2016

METRICS

DEPARTMENT OF MECHANICAL ENGINEERING MAGAZINE
A. JAMES CLARK SCHOOL *of* ENGINEERING
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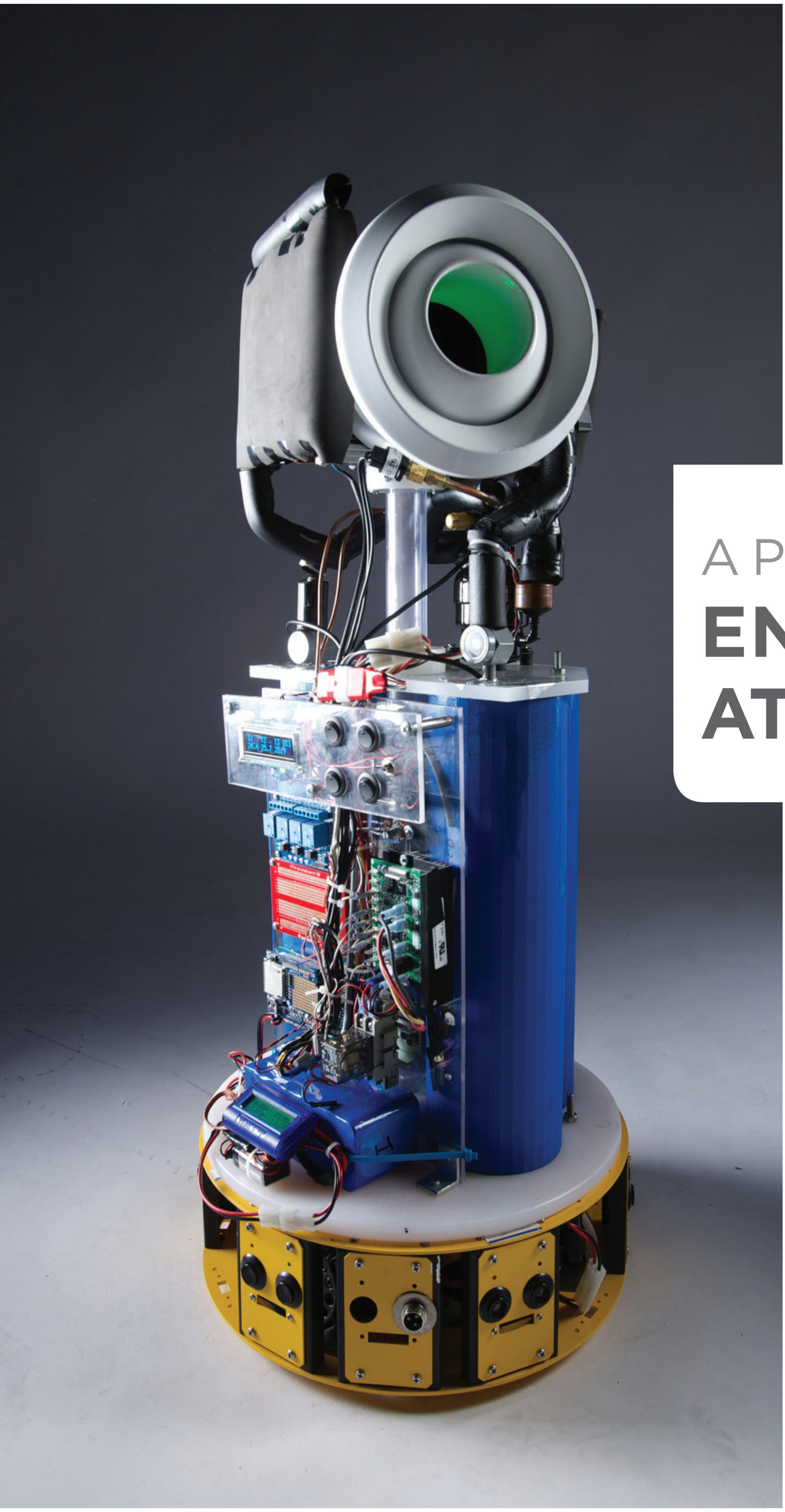

A POWERHOUSE OF ENERGY RESEARCH AT MARYLAND

CHAIR'S MESSAGE

Dear Friends,

As cooler weather heralds the arrival of fall, and classes are in full swing here on campus, another academic year is upon us. METRICS offers us the opportunity to reflect back on all of the stellar accomplishments of our faculty members and students over the past year. As you will see in this issue, not only are our faculty achieving noteworthy success and recognition for their work, but our students are also committed to research excellence and gain invaluable hands-on experience through the many opportunities they have to work in our various labs as graduate and undergraduate researchers.

We are pleased to inform you that the Department of Mechanical Engineering at Maryland has once again been named a top 20 mechanical engineering program in the nation. This continued recognition is possible through the unwavering commitment of our faculty and staff, the exceptional caliber and dedication of our students, and the strong research capabilities we have through both the university as well as a robust community of collaborators and company support.

In this issue, we have a chance to highlight some of our efforts through which we are making great strides in the energy sciences and systems arena. The University of Maryland is a top funded school for U.S. Department of Energy Advanced Research Projects Agency-Energy (ARPA-E) awards, and our faculty, researchers, and students are contributing to the next generation of technology and solutions for a more sustainable and energy efficient future. From a personal cooling and heating robot to improving our understanding and execution of better building energy efficiency, our department is addressing a wide range of energy issues.

