mortality.

VR has been effectively used to evaluate craving behaviors and as a supplemental tool to deliver behavioral therapies in a clinical setting. However, tailoring the VR simulation content to meet smokers' needs is a challenge. To address this particular challenge, Vaughn-Cooke is developing individualized virtual reality therapy sessions that can automatically respond to a patient's physiological and emotional cues to improve their engagement with and response to the program.

Using VR, patients experience tailored group therapy sessions. They engage with several other individuals, or avatars, within the program. The avatars share carefully crafted stories created from the Center for Disease Control's Smokers Stories, and during the session, the patient talks about themselves and listens to the avatars' stories. The patient also wears a wireless EEG that allows the program to monitor their responses in near real time.

"If the patient has a particular emotional response to one of the avatars' stories, something they resonate with, it can be measured by the EEG, and the program will automatically engage that particular avatar to interact with the patient more," Vaughn-Cooke explains. "This type of adaptive simulation mirrors the therapeutic personalization that patients receive in clinical human-human interactions which could make the VR-enabled therapy more effective."

Vaughn-Cooke is also running a simultaneous project geared towards the 'healthy' smoker population. She envisions that the programs could be part of a small portable application or device used in conjunction with a person's smartphone to provide them ready access to support anywhere.

The smoking cessation work is funded through a donation from Avoneaux Medical Institute and supported through collaborations with psychiatrists from the Maryland Psychiatric Research Center, the UMD Center for Addictions Personality and Emotion Research, and the UMD Health Center Tobacco Cessation Program.

Beyond Virtual Reality

While the CAVE occupies a large part of the HSIS lab, Vaughn-Cooke and her team are also involved in improving medical technologies where the end user is the patient rather than a trained professional or operator. By combining sensor technology that can track neurophysiological and emotion cues with algorithms into mobile devices such as smartphones or other non-invasive wearable devices, patients can have better tools to monitor their own health or provide better information to their healthcare providers.

As a part of this research, Vaughn-Cooke is working on the design of usable patient facing technologies for high risk chronic disease patients, such as those suffering from diabetes, hypertension, etc. The behavioral modeling of these patient populations, user-centered device design, and usability testing is currently funded by the Food and Drug Administration.

Vaughn-Cooke & Colleagues' Work Featured in Newsweek

A Nov. 12, 2014 Newsweek story featured Vaughn-Cooke and UMD faculty research collaborators Professor Philip Resnik (Linguistics/University of Maryland Institute for Advanced Computer Studies) and Professor Carol Espy-Wilson's (Electrical and Computer Engineering/Institute for Systems Research) work in engineering systems for mental health.

"Technology's Latest Quest: Tracking Mental Health," by Stav Ziv, explores the trio's work in developing technology to help people keep better track of their mental health outside of formal treatment or between therapy sessions. They are building a complete set of physiological markers like heart rate and skin temperature, along with patterns based on vocal features, facial expressions, and language that could be tracked via a smartphone app or a device like a Fitbit.

An ADVANCE Interdisciplinary and Engaged Seed Grant, on which Vaughn-Cooke was the principal investigator, funded the initial research in this study.

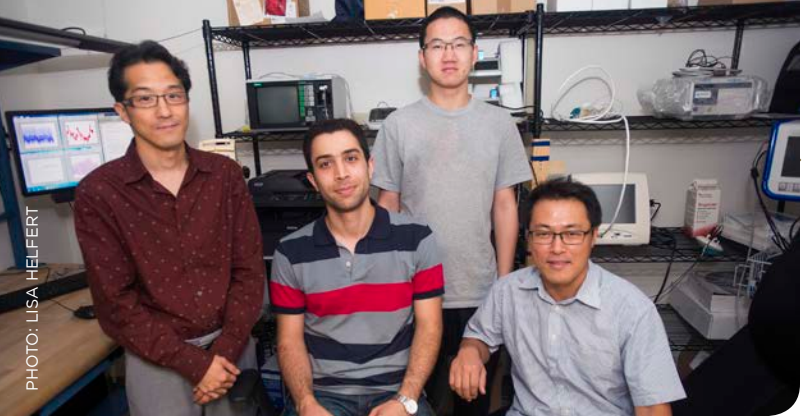


PHOTO: LISA HELFERT

RESEARCH

ASSISTANT PROFESSOR JIN-OH HAHN, GRADUATE RESEARCH ASSISTANTS RAMIN BIGHAMIAN AND XIN JIN, AND RESEARCH ASSOCIATE CHANG-SEI KIM

Autonomous Critical Care Systems

From natural disasters to the front lines of war, critically wounded patients pose unique challenges when medical personnel are overburdened and resources are in short supply. Casualties need close monitoring by clinicians to keep them stabilized, adjust treatments, and reduce complications. But it is extremely difficult to provide optimal patient care, especially when situations overwhelm or distract medical staff. Patients also present a great deal of variability in treatment response from one individual to the next, which makes close monitoring vital to their outcome.

Despite the complexities of this challenge, that is exactly the type of challenge that keeps Assistant Professor Jin-Oh Hahn and his team of researchers busy at Maryland. They are working on a project funded through support from the U.S. Office of Naval Research Young Investigator Program to develop an automated critical care system (ACCS) that when deployed, could monitor and administer to casualties autonomously.

With their current research, the team is addressing two specific challenges. First, they want to address a shortcoming in current closed-loop control systems for automated medication therapy. These systems rely on population-average data to anticipate a patient's drug dose and response, but patients frequently fall outside of this 'average.' Hahn's team aims to create a control system that uses a data-based adaptive model that can support each patient by using measured clinical data to respond and administer treatments such as sedatives, pain killers, and fluids.

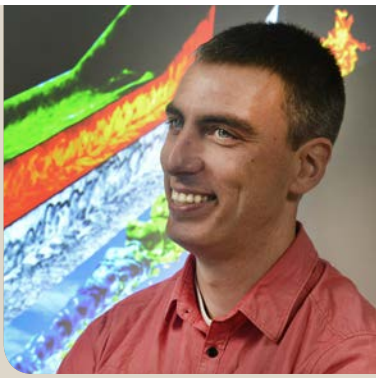
The second challenge in developing an ACCS is that it cannot be tested in a real-world setting since that could interfere with critical patient care. "There are a number of safety issues with testing technology like this," Hahn explained. "But if we can develop an in silico human test bed, mathematical simulation models that can mimic critical care patients, we can speed up pre-clinical testing and improve translation into real clinical settings."

Both tasks would improve patient care systems currently available to medical personnel, and potentially lead to a whole new suite of medical tools to treat patients, especially those in situations where resources are stretched thin. According to Hahn, the therapeutic window for these patients can be extremely narrow, and ACCS could make responsive, carefully calibrated adjustments to patient medications based on an individual's specific needs, improving patient care and outcomes.

Improving Blood Pressure Monitoring

In addition to their ACCS work, Hahn's team has been exploring ways to improve current blood pressure monitoring technology. Hypertension is a leading risk factor in cardiovascular health worldwide, but is frequently undetected and untreated because resources for accessible and affordable detection, especially in low resource areas, are scarce. Affordable blood pressure monitoring tools like arm cuffs are available but less accurate.

Larsson Receives NSF CAREER Award to Improve Understanding of Non-Equilibrium Turbulence



Assistant Professor Johan Larsson received a National Science Foundation (NSF) 2015 Faculty Early Career Development (CAREER) award for his project "Non-equilibrium wall-bounded turbulent flows at high Reynolds numbers."

In most real world settings where turbulence occurs, it is out of equilibrium, that is, it has not had sufficient time to reach an equilibrium state. However, the majority of current and past laboratory research and computer simulations investigating turbulence has involved looking at flows in equilibrium states—the classic scientific tradition of isolating individual physics and allowing for development of physical theories.

"Right now, we are really good at modeling turbulence for airplanes at cruising conditions," says Larsson, "but we are not as good at modeling the turbulence that occurs during take-off and landing, where the air flow accelerates and decelerates much more strongly around the wing."

Bridging this gap is precisely what Larsson aims to accomplish with his research, and he has set out to explore two areas of non-equilibrium turbulence: situations where there are spatial variations in temperature of the surface beneath the fluid, and the effect of strong acceleration and deceleration have on turbulence.

By better understanding how turbulence behaves in non-equilibrium conditions, Larsson can develop better computer modeling tools that could improve future aerospace and marine engineering design processes by reducing the time and money spent building scale models to account for factors previously unaccounted for in most computer simulations.