Our faculty continue to be recognized for their exceptional contributions to their respective fields. This past year, a few of these recognitions included the following: The International Conference on Computational and Experimental Engineering and Sciences honored Professor Emeritus James Dally with a Lifetime Achievement Medal; the Society for Experimental Mechanics awarded Keystone Professor and Associate Dean of Engineering William Fourney the 2016 C. E. (Chuck) Taylor Award; the American Society for Engineering Education recognized Distinguished University Professor Ashwani Gupta with their 2015 Mechanical Engineering Division Ralph Coats Roe Award; and Professor Michael Ohadi received the American Society of Heating, Refrigeration and Air Conditioning Engineers E.K. Campbell Award of Merit.

We welcome new faculty member, Professor Steven Gabriel. No stranger to Maryland, Professor Gabriel joins us from the Department of Civil and Environmental Engineering. He has become the Leader of the Design and Reliability of Systems in the unit.

Looking ahead, we know that the success and vitality of our programs at Maryland would not be as robust without the continued support of our alumni, friends, and corporate partners. This past year, the department has forged new and exciting partnerships with Ford Motor Company that offer both new research opportunities for the Clark School as well as co-op and job opportunities for our students. We look forward to further building and strengthening valuable partnerships like this one. With the generous support of friends and alumni, like Bruce Dale highlighted in this issue, we continue to enhance our efforts to educate and inspire the next generation of multi-disciplinary engineers.

B. Balachandran

Balakumar Balachandran
Chair and Minta Martin Professor

METRICS IS A NEWSLETTER PUBLISHED FOR ALUMNI AND FRIENDS OF THE DEPARTMENT OF MECHANICAL ENGINEERING AT THE A. JAMES CLARK SCHOOL OF ENGINEERING, UNIVERSITY OF MARYLAND.

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PHOTOS BY: LISA HELFERT

OPENING SHOT

Terps Racing would like to thank all those who supported their incredibly successful 2015 Launch UMD Campaign to raise funds for a new tow vehicle. Thanks to everyone's generous support, including Ford Motor Company, the team was able to purchase their big, red tow truck 'Clifford' that will take the team and their cars safely to competition. Meet some of the students you helped support: *go.umd.edu/tr-students*

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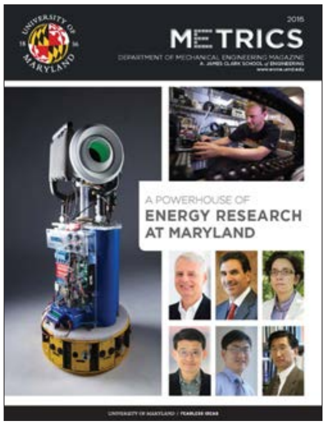

2016
on the cover

Clockwise: RoCo, the Roving Comforter, undergraduate David Hymas in the Small and Smart Thermal Systems Lab, faculty members Reinhard Radermacher, Michael Ohadi, Jelena Srebric, Yunho Hwang, Bao Yang, and Jungho Kim.

image credits John Consoli, Lisa Helford, and Al Santos

ON THE WEB AT
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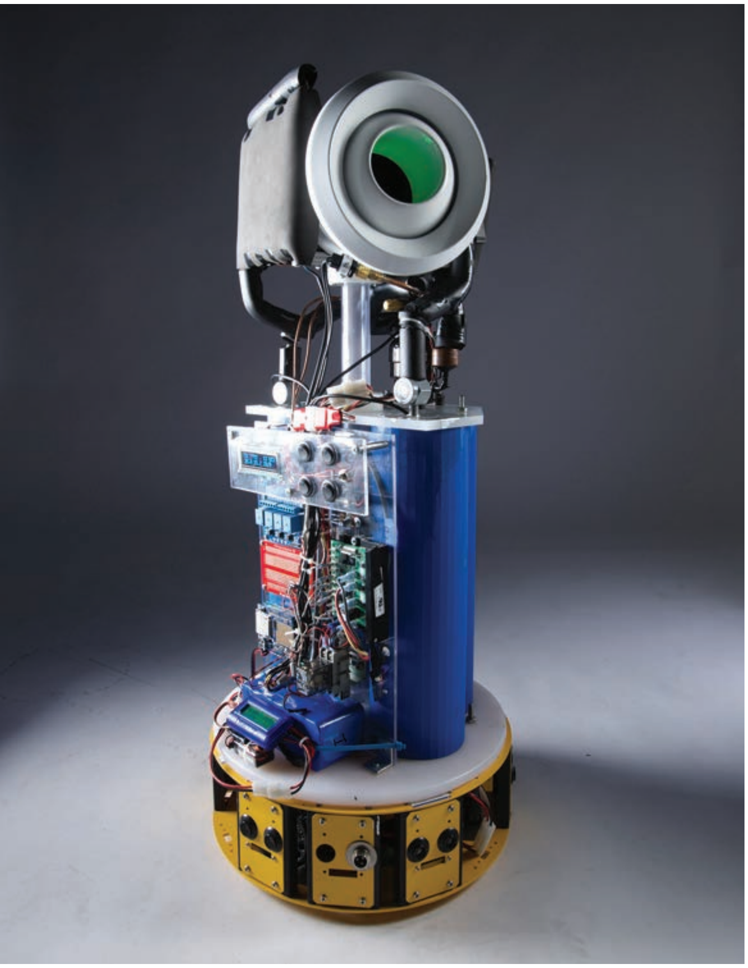
A POWERHOUSE OF ENERGY RESEARCH AT MARYLAND

From improving energy use here on campus to creating Roving Comforters that may one day provide you with on-the-go cooling, faculty, researchers, and students in the Department of Mechanical Engineering are finding new ways to improve energy consumption strategies, develop more efficient energy technologies, and create sustainable solutions to some of the most challenging energy questions.