Read more: go.umd.edu/larsson-nsf

Working with colleagues at Michigan State University and Taipei Veterans General Hospital, they are developing algorithms to improve the accuracy of oscilliometric blood pressure readings, the type of reading taken with an arm cuff.

The team's previous work showed that pulse pressure and arterial stiffness are two major factors that impact the accuracy of oscilliometric blood pressure readings, so they are developing methods to estimate arterial stiffness and blood pressure simultaneously via subject-specific modeling. Through their model-based method, they were able to demonstrate improved readings for individuals with normal and high pulse pressure. The team aims at expanding this method to estimate pulse transit time and central aortic blood pressure for cardiovascular risk predictor monitoring.

Building Robots to Touch

Our sense of touch is something many of us take for granted, but the information we collect from feel is critical. Knowing when we have come into contact with something and whether it is hot or cold, smooth or rough, hard or soft, helps us interact with our environment. So how can we develop robots that can experience and interpret this complex sense? That is exactly the challenge some faculty and students in the department are trying to answer.

Funded through a three-year National Science Foundation (NSF) grant, Professors Hugh Bruck, Elisabeth Smela, and Miao Yu are developing new skin-like sensors made with conductive polymers that can sense pressure, heat, and cold. Using electrical current running through this latex and graphite composite, the sensors detect changes in response to

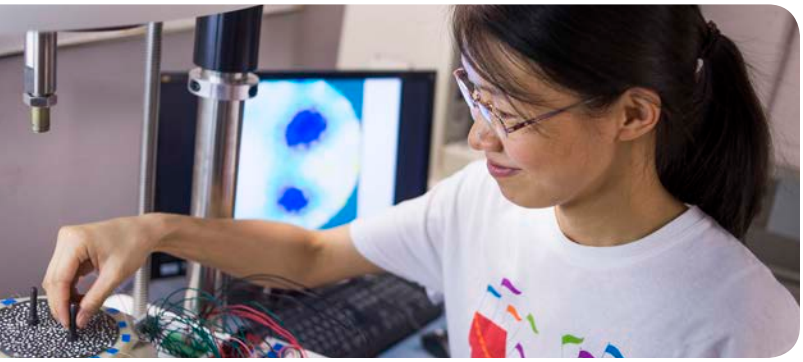


PHOTO: LISA HELFERT

deflection and temperature. The sensors are stretchable and applied as a paint onto a stretchable membrane.

Ph.D. student Ying Chen is using advanced mechanical testing and imaging techniques to research improving not only the consistency and sensitivity of the system, but also its ability to detect where pressure is applied and the direction of the force. If someone tugs your arm, you can sense both how they grasped your arm, and how your elbow and shoulder moved. But recreating the sensitivity of human skin for understanding these types of contact is particularly challenging.

MIAO YU, ELISABETH SMELA, AND HUGH BRUCK (FRONT ROW) IN THE LABORATORY FOR MICROTECHNOLOGIES WITH STUDENT RESEARCHERS NEHEMIAH EMAIKWU, VINCENT WU, JULIAN LOFTON, YING CHEN, AND IVER JENSTROM

PHOTO: LISA HELFERT

Ying holds up a sensing sheet that has evenly spaced wires sprouting from its perimeter. The wires act as "nerves" that collect electrical signals from the center and transmit them to a program that applies an algorithm to infer the locations and magnitudes of pressure. Stretched over foam, or other soft substructure, this sensing "skin" can be wrapped around robots to detect global forces and local shapes. Enabling robots to collect and respond to sensory data could improve operational safety and lead to broader ranges of capabilities, such as fine motor skills for detecting and picking up small objects like needles used for surgical procedures or the ability to gently handle patients in hospitals.

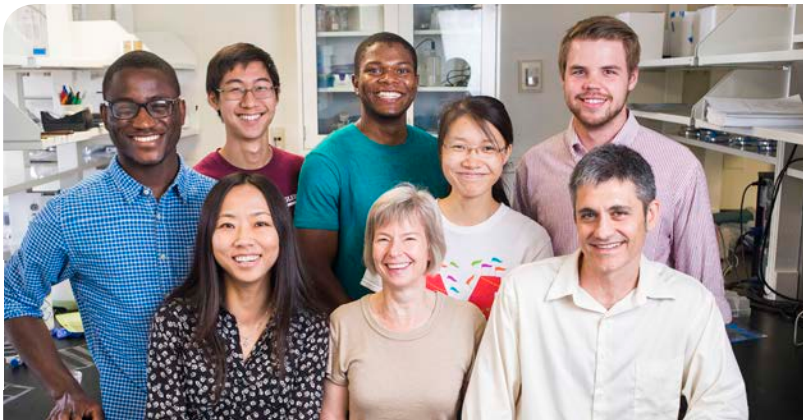
Undergraduates Julian Lofton (Mechanical Engineering) and Eli Barnett (Mathematics) demonstrate experiments they are running to use strips of the sensing membrane applied to a robot fingertip to read braille plates. The deformation caused by the braille bumps alters the voltage across the sensor, which can be analyzed to determine the location of the indentations.

"Currently, robots are pretty good at processing visual information," Barnett explained as he indicated a computer screen where a colorful pressure map visually illustrated the voltage change when the sensor experienced pressure. "But their ability to interpret sensory data is extremely limited."

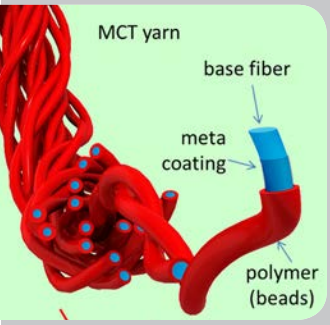
The sensor conducts electric current through tiny graphite particles suspended within rubbery latex. When the sensor is stretched, the pressure pulls some of the graphite particles apart, reducing the pathways available to the current and increasing resistance. Robots will use algorithms to analyze these changes to quantify the location, magnitude, type, and distribution of contact they encounter.

On the horizon, the team is working towards creating a glove for robots that is capable of detecting objects of varying compliance, or squishiness, and texture. They envision that their work in improving robots' sensing capabilities could lead to a whole new realm of bio-inspired control principles, allowing robots to be trained to perform tasks through physical instruction rather than programming, the same way that humans learn.

PHOTO: LISA HELFERT



The U.S. Energy Department's Advanced Research Projects Agency-Energy (ARPA-E) Awards Four Research Teams Over $10 Million in Funding to Improve Energy Efficiency Technologies



META-COOLING TEXTILE

Led by Department of Chemistry Associate Professor YuHuang Wang, along with co-principal investigators (Co-PI) Associate Professor Bao Yang (Mechanical Engineering), Associate Professor Min Ouyang (Physics) and Assistant Professor Liangbing Hu (Materials Science and Engineering), the team will develop a thermally-responsive fabric that extends the skin's thermoregulation ability to maintain comfort in hotter or cooler office settings.

"The majority of human body heat transfers to the environment in the form of thermal radiation. Clothes made from this material will have different thermal transmittance properties in response to room temperature," said Yang.

To provide cooling in hotter surroundings, the fabric's meta-fiber will increase its infrared emissivity and shrink to open pores in the fabric to increase ventilation. In cooler conditions, these effects reverse to increase the garment's ability to insulate the wearer.

ROBOTIC PERSONAL CONDITIONING DEVICE

Aimed at developing a mobile platform to provide personalized cooling to individuals, the project is led by Minta Martin Professor of Engineering Reinhard Radermacher and includes co-PIs Professor Jelena Srebric and Assistant Research Scientist Dr. Vikrant Aute.

The team envisions a small, compact air conditioning unit that can follow the user and provide cool or warm air only where (and when) needed. The highly portable nature of the platform and accompanying sensor and control system, allows it to be optimally placed to improve personal comfort and reduce the energy required to cool buildings.

The platform will contain a small, battery-powered, high-efficiency vapor compression heat pump to provide localized air conditioning as needed during the day while dumping stored heat and recharging batteries at night.

"This project is a paradigm shift in how people stay comfortable in homes and buildings," said Radermacher. "This is mobile air conditioning in a totally new context, not in the traditional sense of automotive air conditioning, but supplementing or substituting for traditional air conditioning."