MEET ROCO, THE COOLEST ROBOT AT MARYLAND

In the Center for Environmental Energy Engineering (CEEE), researchers have been developing a new robotic cooling device that one day could lead to energy savings of 12-30% over typical conditioned building systems. Dubbed RoCo, or Roving Comforter, the R2D2-like robot can follow users around while delivering cool or warm air depending on the comfort needs of the user.

The project, sponsored by Advanced Research Projects Agency-Energy (ARPA-E) through a three-year contract, is led by CEEE Director and Professor Reinhard Radermacher and includes colleagues in CEEE, the Cluster for Sustainability in the Built Environment at the University of Maryland (CITY@UMD), and Oak Ridge National Laboratory.

The team envisions that the final robot will respond to each user via a wireless interface where the person uses a wearable device—think Fitbit—that transmits biometric data, like heart rate and skin temperature, to RoCo, which can automatically adjust its output to keep the user comfortable automatically. Professor and CITY@UMD Director Jelena Srebric and her team are currently working on developing RoCo's wearable interface. When completed, it could help interpret a user's thermal comfort level and communicate to that information to RoCo so it can best target warm or cool air to the parts of the individual that can benefit most.

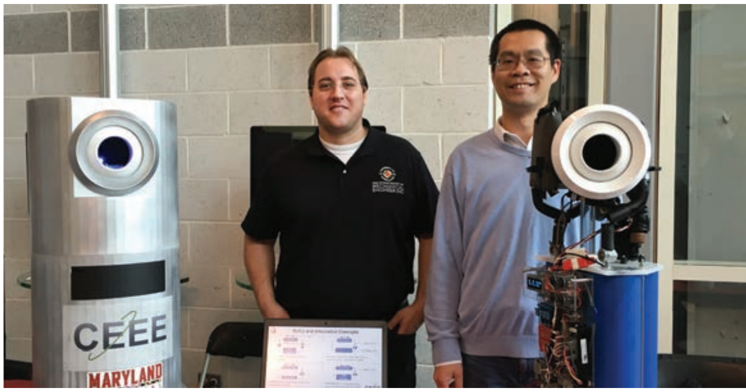
In addition, the team anticipates a future RoCo that could be fully customizable based on users' needs, and feature a variety of accessories such as Hepa filters, USB outlets, tool caddies, and more depending on where RoCo is operating. It could even come with facial recognition software to allow features such as security access checks.

RoCo also features a next generation miniature heat pump system with built-in phase change material (PCM) storage. The storage system allows RoCo to store its own produced heat and release it outside the building or space at a later point in time. This way, RoCo not only keeps its user comfortable, but reduces its own energy footprint.

While originally envisioned as a thermal management system for large open buildings where only a few individuals might work, like a shipping facility or factory, the team doesn't rule out the possibility that RoCo could one day become a household name. "The imagination is our only limit, but we are optimistic that the unit will be affordable based on ever evolving technology and the lowering cost of manufacturing," explained Associate Research Scientist and RoCo team member Vikrant Aute.

RoCo has garnered a lot of media buzz, and in 2016, media outlets from IEEE Spectrum to The Washington Post and Smithsonian.com highlighted this cool robot.

Read more at go.umd.edu/roco-news



ROCO TEAM MEMBERS JAN MUEHLBAUER AND DR. JIAZHEN LING DEMO ROCO DURING MARYLAND DAY 2016.

CAMPUS BUILDINGS SERVE AS RESEARCH LABORATORIES: UNDERGRADUATE XIAO LIN (CENTER) AND GRADUATE EXCHANGE STUDENTS FLORIAN BLANCHET (LEFT) AND GRADUATE STUDENT NAIL RASHIDI (RIGHT) INVESTIGATE HVAC SYSTEMS IN THE KIM ENGINEERING BUILDING.

IMPROVING ENERGY EFFICIENCIES ON CAMPUS THROUGH RESEARCH, EDUCATION, AND WIN-WIN COLLABORATION

In 2014, UMD President Wallace Loh announced an energy initiative on campus aimed at reducing overall energy use 20% by 2020. As part of this plan to enhance sustainability and reduce energy expenses on campus, researchers and students in Professor Michael Ohadi's Small and Smart Thermal Systems Laboratory (S2TS) are conducting building audits across campus to develop models that pinpoint areas of improvement or change for building systems that could improve energy efficiency and reduce costs.

The team performs complete systems energy audits and modeling of a building to determine what exact heating and cooling system(s) are used—steam, chilled water systems, number of air handlers—and inventory all the variables, such as pumps, fans, and duct design, that are part of a buildings energy systems. In addition, they factor in things like wall materials, square footage, and other components of the building 'envelope.'

"We are really dissecting the building to look for problems," explained research assistant Stefan Bangerth on the surgical-like approach of their work. "We [then] have real stats that tell us about the building's system as a whole, and where building [systems] controls were not set at their most efficient settings."

Once a team has audited a building's systems, the information is used to create a model to evaluate a variety of adjustments to a system. Within the model, they can adjust variables in a building system to see how it impacts energy usage. This information helps determine what low or no-cost system changes, or 'energy conservation measures' (ECMs), that could be implemented to improve efficiency and reduce building energy costs.

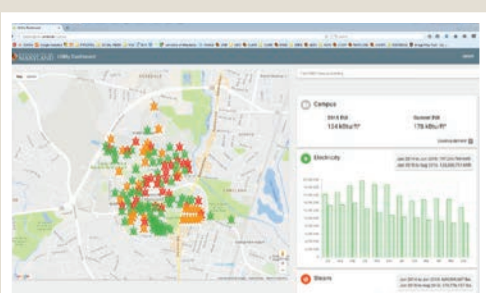
According to Ohadi, better calibration of just one campus building's systems could save several hundred thousand dollars a year. And if we could evaluate and apply that approach across campus, the immediate cost savings could be enormous.

The project has been underway for more than two years, resulting in at least 12 major building audits completed to date. Once audits, modeling, and ECM recommendations are completed, the team presents their findings to UMD's Facilities Management. The close collaboration with the campus facilities management department and their dedicated time, over and above their daily duties, has been critical to success for this joint effort, says Michael Ohadi a professor at the Center for Environmental Energy Engineering in the mechanical engineering department.

In 2014 the team completed a comprehensive audit and modeling of Kim Engineering Building. Results indicated a potential savings of over $300,000 per year with low cost or no cost adjustments of control devices and set points. The work was published as an *ASHRAE Transaction* paper and was well received when presented at the ASHRAE Annual meeting in Atlanta, Ga. More recently, the team conducted an audit on the renovated UMD Denton Dining Hall. While a LEED certified Silver building, the team found areas where the operation of systems could be improved. After the implementation of half the recommended ECMs, $50,000 in utility costs were saved over the first 9 months.

Looking ahead, they are working with alum Dr. Abtar Singh (M.S. '94, Ph.D. '95) and his company Singh 360 to develop software that incorporates the building audit data and provides improved modeling capabilities to evaluate the before and after effects of various ECMs. They also received a $11,500 Dominion education grant this fall to support additional audits on campus.

"We would like to be a role model for other colleges," adds Ohadi. "It's really about the impact it can have on not only our campus, but other campuses as well. It is a fantastic model of facilities management working closely with the faculty and students and with mutual respect for contributions on each side. And the real-life engineering experience it provides to the students is tremendous."



NEW DASHBOARD CONNECTS CAMPUS MEMBERS TO ON CAMPUS ENERGY USE

Professor Jelena Srebric and members of the Cluster for Sustainability in the Built Environment at the University of Maryland (CITY@UMD) and UMD Facilities Management have partnered to develop an interactive online dashboard to engage the campus community with their energy use. Spearheaded by Srebric, the dashboard was created through efforts from both students and faculty. The dashboard serves as a learning and living sustainable laboratory providing insights on utility usage for buildings across campus.

In 2015, Srebric received a grant through the UMD's Sustainability Fund for "Real-time UMD Campus Energy Water Monitoring, Mapping and Management." The award helped install occupancy sensors in select buildings to monitor and collect data on water and energy use that was incorporated into the dashboard.

NEW THERMODYNAMIC MODEL HELPS UTILITY COMPANIES AND HOMEOWNERS MONITOR IMPACT OF WEATHER TRENDS ON ENERGY CONSUMPTION

Keystone Professor Jungho Kim, along with alumni Michael Siemann (Ph.D. '13), and Ratnesh Tiwari (Ph.D. '15) have created a model that allows both energy companies and homeowners to view and respond to home energy consumption trends based on weather patterns. The work was funded through a Maryland Industrial Partnerships (MIPS) grant supported by the University of Maryland and Earth Networks, which owns familiar weather app Weatherbug®.

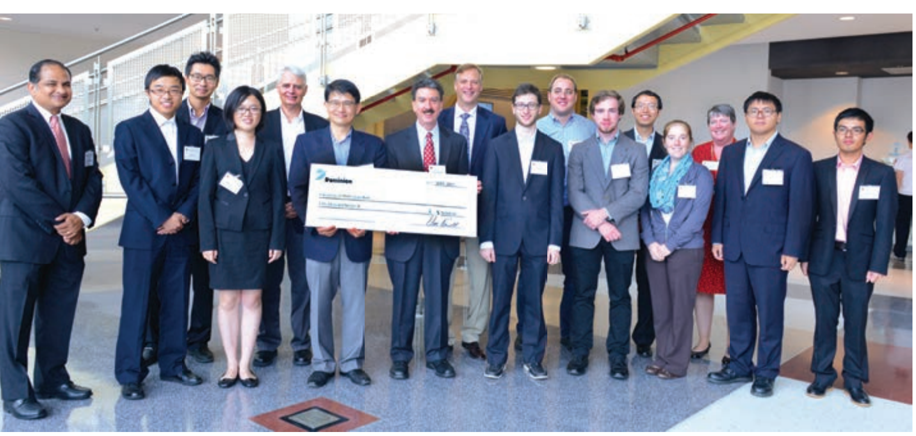
They developed a grey-box building energy model that has the ability to forecast residential electricity load in response to changing weather conditions. By remotely observing the response of indoor temperature and HVAC system status via wireless thermostats to changing weather conditions for a few days, a model capable of determining the coefficients of heat transfer equations that govern air infiltration, solar loading, wall insulation and heat capacity, internal thermal mass, and HVAC capacity is generated. The model in conjunction with smart meter data (which monitors the electrical energy flowing into a home vs. time) is then used to predict total house energy based on future weather forecasts; predict energy consumption for a specific thermostat setpoint or setpoint profile; shift energy use away from high-demand times to levelize power load; compute optimized thermostat setpoint profiles to provide desired comfort at minimum energy or cost; and perform remote home energy audits.