NOVEL MICROEMULSION ABSORPTION SYSTEMS FOR SUPPLEMENTAL POWER PLANT COOLING

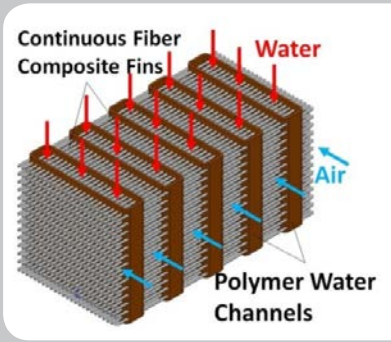
Associate Professor Bao Yang is leading a project to develop an absorption cooling system for power plants that utilizes a novel microemulsion liquid absorbent.

Co-principal investigators include Professor Michael Ohadi and Minta Martin Professor Reinhard Radermacher. The team will also work with partners at Stony Brook University, the Electric Power Research Institute, WorleyParsons Group, and Rocky Research.

"It is a team effort," Yang said. "Each partner has unique technical expertise to bring to this project."

Yang's team will utilize a novel microemulsion liquid absorbent, recently invented by the researchers at UMD for use in absorption cooling systems for power plants. These microemulsion absorbents can absorb water vapor (refrigerant), and release the water as liquid during desorption, thus achieving a high coefficient of performance. Waste heat from the power plant flue gas will drive the microemulsion cooling system to provide supplemental cooling below the ambient temperature.

NOVEL POLYMER COMPOSITE HEAT EXCHANGER FOR DRY COOLING OF POWER PLANTS PROJECT



Professor Michael Ohadi and his team target improving power plant cooling technologies by developing and applying new composite heat exchangers that use a low-cost, high conductivity medium encapsulated in a polymeric material that is highly durable, low cost and has a high resistance to corrosion.

The team includes Professor Hugh Bruck, Associate Research Scientist Dr. Serguei Dessiatoun and Assistant Research Scientist Dr. Amir Shooshtari, along with Professor Joshua Pearce at Michigan Technological University, Dr. Arun Muley at Boeing Research and Technology, Huntington Beach, Calif. Dr. Justin Zachary at ExperTech Engineering Corp. will serve as consultant on the power plant feasibility studies and as the link between the project and the power plant community.

The team's novel polymer composite heat exchangers for indirect air cooling of power plants are superior to current state-of-the-art metallic heat exchangers in terms of cost, performance, lifespan, and corrosion resistance. In addition, the team can keep production and assembly costs low by using onsite additive manufacturing (3-D printing) technologies.

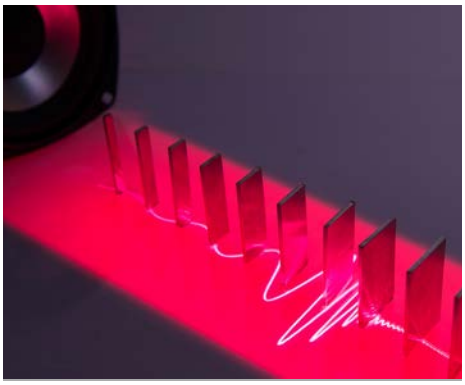
"Maryland leads the nation in energy research and innovation," said Maryland Sen. Barbara Mikulski, *"These are smart investments in the most innovative early stage research that leads to new ideas, new products, and new jobs. I'm so proud of the Maryland researchers leading the way in technologies that will make our nation safer and our economy stronger."*

PUBLISHED IN *NATURE COMMUNICATIONS*

Artificially Engineered Materials Breakthrough for Sound Sensors

Researchers developed breakthrough technology to improve sound sensor capabilities through the use of artificially engineered materials.

Sound, or acoustic sensors, plays an important role in a wide range of uses. However, current sensors are limited in their ability to detect weak acoustic signals. These weak signals fall outside of most sensors' minimal detectable range, so extremely small tumors, or fine damage in a bridge's foundation may go undetected.



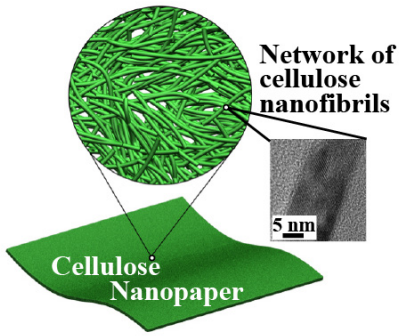
Led by Associate Professor Miao Yu, the UMD researchers are addressing current sensor limitations by developing new uses for artificially engineered materials—metamaterials—to improve acoustic sensing capabilities. Their work is the first research to use metamaterials for improving acoustic sensing.

The team created a new sensing platform that uses acoustic metamaterials—artificial materials specifically designed to manipulate sound waves—to enhance acoustic detection. They developed a metamaterials structure that would compress and amplify a sound wave before detection by a sensor. This compression and amplification process, in effect, 'concentrates' the sound wave into a range the sensor can detect and allows a sensor to pick up weaker, or low volume, signals that previously would have gone undetected.

go.umd.edu/sound-sensors

PUBLISHED IN *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*

Small Can Be Strong *and* Tough



UMD researchers discovered that paper made of cellulose fibers is tougher and stronger the smaller the fibers get. Engineers have long sought a material that is both strong and tough.

"Strength and toughness are often exclusive to each other," said Associate Professor Teng Li. "For example, a stronger material tends to be brittle, like cast iron or diamond."

The team has been pursuing this holy grail in materials design by exploring the mechanical properties of cellulose, the most abundant renewable bio-resource on Earth. They made papers with several sizes of cellulose fibers—all too small for the eye to see, ranging in size from about 30 micrometers to about 10 nanometers. Notebook paper is made of cellulose fibers a thousand times larger, but paper made with ten-nanometer-thick fibers was 40 times tougher and 130 times stronger.

Cellulose fibers have many available hydrogen bonds, which are easily formed and broken, but they can also reform on their own—giving the material a 'self-healing' quality. The smaller the cellulose fibers, the more bonds per square area. This means they could both hold together better and re-form more quickly, the key for cellulose nanopaper to be both strong and tough.

The research is part of a National Science Foundation funded grant to explore 'the science underpinning anomalous scaling laws of strength and toughness in nanocellulose materials.'

go.umd.edu/strong-and-tough

PUBLISHED IN *COLLOIDS AND SURFACES B: BIOINTERFACES*

Work Sheds Light on Electrostatic Potential in MS2 Bacteriophage Viruses

Undergraduate researchers led by Assistant Professor Siddhartha Das published work shedding new light on the complex pH-dependent electrostatics of viruses that may greatly influence interactions between viruses and bacteria.

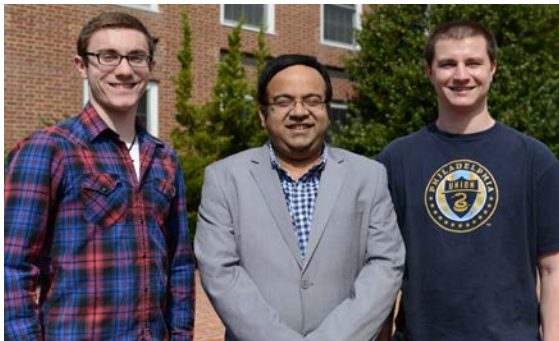
Their research, which was the cover article in the March 2015 issue of *Colloids and Surfaces B: Biointerfaces*, focused on developing models to quantify the electrostatics of a charged spherical particle. These new insights will help explain the electrostatics and the consequent biophysics of the MS2 bacteriophage virus—a type of virus that specifically infects certain strains of bacteria, such as Escherichia coli.

The key result of their research is that the polyelectrolyte layer—grafted onto the particle core and intrinsic to the configuration of the soft particle—may exhibit pH-dependent charge density which can significantly affect the electrostatics at the interface of the particle and the surrounding medium. This means that the environmental pH a virus is exposed to can actually alter how it behaves and interacts with a bacteria.

The team found that depending on the value of the pH, the charge of the core may exhibit virtually negligible or extremely significant influence in dictating the electrostatic potential around the particle. This is the first research to demonstrate how significant pH variation is as a factor in the electrostatics of a soft particle with a charged core.

go.umd.edu/ms2-virus

Kyle McDaniel, Siddhartha Das, and Joseph Andrews



New Engineering Course in Social Philanthropy Seeds 'Green' Transformation for DC Elementary School

PHOTO: LISA HELFERT

A new class in Mechanical Engineering at the University of Maryland (UMD) teaches young engineers to think beyond solving the next technical problem to thinking about how they can impact and solve some of the toughest social issues in their communities and beyond.

The class, with support from UMD's School of Public Policy, introduces students to the ideas of social change and social entrepreneurship through the intersection of concepts from both engineering and philanthropy.

Course organizers say that while many universities focus on public policy and developmental engineering to address issues of support in developing, or economically challenged areas, UMD is leading the way in social engineering and social entrepreneurship by infusing the ideas and processes of philanthropy into its engineering curriculum.

"This course provides an educational experience that connects engineering, philanthropy, and social change, and gives students a firsthand look at how they can make a very real impact in their own local community," said course creator, Professor Emeritus Davinder Anand. "Students also have the opportunity to demonstrate thought leadership and gain an understanding of how individuals' values and backgrounds influence the decision making process."

Throughout the course, students learned from both engineers and leaders in nonprofit organizations. In addition, the class culminated in awarding one $10,000 grant to a nonprofit organization of their choosing.

FRESHFARM Markets, the inaugural recipient of an Engineering for Social Change Grant, will use the grant for green space and gardens at Ludlow-Taylor Elementary School (LTES). LTES is the newest school enrolled in FRESHFARM Markets' FoodPrints program, an educational program that integrates gardening, cooking, and nutrition education into the curriculum at five Washington D.C. Public Schools.

"The UMD grant will cover almost 100 percent of the garden area construction and installation," said Jessica Hulse Dillon, FRESHFARM Markets' grant program manager. "The students will get a massive transformation of their asphalt playgrounds into gardens and beautiful green space they can learn from and run around in."

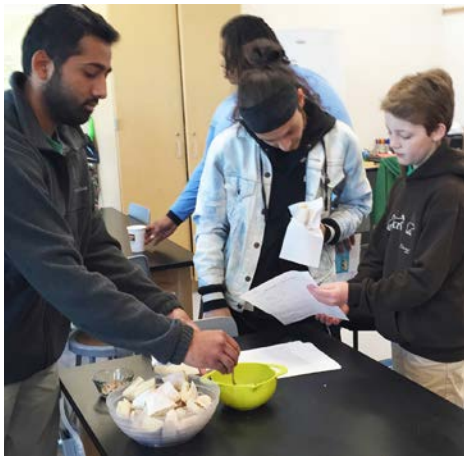
The UMD students worked together as a group—through open discussion and debate—to decide not only what kind of non-profit they would help, but what the selection process would look like and then facilitate it.

"The students are really able to take ownership of the process," said Jennifer Littlefield, Associate Director of the Center for Philanthropy and Nonprofit Leadership in the UMD School of Public Policy, who helped co-teach the course this semester. "There are a lot of leadership skills that the students have the opportunity to learn. They learn good group decision-making models, how to compromise, how to both pitch and support ideas, and more."

After soliciting proposals, students interviewed potential nonprofits and conducted site visits with the finalists to see for themselves how each nonprofit would use the grant.

"Site visits gave us the opportunity to see firsthand what the impact would be in the local community," said rising senior Jazmyne Claggett, who grew up in D.C. and Prince George's County. "[With FRESHFARM at Ludlow-Taylor] we would be able to have an impact on young children's lives and could see how that could be grown and fostered in their own families."

In addition to the class-awarded



UMD students visited Ludlow-Taylor Elementary School to learn how FARMFRESH Markets' FoodPrints Program makes a difference both in the classroom and in the community.

$10,000 grant, students had the opportunity to compete for a $1,000 seed grant of their own through the class' Virtual Nonprofit Challenge. Course Manager Dylan Hazelwood noted, "We designed the Virtual Nonprofit Challenge to allow students to utilize their engineering, creativity, leadership, and entrepreneurial skills to engage in developing a nonprofit in an area they felt passionately about." The winning team can then use the grant to start their own organization.

Claggett and teammates Brent Bian, William Sama, and Mulindi Johnson won the student challenge with their proposal for Inspyre, a student led initiative to provide STEM education activities, outreach, and support to K-12 students.

Having benefited from a similar program as a child, Claggett is dedicated to helping other young students fulfill their STEM goals. The first woman in her family to achieve a college education, Claggett said, "The impact that a nonprofit program can have is very keen to me. I was that child, and I have a passion for STEM education because of how it changed my life."

The Neilom Foundation and the Center for Engineering Concepts Development provided this semester's grant, and conducted the class in partnership with UMD's Center for Philanthropy and Non-Profit Leadership in the School of Public Policy.

IF YOU'RE INTERESTED IN LEARNING MORE ABOUT HOW YOU CAN SUPPORT THIS CLASS FOR FUTURE STUDENTS, CONTACT ***NATALIE GRANDISON*** *DIRECTOR OF EXTERNAL RELATIONS 301-405-1364 NATALIEG@UMD.EDU*

Baz Recognized for Scholarship and Teaching Excellence

Minta Martin Professor Amr Baz has been recognized for his excellence in scholarship and teaching by the both the University of Maryland (UMD) and the A. James Clark School of Engineering by awarding him a 2015-2016 Distinguished Scholar-Teacher Award and the Poole and Kent Teaching Award for Senior Faculty.

The Distinguished Scholar Teacher Award honors senior faculty who, as men and women of outstanding scholarly accomplishment, combined with excellence in teaching, personify the image of the professorate. The nominee must be a current member of the University of Maryland faculty for a minimum of five years and hold the rank of tenured professor.

The Poole and Kent Award for Senior Faculty recognizes excellence in teaching. Baz's teaching is distinguished by his effective approach to integrating leading edge research results into traditional course material. He uses extensive visualization techniques to communicate content and fully utilizes web-based course support both for on-campus and distance offerings.

In addition, Baz uses his research laboratories to develop examples for demonstrating fundamental concepts discussed in his undergraduate and graduate courses.

Undergraduate students consistently rank him very high for course content, clarity of instructions, and his dedication to student learning both inside and outside the classroom. His mentorship has been a key factor in both undergraduate and graduate career planning and achievements.

Baz received his Ph.D. from the University of Wisconsin, Madison in 1973. His research interests include active and passive control of vibration and noise, active constrained layer damping, magnetic composites, virtual reality design of smart structures, and active acoustic metamaterials. Baz is also the Director of the Smart Materials and Structures Research Center.

Schmidt Attends NAE Frontiers of Engineering Education Symposium

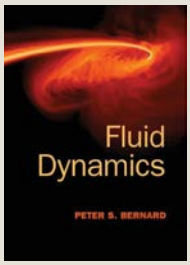
Associate Professor Linda Schmidt took part in the National Academy of Engineering's (NAE) sixth Frontiers of Engineering Education Symposium held October 26-29, 2014 in Irvine, Calif. Schmidt was one of 77 invited educators NAE called out for developing and implementing innovative educational approaches across a variety of engineering disciplines.

The symposium brings together the nation's most innovative engineering educators to share ideas, learn from research, and best practice in education, and leave with a charter to bring about improvement in their home institution.

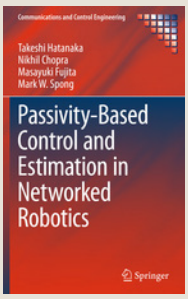
"Professor Linda Schmidt has been a thought leader in the design education and research space for a number of years, and she has been one of the primary faculty members involved in establishing the design curriculum in the department," said Chair and Minta Martin Professor of Engineering Balakumar Balachandran. "She has co-authored a well-received textbook, which is used at Maryland and a number of other schools. Naturally, we are pleased to know that she was chosen to participate in this important NAE symposium."

Faculty Publications

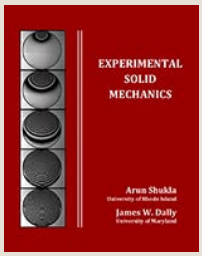
Professor Emeritus **RONALD ARMSTRONG** co-edited new Royal Society Philosophical Transactions themed edition, *Fracturing Across the Multi-scales of Diverse Materials.* *go.umd.edu/armstrong-book*



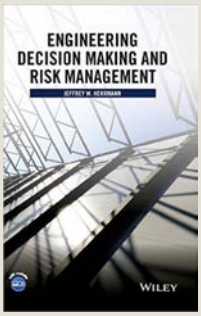
Professor **PETER BERNARD** authored *Fluid Dynamics,* published by Cambridge University Press. *go.umd.edu/bernard-book*



Associate Professor **NIKHIL CHOPRA** co-authored *Passivity-Based Control and Estimation in Networked Robotics*, Springer International Publishing. *go.umd.edu/chopra-book*



Professor Emeritus and Glenn L. Martin Institute Professor of Engineering **JAMES DALLY** co-authored the revised 2nd edition of *Experimental Solid Mechanics*, College House Enterprises. *go.umd.edu/dally-book*



Professor **JEFFREY HERRMANN** authored *Engineering Decision Making and Risk Management,* published by Wiley. *go.umd.edu/herrmann-book*

CAS Honors Michael Pecht

In 2015, the Chinese Academy of Sciences (CAS) recognized Professor Michael Pecht (left) with both a Distinguished Scientist 2015 President's International Fellowship and the Distinguished Scientist of 2015 Award.