While energy companies have been the primary users for this model to help them manage utility loads, Weatherbug® is expanding its use to homeowners via 'Weatherbug Home,' a new feature in the Weatherbug® app. Users with wireless home thermostat systems will be able to access and see their home's energy use patterns in conjunction with weather trends to not only see the impacts on their energy consumption, but use that information to take steps to reduce power and save money.

Kim, along with co-inventors Christopher Sloop, David Oberholzer, Robert Marshall and Siemann were awarded a U.S. patent (9,261,863) earlier this year for their work, "Optimizing and controlling the energy consumption of a building."

DOMINION FOUNDATION AWARDS $50,000 TO STUDY EFFICIENT SOLAR COOLING SYSTEM

Dominion Foundation presented department faculty with a $50,000 educational grant, part of Dominion's Higher Educational Partnership to support Maryland's project for "Design of Efficient Solar Cooling System with High Coefficient of Performance."



Led by Research Professor Yunho Hwang, the project aims to model, design, fabricate, and test a new solar cooling system that exceeds current efficiency standards.

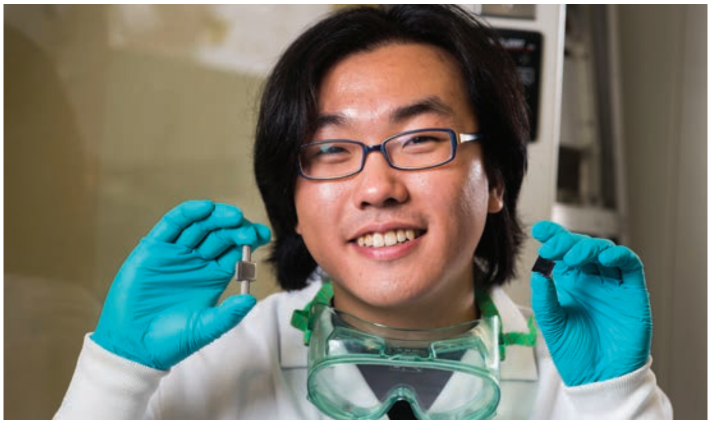
"In the U.S., cooling and heating systems are responsible for 63% of building energy use," explained Hwang. "Therefore, utilizing solar energy to provide cooling and heating for buildings will contribute to saving energy and conserving our environment."

In addition to Hwang, the research team includes Mechanical Engineering undergraduate students Jonathan Kagan and Joseph Baker and graduate student Tao Cao. As members of the team, they have the opportunity to gain a better understanding of technologies for sustainable energy conversion and utilization. Through this hands-on experience, they will learn the challenges and opportunities in designing sustainable energy systems.

This project is another demonstration of Maryland's commitment to expanding energy research and creating technologies that improve energy efficiency and reduce environmental impact.

Hwang is the Associate Director for the Center for Environmental Energy Engineering (CEEE) and is part of CEEE's Consortium for Energy Efficiency and Heat Pumps (EEHP).

ADDITIVE MANUFACTURING ADVANCES OPEN NEW DOORS FOR ENERGY EFFICIENCY



Changes in additive manufacturing technology are offering new opportunities to develop better heat exchangers that can create improved energy efficiencies in areas from reduced aircraft fuel cost to faster electronics processing speeds through better cooling components. In Professor Michael Ohadi's Small and Smart Thermal Systems Laboratory (S2TS), student researchers like mechanical engineering senior Danial Bae (top left) and graduate student Xiang Zhang (bottom right) are helping create new heat exchangers leveraging advances in additive manufactuing to do just that.

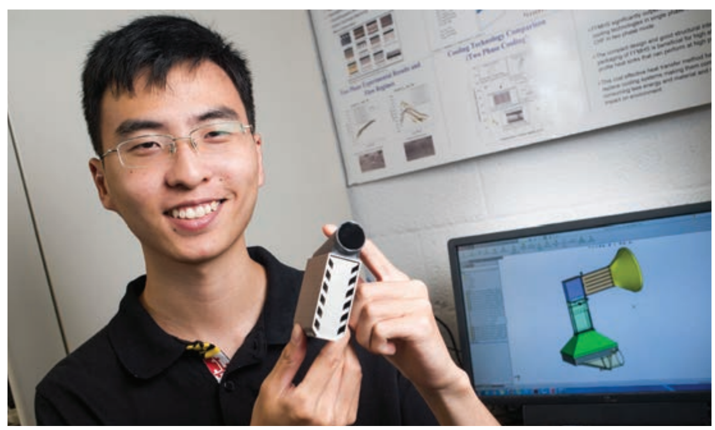
Bae currently works on a Defense Advanced Research Projects Agency (DARPA) funded project that focuses on creating very small heat exchangers approximately the size of a 1 centimeter by 1 centimeter micro-chip that can be used to improve cooling efficiency in electronics. As Bae explains, everyone wants more power, and faster processing speeds, but as electronics grow increasingly smaller, yet more powerful, and with an increasing number of transmitters inside, the amount of heat multiplies, which requires enhanced cooling capabilities.