Pecht, director for Center for Advanced Lifecycle Engineering (CALCE), was invited to lecture at the Shenyang Institute of Automation under CAS' President's International Fellowship Initiative. Pecht gave two presentations, one on sensor development, prognostics, and data analytics, and a second on how these activities of excellence in CALCE are used in the Internet of Things.

On June 2, UMD signed a memorandum of understanding with CAS to encourage joint research activities, student exchanges, and other related mutually beneficial activities.

go.umd.edu/cas-pecht

Radermacher Recognized for Contributions to Refrigeration

The Institute of Refrigeration (IOR) and The International Institute of Refrigeration (IIR) have recognized Minta Martin Professor of Mechanical Engineering Reinhard Radermacher for his work in the field of refrigeration.

IOR awarded Radermacher the 2015 J&E Hall Gold Medal for his contributions in the field of refrigeration. The award recognizes individuals for their outstanding practical contribution to the field of refrigeration, and selected Radermacher for pushing research frontiers through his exploration of new technologies and developing them for real-life applications.

IIR named him the 2015 recipient of the Gustav Lorentzen Medal. IIR awards the medal every four years to an individual who has made outstanding and original achievements in academic or industrial research, innovation, or development, in all fields of refrigeration, thus promoting creativity and renewal in the fields of expertise of the IIR.

go.umd.edu/radermacher

Awards & Recognitions

Professor Emeritus **RONALD ARMSTRONG** received the 2015 John Rinehart Award for his work in dynamic deformation.

Professor **JAYDEV DESAI**, Professor **ABHIJIT DASGUPTA,** Associate Dean and Keystone Professor **WILLIAM FOURNEY,** Research Professor **YUNHO HWANG,** and Associate Professor **LINDA SCHMIDT** were named American Society of Mechanical Engineers Fellows.

The Institut National des Sciences Appliquées Rouen recognized Professor **ELAINE ORAN** with an Honorary Doctorate during their 30-year Anniversary Program.

The Surface Mount Technology Association recognized Center for Advanced Life Cycle Engineering's Dr. **DIGANTA DAS** with their International Member of Technical Distinction Award.

The University System of Maryland awarded Jeong H. Kim Professor **ABHIJIT DASGUPTA** a 2015 USM Regents' Faculty Award for Excellence in Scholarship.

The American Physics Society selected Visiting Professor **JERRY W. FORBES** for the 2015 George E. Duvall Shock Compression Science Award.

Minta Martin Professor **AMR BAZ** and Professor **JUNGHO KIM** were both named Keystone Professors.

NEW FACULTY

ENRIQUE DROGUETT, Associate Professor
Ph.D. University of Maryland
Droguett conducts research on methods for probabilistic risk analysis and reliability of systems, uncertainty analysis, Bayesian methods, maintenance optimization, and ecological and biological risk assessment. He has led studies on risk and reliability of complex systems such as oil and gas exploration and production, oil refineries, commercial aviation, and hydropower plants. *enme.umd.edu/faculty/droguett*

MARK FUGE, Assistant Professor
Ph.D. University of California, Berkeley
Fuge's research lies at the intersection of mechanical engineering, machine learning, and design; an area he refers to as "Design Informatics." This involves using a combination of artificial intelligence, machine learning, computational linguistics, ethnography, human-computer interaction, social science, and crowdsourcing techniques to analyze and build web-based software tools for designers on top of scalable machine learning systems. *enme.umd.edu/faculty/fuge*

RYAN D. SOCHOL, Assistant Professor
Ph.D. University of California, Berkeley
Sochol's work involves utilizing state-of-the-art micro/nanoscale 3D printing approaches to solve mechanically and physically-complex biological challenges, with a focus on creating "Organ-on-a-Chip" living systems that mimic the physiological architectures, characteristics, and functions of organs in vivo. *enme.umd.edu/faculty/sochol*

Tenure and Promotions

Associate Professor **PETER CHUNG** received tenure at this rank. *go.umd.edu/chung2015*

Associate Professor **JEFFREY HERRMANN** was promoted to the rank of Professor. *go.umd.edu/herrmann2015*

Professorships

Professor **ABHIJIT DASGUPTA** is the inaugural recipient of the Jeong H. Kim Professorship.

Professor **MOHAMMAD MODARRES** was named the Nicole Y. Kim Eminent Professor.

In Memoriam

Retired Professor **CHUNG TSUI** passed away on July 27, 2014.

A professor for more than 40 years, Tsui taught fluid mechanics and measurement laboratory classes. In 1999, Tsui received the Clark School's Faculty Service Award in recognition of his outstanding service to both the Department of Mechanical Engineering and the A. James Clark School of Engineering.

For more than a decade before he retired, Tsui was in charge of Mechanical Engineering's facilities, inventory, and keys. He frequently referred to himself as the 'key man' of the department. Many of our faculty recall Professor Tsui's kind and helpful nature.

Tsui was born in 1931 in Hong Kong S.A.R. He graduated from Hong Kong Technical College and came to the United States as a student in September 1957. He received his M.S. in July 1959 and Ph.D. in January 1967 from Purdue University.

Tsui is survived by his wife, Linda Chang Tsui, and his two children, Dr. Allen and Amy Tsui, J.D.

STUDENT NEWS

UNDERGRAD SPOTLIGHT

Linus Francis

Growing up just a short distance from the University of Maryland, Linus Francis always had an interest in how things work. When asked what started his interest in engineering, he says he spent a lot of time doing hands on things growing up.

"I took a lot of my toys apart as a kid," Francis said. "And I got a lot experience working around the house doing things like car maintenance, putting together furniture, building sheds, simple wood work."

Mechanical Engineering at Maryland was a great fit for him. He could combine his interest in cars with engineering to pursue a career in the automotive field. From there, it was a natural step to join the Terps Racing team. "I was always passionate about cars, and I enjoy working on and modifying my own cars, so any opportunity to learn about and work on race cars was a hard one to pass up," Francis explained.

He joined Terps Racing freshman year. Starting on the Baja Team's Suspension Sub-Team, he spent time machining, fabricating, and presenting at competition. From there, he moved to the Formula Team where he tackled everything from designing exhaust manifolds and a camshaft package to developing an engine simulation model and fabricating parts. Last year, he worked on the Engine Sub-Team and will work as a teaching assistant for the upcoming Terps Racing class.

His automotive enthusiasm has served him well, and this year L-3 awarded him their Automotive Scholarship. L-3 has funded scholarships at Maryland since 2010, and this award provided a $10,000 scholarship as well as an internship working for L-3 over the 2015 summer.

"The L-3 scholarship and internship was an opportunity to work on projects closely related to the automotive field," Francis said. "My experiences with Terps Racing qualified me to have this chance, and I believe working for L-3 will open doors to more opportunities."

During his L-3 internship, Francis saw powertrain development in action by observing engine dyno testing, helping with oil valve testing, and running fuel injector data analysis. He gained project management experience working towards the completion of a fuel test bench for isolating and testing the fuel sub-system of different engines. He also designed an adapter and tone wheel for the test bench.

While Terps Racing and L-3 have provided positive opportunities to hone his engineering skills, Francis says it is important to always go back to the basics in engineering. Thus far, it is one of the most important lessons he has learned in becoming an engineer.

"Developing the ability to derive why something happens at the most basic level means you also have the understanding necessary to alter a system and change the outcome to a desired result," he explains. "This is valuable because it can be applied to anything from studying for a test, to addressing an actual engineering problem."

RISE Ambassadors Host Local High School Students to Foster Interest in Mechanical Engineering

Mechanical Engineering students in UMD's Research, Instruction, Service, and Entrepreneurship (RISE) Program served as outreach ambassadors to get students at Phelps High School in Washington, D.C. engaged with engineering and develop a long-term relationship with the department.