Using 3D manufacturing at a reduced scale, their goal is to build a complex cooling delivery system that can flow directly onto the back of a micro-chip. This approach minimizes the layers between the circuitry and heat exchangers and greatly enhances cooling efficiency.

Next door in the S2TS lab, Zhang is working on a project sponsored by the Advanced Heat Exchangers and Process Intensification Consortium to develop high-temperature heat exchangers for primary use in aircraft. According to Zhang, upwards of 60% percent of the energy created from an airplane's turbine is waste heat. Their research goal is to develop an exchanger that can both recover waste heat up to 1000 degrees Fahrenheit and repurpose it elsewhere, such as heating the main cabin. In addition, they speculate the waste heat could also be used to pre-heat the craft's intake air, which in turn could improve airplanes' overall fuel efficiency, reducing fuel and oil costs—one of the most costly expenses in aircraft.

"We are taking a page from additive manufacturing," says Zhang. "Our current design cannot be produced by traditional manufacturing capabilities."

Their exchanger, which takes about 1 week to produce through their additive manufacturing approach would take up to one month with traditional manufacturing. This makes their exchangers faster to build, and potentially more cost effective. Beyond aircraft, Zhang and his colleagues are looking for even more areas to apply their exchangers such as within automotive, power, oil and gas companies. Almost any area where there are potential utilizations for wasted heat, this technology could help reduce waste product and improve energy efficiency.



ALUMNI PERSPECTIVE: LEO BRETON (M.S. '90)

"Energy research and sustainability practices pay for themselves when energy prices are high or when natural resource availability becomes constrained. We have already witnessed numerous occurrences of these conditions since the 1970s and will likely see them again in a world becoming increasingly populated and developed. But most importantly, research and best practices hedge against the future unknowns related to the availability of vital resources which the world's economies need to function. There is real value in this insurance."

Alumni Leo Breton (M.S. '90) is the Technology Development Manager at United States Department of Energy, and he is no stranger to the need for improved energy strategies.

In case you missed it, his work on the Real-time, On-road, Vehicle Emissions Reporter (ROVER), which helped uncover Volkwagon's emissions cheating, was featured in the spring issue of Terp Magazine.

go.umd.edu/terp-breton

UNDERGRADUATE RESEARCH SPOTLIGHTS

Undergraduate students in the Department of Mechanical Engineering at Maryland have an enormous number of opportunities to engage in research beyond the classroom. With more than 40 labs, and countless projects underway, our faculty and researchers are able to give many undergraduates a chance to gain valuable research experience that most students don't have until graduate school.

HYMAS SHOWS OFF AN EARLY SUB SCALE PROTOTYPE SAMPLE CREATED ON THE TEAM'S SPECIALLY MODIFIED 3D PRINTER

IMPROVING NEXT GENERATION POWER PLANT COOLING TECHNOLOGIES

UNDERGRADUATE RESEARCHER DAVID HYMAS

According to David Hymas (B.S. '16), engineering wasn't just a choice, it was a life-long calling. "I was probably one of the only six year olds that wanted to be a mechanical engineer rather than a fireman or pilot," explained Hymas. "I'm a tinkerer by nature, and don't think I've ever owned a computer that I haven't modified in some form or fashion. So I became a mechanical engineer because what else would I possibly do."

Hymas currently works in Professor Michael Ohadi's Small and Smart Thermal Systems Laboratory (S2TS) on an Advanced Research Project Agency-Energy (ARPA-E) funded project 'Dry Cooling of Power Plants' to improve energy plant cooling strategies through the development of new technology aimed at greatly reducing, or even eliminating water consumption in traditional thermoelectric power plant cooling systems. Traditional power plant cooling systems exhaust enormous amounts of fresh water, and frequently have adverse effects on the surrounding ecosystems. Using advances in composite additive manufacturing, they are creating new heat exchangers that are both more efficient and cost effective to produce.

Hymas' role on the team as an undergraduate was to help develop the first ever embedded metal fiber composite 3D printer. "This involves designing and implementing the machinery required to accomplish this task and insuring that it operates as intended," explained Hymas. "While I don't work on designing the heat exchanger [itself], I lead the effort related to the production of test specimens and incorporating the results of these tests into the printing process."

While he has been not only integral to leading the team's 3D printing efforts, and thus learning the ins and outs of research, Hymas has also been honing his presentation skills by updating their government sponsors at the Department of Energy on their research. "The most rewarding aspect of my time as an undergraduate researcher, although sometimes I hate to admit it, has definitely been simply presenting my work and the feedback I have received," he said. "This has been hugely rewarding just because for me, designing a machine is easy, but if I can present to the Department of Energy, then I can do anything!"