RISE ambassadors visited Phelps students, and using quadcopters, held interactive sessions demonstrating the vehicle's capabilities and teaching the students how different aspects of mechanical engineering come together and apply to make the quadcopter function properly. Phelps students had the opportunity to fly quadcopters themselves to see engineering principles firsthand. In addition, RISE students talked about what high school students could expect as an engineering student at Maryland.

RISE also hosted a group of Phelps High School students who showed interest in engineering to visit the Maryland campus, and give them an interactive, first-hand look at engineering at Maryland.

This year's RISE students are confident that the relationship between the department and Phelps High School will continue to flourish, creating excitement and engaging future mechanical engineers.

RISE students Alina Moosvi (far right) and Sarah Andrews (second from right) with Phelps High School students.

Kusimo Delivers Student Speech

Abisola Kusimo was the student speaker for the Clark School spring commencement ceremony held Friday, May 22 at the University of Maryland Xfinity Center.

At Maryland, she pursued three minors in Engineering Leadership Development, Technology Entrepreneurship, and Rhetoric Communication, interned two summers with Sikorsky Aircraft Corporation as an Airframe Design Engineer, and led over one hundred students as a three-year South Campus Resident Assistant.

She studied abroad and was involved in numerous campus leadership and academic activities. After graduation, she will attend Stanford University to pursue her Ph.D. in Mechanical Engineering with a focus on Design for Extreme Affordability.

go.umd.edu/kusimo

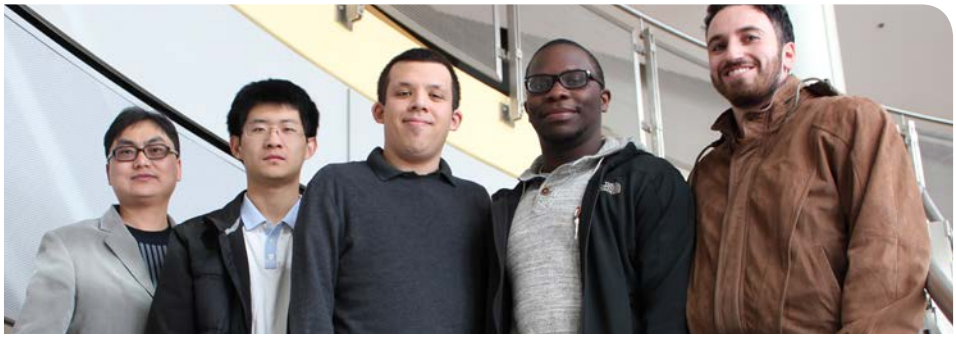
Team Wins in RevCon Competition for Second Year Straight

A Mechanical Engineering team was one of eight winning teams in the 2015 Defense Advanced Research Projects Agency's (DARPA) International Field-Reversible Thermal Connector (RevCon) Challenge for the second straight year. The competition challenges student teams to design concepts for a field-reversible, low-thermal resistance thermal connector for use in radar electronics.

The team's concept aimed at meeting two key challenges: to have a strong clamping force and to be a good thermal conductor that supplied the least thermal resistance between the circuit board and the heat sink. Since the clamp is designed for use in portable electronics units, a strong clamping force prevents the connector from shifting during movement.

The team also designed their connector to have a large surface area and made it out of copper for increased thermal conductivity.

go.umd.edu/revcon2015



Associate Professor Bao Yang, Haoyuan Liu, Joseph Fustero, Allswell Akrong, and Joshua Zelen

COLLEGIATE WIND COMPETITION
U.S. DEPARTMENT OF ENERGY

Wind TERPines

Undergraduate students from across Mechanical Engineering, Aerospace Engineering, Business School, and the Atmospheric and Oceanic Sciences are joining forces to compete in the Department of Energy's 2016 Collegiate Wind Competition.

"Wind TERPines" is led by Department of Aerospace Engineering professor James Baeder. As part of the competition, they will attend the American Wind Energy Association Windpower Conference in New Orleans in May 2016. There, the team will present their business plan and deployment strategy as well as test their prototype wind turbine in an on-site wind tunnel.

This year's competition theme is to design and construct a wind-driven power system to supply electricity to non-grid connected devices for off-grid applications.

GRADUATE SPOTLIGHT Frank VanGessel

This summer, graduate student Frank VanGessel got a crash course in computational modeling at the Los Alamos National Research Laboratory (LANL). Selected from some of the best students across the U.S. for LANL's competitive Computational Physics Student Summer Workshop, VanGessel spent the summer working with some of the world's best computational scientists in Los Alamos, New Mexico.

"Participating in the workshop has been an eye opening experience for me," VanGessel said. "I have been completely immersed in the culture of computational modeling. My coding abilities are growing in leaps and bounds, and my all around comfort level with using computers as an engineering tool has increased too."

VanGessel arrived at Maryland after completing his undergraduate work in mathematics and physics at St. Mary's College of Maryland. When asked why he chose to pursue these subjects, he said, "I was always proficient at math. There is a natural connection between math and physics and it was how physics explains natural phenomena that I found intriguing."

This seems like the perfect fit in light of the work he did at LANL this summer. VanGessel worked on the Monte Carlo Thermal Radiation Transport (MCRad) project modeling radiation such as X-rays. These models have applications to both astrophysics phenomenon and combustion. His project mentors were Drs. Matt Cleveland, Allan Wollaber, and Todd Urbatsch.

Currently working on his master's studies under the mentorship of Associate Professor Peter Chung, VanGessel's research at Maryland has focused on the computational modeling of material properties. Specifically, he is focusing on modeling phonon transport in crystalline materials to obtain accurate temperature profiles at nanometer scales.

PHOTO : LANL

VanGessel chose to pursue engineering because he could apply his skills in mathematics and physics to modeling real world problems. The application of different disciplines was also a highlight of his summer experience at LANL. "Workshop participants' backgrounds range from computational quantum chemistry to applied math to computer science and include everything in between," VanGessel explained. "As a result I am exposed to new ways of thinking about a problem as well as learning how to communicate ideas to people who possess a different skill set than my own."

Some of his advice for fellow young engineers? "Experience as many different areas of engineering, within your field of interest that you can. This allows you to find work that you are truly passionate about and nothing is more satisfying than doing something you enjoy on a daily basis."

STUDENT NEWS

Undergraduate Awards & Honors

American Society of Mechanical Engineers Senior Award
ZACHERY HUTCHINSON

Pi Tau Sigma Memorial Award
MADISON KAFER

Pi Tau Sigma Service Award
PARTH KATHROTIYA

Pi Tau Sigma Sophomore Award - 4.0 GPA
DAVID ALCANTARA, **MICAH ARNSON-SEROTTA**, **ALLISON CLEARY**, **JACOB EISENMAN**, **KATHRYN JAHN**, **SIQI JIANG**, **ELLERY KLEIN**, **GEDALIAH KNIZHNIK**, **SURABI KONDAPAKA**, **CHASE MANNY**, **JOHN O'NEILL**, **TRISHA PATEL**, **ALEXANDER PIQUE**, **LAURA SHUMATE**, **CARLOS ST. REGIS**, and **RYAN WARREN**

Society of Automotive Engineers Senior Award
MARK NATHANSON

Society of Automotive Engineers Service Award
THEODORE ROOT

CLARK SCHOOL & DEPARTMENT UNDERGRADUATE AWARDS

Center for Minorities in Science and Engineering Service Award
BONGNWI TANGYLE, **DANIA MORRIS**, **CHARIAH GHEE**, and **ITOHAN EBHOJIAYE**

Dinah Berman Memorial Award
CHANA GARBOW

A. James Clark School of Engineering Leadership Award
SARAH NIEZELSKI

Outstanding Engineering Co-op/Intern Award
JONATHAN FOURNEY and **MICAELA LARSON**

Department of Mechanical Engineering Academic Achievement Awards
CHANA GARBOW, **DAEVIN HUGH**, **JEEVEN HUGH**, **JONATHAN KORDELL**, and **SAMANTHA SMALLWOOD**

Department of Mechanical Engineering Chairman's Awards
SARAH ANDREWS, **RALPH FAIRBANKS**, **GREGORY HOLLAND**, **RYAN CHOW**, **MARK NATHANSON**, **ZACHARY HUTCHESON**, **SARAH NIEZELSKI**, and **PARTH KATHROTIYA**

Graduate Awards & Honors

35th Annual International Symposium on Combustion 2015 Distinguished Paper Award
AJAY SINGH

Maryland Daily Record's 2014 Innovators of the Year Award **TAYLOR MYERS**

ALL-Scholarship Teaching Administration Research Fellowship
TAYLOR MYERS

American Society of Heating, Refrigerating and Air-Conditioning Engineers Graduate Student Grant in Aid **STEFAN BANGERTH**, **XIANG ZHANG,** & **MATTHEW DAHLHAUSEN**

American Society of Heating, Refrigerating and Air-Conditioning Engineers National Capital Chapter Endowed Fellowship
TAO CAO

Ann G. Wylie Dissertation Fellowship
SUXIN QIAN & **J. EDMON PERKINS**

Center for Advanced Life Cycle Engineering Consortium Meeting Best Student Presenter, Spring 2015
JORDAN JAMESON

Department of Mechanical Engineering Award for

Best Dissertation
ELIF AYVALI & **SUBHASIS MUKHERJEE**
Best Thesis
ANDREW TRETTEL
Best Teaching Assistant
ANTO PETER

Los Alamos National Laboratory's Computational Physics Student Summer Workshop Placement
FRANK VANGESSEL

Delgate Melony Griffith Scholarship Award, 2014-2015 **KAILYN CAGE**

EduPal Prize Winner
MEHDI KOHANI

Clark School's Future Faculty Program
MICHAEL FISH & **SEYED ALI MOEDINI**

GDF-Suez Fellowship
SUXIN QIAN & **ZHI YANG**

Global Entrepreneurship Monitor Consortium Fellowship
CHRISTA PETTIE

Graduate Dean's Dissertation Research Fellowship
IVAN PENSKIY

Graduate Summer Research Fellowship **ALI MOEINI**

Institute of Electrical and Electronics Engineers International Conference on Robotics and Automation Travel Grant
SHING SHIN CHENG

International Microelectronics Assembly and Packaging Society Chesapeake Chapter Poster Competition

First Runner Up
CHRISTOPHER HENDRICKS

Second Runner Up
JORDAN JAMESON

International Microelectronics Assembly and Packaging Society 2014 Steve Adamson Student Recognition Award
ELVIZ GEORGE

International Microelectronics Assembly and Packaging Society UMD Chapter Best Poster Award
ARVIND SAI SARATHI VASAN

Jacob K. Golhaber Travel Grant
SHING SHIN CHENG, **ALEXANDER SCAMMELL,** **VALENTIN SOLOTYCH,** & **LUIS SANTOS**

Miss Willie M. Webb Reliability Engineering Fellowship
LUIS SANTOS

National Science Foundation Graduate Research Fellowship
DAVID DEISENROTH

Northrop Grumman Graduate Fellowship in Engineering Education
AJAY SINGH

Outstanding Graduate Assistant Award
AJAY SINGH, **SHUZE ZHU**, **NICHOLAS WILLIARD,** & **ANAHITA IMANIAN**

Electronic Components Industry Association's QRTS Travel Grant
HELMUT BEVENSEE & **ANTO PETER**

Richard and Stefanie Vogel Graduate Student Award
CHAD KESSENS

Students, staff, and faculty during the 2015 Graduate Honors & Awards Ceremony

PHILANTHROPY AT WORK

SUPPORTING THE NEXT GENERATION OF ENGINEERS

Terps at Bell Pay it Forward

While Bell Helicopter is an industry leader in vertical lift technology, they have come to depend on Maryland for supplying them with some of the latest in next generation engineers. Currently, twenty two alumni reside at Bell as engineers, engineering managers, and directors, and through their efforts, Maryland and Bell have been fostering strong ties and relationships to educate, support, and recruit students with a passion for engineering and interest in working at a company that values promoting STEM in the communities they live and work and the customers they serve.

For years, Bell, a Textron Company, has actively engaged with and supported Maryland students through class sponsorships, inclusion in their competitive summer boot camp, internship opportunities, and most recently, the Bell Helicopter Engineers on a Mission Scholarship Fund.

Through the coordination efforts of Charlie Kilmain (B.S. '85), the Terps at Bell established the Bell Helicopter Engineers on a Mission Scholarship Fund to fuel future engineers in their academic success, and give back to the school that helped set them up for a successful career in engineering.

For those like Mike Ryan (B.S. '85), it is important to support and foster future engineers and support the types of experiences that made it possible for him to enjoy an almost thirty-year career at Bell. "Giving to the scholarship goes towards trying to give back," explained Ryan, a Manager in Aircraft Structures Design and Liaison. "And to create an opportunity for someone else to get a similar experience that we had."

"Maryland's a great school," said alumnus and scholarship supporter Justin Pearse (B.S. '10, M.S. '12). "I hold the community [there] in high regard and the school close to my heart. We have great professors, and great research." Joining Bell in 2012, Pearse currently works as an engineer on V-22 Aircraft Systems. He credits the experiences and skills he cultivated during his six years at Maryland with helping him succeed at Bell. "[At Bell] it's always like drinking from a fire hose, but what that means is that you are expected to learn a lot in a quick amount of time," he explained. "My research experience at Maryland helped prepare me for this."

Kilmain, who serves on Mechanical Engineering's Visiting Committee, has been very active in building and strengthening the ties between Bell Terps and Maryland. "Charlie keeps us informed about what's going on at Maryland from a collaborative perspective," said Pearse. "He really encourages us to contribute and participate."

Beyond scholarships, Bell cultivates a successful pipeline for getting young engineers involved with the company and runs both an annual competitive boot camp and internship program. Since it began in 2011, Bell has selected at least one Maryland student every year to participate in its Bell Helicopter Engineering Boot Camp at their global headquarters in Fort Worth, Texas. Bell selects only 20 students each year from more than 260 applicants.

The week-long intensive design and engineering experience challenges students to solve real-world problems such as a helicopter design modification or improvement. Attendees tour facilities and have open access to Bell's engineering and manufacturing talent, including tech fellows, specialists, and leadership personnel. They learn about engineering processes, new product development, six sigma skills, and trade studies.

"This is one of the first opportunities for students to get experience with Bell, and may lead to an internship, and potentially a job opportunity at Bell," explained Ryan. "It's a real world engineering challenge, and they have access to all of the talent at the company—from engineers to the customer—during the design challenge."

Bell regularly attends the Clark School of Engineering and department job fairs. Ryan currently works on talent development at Bell and really looks forward to his trips to campus. "Seeing the students on campus, they have a lot of energy," Ryan said. "When you look at these individuals, you realize they are the future of Bell Helicopter and who knows what they will come up with! It can be really exciting."

Ryan makes an effort to accommodate students' busy schedules, and spends his visits meeting as many students as possible all over campus. "We have had really good success recruiting from Maryland," he added. "Maryland does a really good job in preparing their engineers, and we have been able to hire people who are shaping the future at Bell."

Through alumni and leadership engagement, like that at Bell, the department has the opportunity to expand students' experiences beyond the classroom, establish collaborations across industry, academia, and government to build a stronger engineering foundation for both students' careers and the organizations they work for, fostering passion, collaboration, and commitment to the future of engineering.

"I JOINED BELL BECAUSE OF THE HELICOPTERS. THEY HELP PEOPLE ACCOMPLISH INCREDIBLE THINGS," ADDS PEARSE. "ALL THE THINGS THAT WE WORK ON HERE GO OUT IN THE WORLD. THEY HELP SAVE LIVES AND ACCOMPLISH AMAZING THINGS."

ALUMNI NEWS

PHOTO: UNIVERSITY OF NEW ORLEANS

Ikeda Receives ONR Young Investigator Award

Alumna Christine Ikeda (Ph.D. '12, M.S. '11, B.S. '06) received a 2015 Young Investigator Program Award from the Office of Naval Research (ONR).

Ikeda is an assistant professor of naval architecture and marine engineering at The University of New Orleans (UNO), and the three-year, $510,000 research grant will fund her research on how the hulls of high-speed watercraft interact with waves.

High-speed craft undergo repeated slams into waves that not only lead to discomfort and injury to those on board but can also damage the craft itself. The goal of Ikeda's research is to gain a basic scientific understanding of what happens to the craft's hull when it encounters these slam events on the water.

In a UNO news story, Ikeda said, "The results of this project will allow for the development of design criteria for high-speed navy craft that reduce weight and increase efficiency through the use of fundamental scientific principles."

During her time at Maryland, Ikeda was part of the Clark School's Future Faculty Program and completed her Ph.D. work on "The Implosion of Cylindrical Shell Structures in a High-Pressure Water Environment" under the mentorship of Professor James Duncan.