When asked what one of the most unexpected experiences as an undergraduate researcher was, he said, "Everything you learn in research is unexpected, especially at my level. How metals interact with plastic, how anything interacts with plastic. You could spend years looking into just this and never truly understand it." And even more surprising? "I guess the most unexpected thing I learned is how research is actually performed. It turns out making 'the first one ever' can be pretty ugly at times and proving an idea works is often a challenge that even the smartest people in the world struggle with."

Hymas is staying at Maryland to complete his master's degree, and he'll continue the work he's started in the S2TS Lab, but he's already looking ahead to life after college. "At this point the 3D printers are calling my name. In my opinion, these companies are state of the art in manufacturing and I want to be a part of the development of this technology. One day there will be printers printing printers, which print printers, and a conundrum like that is too good to pass up!"

USING NANO 3D PRINTING TO STUDY CELL MIGRATION

UNDERGRADUATE RESEARCHER AAMAN MENGIS

In a bright, white lab, Aaman Mengis (B.S. '18) peers into the twin eyepieces of a microscope. On the monitor next to him, a screen shows a nano 3D printed platform that is being used to study the migration behavior and mechanical forces of living cells. What is even harder to see on the computer monitor are the hundreds of little posts that stud the grid's surface. "The posts in the grid vary in their stiffness, which causes cells to move along the grid due to their preference towards more rigid environments," explained Mengis. "I focus on the mechanical side of the project while I leave the more biological aspects of the research to my teammates."

Mengis decided to study mechanical engineering because he liked the variety of options available to him to explore. "The analysis of all types of problems in engineering intrigued me," he said. Mengis' experience working for a 3D printing company sparked his interest in coming to Assistant Professor Ryan Sochol's Bioinspired Advanced Manufacturing (BAM) Laboratory, and according to Mengis, seeing how Sochol utilized nano 3D printing immediately drew him in.

"The most rewarding aspect of my research in the BAM Lab is the ability to grow from failure," added Mengis. "Dr. Sochol creates an environment where it's okay to make mistakes and ask questions, as long as you continue to pursue excellence in your work. [He] makes sure that I feel inspired, not pressured, to succeed in my work."

While he really enjoys working in the lab, his research role has offered some unexpected benefits. "I didn't realize [that] an undergraduate student focused solely on classes sees only the tip of the iceberg that is UMD resources," he explained. "My research gives me a reason to peek behind doors and meet people that I would have never encountered in my studies."

Although Mengis has yet to settle on a definitive course after graduation, he will likely pursue an avenue related to 3D printing, but he is open to the limitless possibilities in mechanical engineering.

"I believe I should have more experience in an engineering industry before fully committing myself to a field," he said. "Although I don't have any specific career goals in mind, I believe if I continue to stay curious, work hard, and maintain focus, I will end up where I want to be in my career."

Sochol employs over 40 undergraduate students in a variety of projects in the BAM Laboratory, which leverages some of UMD's most state-of-the-art micro and nanoscale 3D printing technologies to solve physically-complex biomedical challenges, such as creating biomimetic 'organ-on-a-chip' systems.

At right, students Joseph Dawson, Stacey Mannuel, and Connie Nguyen, work on cleaning and testing 3D printed renal tubules that will be used to mimic parts of the human kidney.

The 3D printed systems and structures developed in Sochol's lab could be used to one day to improve pre-clinical testing for drugs, enhance the efficacy of medical testing, and open new avenues for exploring complex biological systems.

PUBLISHED IN *NATURE COMMUNICATIONS*

SUPERLATTICE-BASED THIN-FILM PROVIDES HIGH COOLING POTENTIAL

Professors Bao Yang and Avram Bar-Cohen, along with colleagues from RTI International, published new research that could greatly improve cooling efficiency in high-performance electronics.

Acording to the team's abstract, "thermoelectric modules can, in principle, enhance heat removal and reduce the temperatures of such electronic devices," but current state-of-the art thermoelectric modules lack sufficient thermal management for today's high-power devices.

They demonstrated that through the use of thin-film Bi2Te3-based superlattice thermoelectric modules, they could improve cooling performance by more than double that of current thermoelectronic modules.

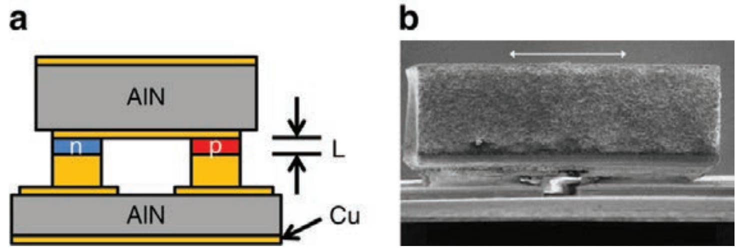


FIGURE 1: CROSS-SECTIONAL VIEWS OF A BI2TE3-BASED THIN-FILM THERMOELECTRIC MODULE.