After graduating from Maryland, she became an assistant research professor at the United States Naval Academy and worked with Professor Carolyn Judge on water impact of hydrodynamically-supported rigid bodies from 2012 to 2014.

Read more: go.umd.edu/ikeda

Goldwasser Receives UMD Alumni Volunteer Award

The UMD Alumni Association awarded Mechanical Engineering Alumna Liz Goldwasser (B.S.'03) the Alumni Volunteer Award as part of their inaugural Volunteer Leadership Awards presented June 13, 2015. Winners are nominated by their peers and selected in recognition of their commitment and service to the University of Maryland.

Goldwasser joined the Engineering Alumni Network board in 2005 and has had many accomplishments in her 10 years of service. She has championed student programming, taking a leadership role in the development of the Clark School Alumni Cup Competition and the Order of the Engineer Ceremony.

Most recently, she helped organize the first-ever Engineering Terp Service Month projects, including their marquee event with the Baltimore Community ToolBank. She has also made significant changes to the operations of the Engineering Alumni Network by revising bylaws, updating their strategic plan, and spearheading the creation of the Alumni Network Leadership Scholarship endowment.

The Alumni Volunteer Award honors the outstanding service and leadership of Network volunteers who have consistently gone above and beyond the call of duty.

Alumni Notes

MICHAEL ARMANI (B.S. '05 Mechanical, Ph.D. '10 Bioengineering) co-founded Maryland-based startup M3D, manufacturing inexpensive desktop 3-D printers.

At the College of Southern Maryland commencement ceremony, **BERNICE BREZINA** (B.S. '86) received the 2015 Annual Faculty Excellence Award Honoring Permanent Faculty.

Alumnus **SAGAR CHOWDHURY** (Ph.D. '13) received the 2015 ASME Computers and Information in Engineering Division's Best Dissertation Award for his work, "Planning for Automated Optical Micromanipulation of Biological Cells."

Recent alum **JOSUE CRUZ** (B.S. '14) represented his company, X3D Machines, at the UMD 3-D printing showcase in April, demonstrating the machine's capability to provide large print volumes, fast speeds, and quality prints at a record-low price.

Northrop Grumman promoted **STEVE HOGAN** (B.S. '85) to Vice President, Global Sustainment.

MARIA KORSNICK (B.S. '86, Nuclear Engineering) joined the Nuclear Energy Institute as their Chief Operating Officer in May.

In the Electronics Systems sector at Northrop Grumman, **DOUGLAS LAWTON** (B.S. '83) was appointed to the role of Vice President, Engineering Manufacturing and Logistics.

The 29th Annual Black Engineer of the Year Award (BEYA) Science, Technology, Engineering and Mathematics (STEM) Global Competitiveness Conference honored **PHILIP LOVELL** (M.S. '01) with the Outstanding Technical Contribution award.

VISITING COMMITTEE

Alumni Notes

The A. James Clark School of Engineering awarded **ALEX MEHR** (M.S. '03, Ph.D. '03) an Early Career Award in recognition of his professional achievements and exceptional contributions to the advancement of technology.

Brooks Automation, Inc. announced the appointment of **MAURICE "DUSTY" TENNEY III** (B.S. '85) to the role of President, Life Science Systems.

HAVE NEWS YOU WOULD LIKE TO SHARE? SEND IT TO NATALIEG@UMD.EDU.

Alumni Appointments

ASHIS BANERJEE (Ph.D. '09)
Assistant Professor,
University of Washington
Advisor: Professor S. K. Gupta
Dissertation: *Real-Time Path Planning for Automating Optical Tweezers based Particle Transport Operations*

HAIJUN LIU (Ph.D. '12)
Assistant Professor
Temple University
Advisor: Miao Yu
Dissertation: *Fly-ear inspired optical directional microphones*

MOSTAFA NOUH (M.S. '12, Ph.D. '13)
Assistant Professor
University of Buffalo
Advisor: Amr Baz
Dissertation: *Thermoacoustic piezoelectric systems with dynamics*

TIM FITZGERALD (M.S. '09, Ph.D. '13)
Assistant Professor
Gonzaga University
Advisor: Bala Balachandran
Dissertation: *Nonlinear fluidstructure interactions in flapping wing systems*

Harary Appointed Director, NIST Engineering Laboratory

PHOTO: NIST

Visiting Committee member Howard Harary was appointed director of the National Institute of Standards and Technology's (NIST) Engineering Laboratory. Harary has served on the committee during the tenure of two department chairs.

The NIST Engineering Laboratory develops the measurement tools and standards needed to support technology-intensive manufacturing, construction, and cyber-physical systems and conducts research to reduce the risks of fire, earthquakes, and other hazards.

In addition to serving as a Visiting Committee member, Harary is a member of The American Society of Mechanical Engineers Council on Standards and Certification, a member of the ASME Board on Standardization and Testing, and is the government representative to the board of PDES Inc., an industrial consortium working in the area of the digital exchange of manufacturing information.

Read more: go.umd.edu/harary

Mechanical Engineering Visiting Committee

DR. GEORGE E. DIETER
Emeritus Professor
Glenn L. Martin Institute
Professor of Engineering,
University of Maryland

DR. HOWARD H. HARARY
Director, Engineering
Laboratory at NIST

MR. STEVE HOGAN
(B.S. '85) Vice President
Global Sustainment
Technical Services
Northrop Grumman

MS. MARIA KORSNICK
(B.S. Nuclear Engineering
'86) Chief Operating Officer,
Nuclear Energy Institute

MR. CHARLEY KILMAIN
(B.S. '85)
Repair Strategy Lead - CSS
Bell Helicopter Textron Inc.

MR. G. LEE LUSHBAUGH, JR.
(B.S. '74) Retired, Senior Vice
President and Execution
Unit Manager, Bechtel
Power Corporation

MS. NANCY MARGOLIS
(M.S. '81) President
Energetics

MR. THOMAS (T.G.) MARSDEN (B.S. '87)
Vice President
Automotive Products Bowles
Fluidics Corp.

MR. MICHAEL W. MILLER
(B.S. '79, M.S. '84)
Chief Technology Officer
Genesis Engineering
Solutions

MS. SHEILA MORTAZAVI
(B.S. '95) Partner
Kenyon & Kenyon

DR. HRATCH SEMERJIAN
Visiting Professor
Department of
Mechanical Engineering
University of Maryland

DR. ALEX SEVERINSKY, P.E.
President, Fuelcor LLC

MS. SUSAN H. SKEMP
Executive Director,
Southeast National Marine
Renewable Energy Center
Florida Atlantic University

MR. TOM STRICKER (B.S. '88, Electrical Engineering)
Vice President, Technical
& Regulatory Affairs and
Energy & Environmental
Research, Toyota Motor
North America, Inc.

MS. TONIANN THOMAS
(B.S. '82)

DR. KON-WELL WANG
Tim Maganello/Borg
Warner Department Chair
Stephen P. Timoshenko
Collegiate Professor of
Mechanical Engineering
University of Michigan

DR. WARD O. WINER, P.E.
Regents Professor Emeritus
Georgia Institute of
Technology

MR. MANOLO ZUNIGA
(B.S. '83) (Manuel Pablo
Zúñiga-Pflücker)
President and CEO
BPZ Energy

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WE NEED YOU!

HELP US SUPPORT THE NEXT GENERATION OF MECHANICAL ENGINEERS.

GET INVOLVED

ALUMNUS DAVE SUTTON (B.S. '85) VOLUNTEERS AS A GUEST JUDGE DURING DESIGN DAY TO REVIEW STUDENT PROJECTS & ENGAGE WITH THE NEXT GENERATION OF ENGINEERS.

GIVE YOUR TIME

ALUMNUS CHRISTOPHER STRAIGHT (B.S. '84) SPEAKS TO STUDENTS IN OUR CAREER PATHS CLASS ABOUT ENGINEERING OPPORTUNITIES IN THE HEALTH FIELD.

SHARE YOUR STORY

ALUMNUS JOSUE CRUZ (B.S. '14) SHARES HIS IDEAS FOR A NEW 3D PRINTER DURING THE CLARK SCHOOL'S 3D INNOVATION SHOWCASE HELD APRIL 23.

Find out more about how you can get involved with, and support the Department of Mechanical Engineering at Maryland, contact: ***Natalie Grandison****, Director of External Relations, 301-405-1364 | natalieg@umd.edu*