These results could have "far-reaching impacts in diverse applications, such as advanced computer processors, radio-frequency power devices, quantum cascade lasers and DNA micro-arrays."

go.umd.edu/yang-barcohen-electronics-cooling

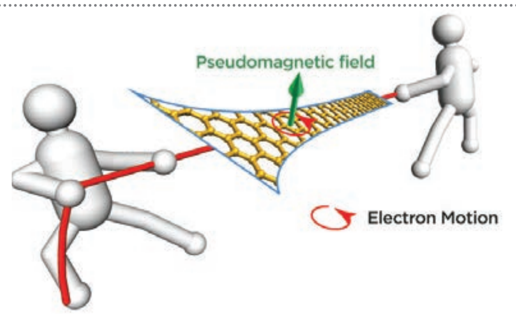
PUBLISHED IN *PHYSICAL REVIEW LETTERS*

A SIMPLE STRETCH CREATES POWERFUL PSEUDOMAGNETIC FIELDS IN GRAPHENE

Our researchers made a breakthrough discovery in graphene research that could provide a testbed for understanding how electrons move in extremely high magnetic fields. Since its discovery, graphene has become a celebrity in materials science and physics due to its remarkable physical properties, and graphene-related research is fueling potentially revolutionary new applications in everything from faster electronics and wearable technology to better energy storage, sensors, and medical devices. Now, our researchers may have found a way to make it even more powerful.

Graduate student Shuze Zhu and Associate Professor Teng Li, along with National Institute of Standards and Technology (NIST) collaborator Joseph Stroscio, have developed a theoretical model that demonstrates how to shape and stretch graphene to create a powerful, adjustable and sustainable magnetic force.

When stretched, or strained, graphene's electrons behave as if they are in a strong magnetic field. This so-called pseudomagnetic effect could open up new possibilities in graphene electronics, but researchers have only been able to induce such pseudofields that are highly localized and need peculiar loading conditions



that are prohibitive to realize in practice. However, UMD researchers may have explained how to shape a graphene ribbon so that simply pulling its two ends produces a uniform pseudomagnetic field. With current nanofabrication technologies, the team is confident that they will soon be able to transition their theoretical model to a design reality.

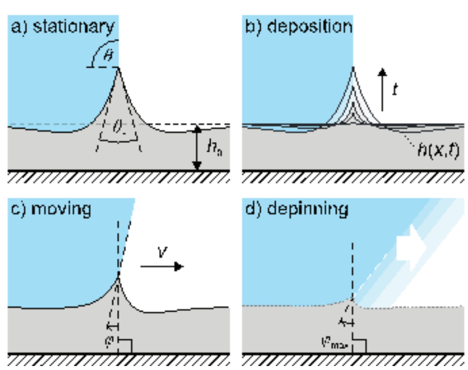
go.umd.edu/li-graphene-stretch

PUBLISHED IN *NATURE COMMUNICATIONS*

SURFING LIQUID DROPS SHED NEW LIGHT IN SOFT MATERIALS RESEARCH

A collaboration between Assistant Professor Siddhartha Das and researchers at the University of Twente in the Netherlands and ESPCI Paris, France sheds new light on how liquid drops behave on soft, squishy materials. The research could provide new insights into applications ranging from cancer therapies and contact lenses to 3-D printing and mayonnaise.

Understanding drop motion on different surfaces is a central question in fluid



mechanics of capillarity and wetting. The motion of liquid drops on rigid surfaces has been well understood for several decades, but very little is known about the science of drop motion on a soft surface, like a jelly.

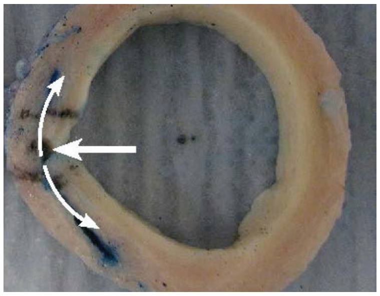
The team's study discovered that liquids placed on soft surfaces create tiny 'ridges' on the material at the edge of the droplet as a result of the droplet's surface tension. Surface tension is what gives a droplet its spherical shape or allows insects to stride over water.

Their research could improve fields such as 3-D printing by providing a better understanding of the mechanism that involves the interactions of the molten materials in form of droplets with the partially solidified material, and provide important clues that could lead to more reliable manufacturing of things such as soft contact lenses, mayonnaise and nano-structures on microchips.

go.umd.edu/das-liquid-drops

PUBLISHED IN
JOURNAL OF CARDIOVASCULAR ENGINEERING AND TECHNOLOGY

MECHANICS OF AORTIC DISSECTION



New research sheds light on some of the mechanical properties behind aortic dissection. Aortic dissection is a serious, often fatal, condition in which the inner layer of the aorta, the large blood vessel branching off the heart, tears, leading to internal bleeding and possible rupture.

Due to the complex layers of tissue that make up the aorta's arterial walls, the exact mechanisms of how arterial dissection occur are not well understood, and there are no current predictive models to know when dissection might occur.

Associate Research Professor Henry Haslach, mechanical engineering graduate student Lauren Leahy, and a team of undergraduate researchers, spent the past few years applying mechanical principles to investigate the effects of pressure on aortic tissue. Using bovine aortas, they ran a series of tests that subjected the tissues to pressure and shearing stresses.

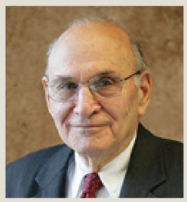
What the team discovered was that the aortic tissue did not dissect, or crack, in a continuous path. Instead, after the initial small crack was made (as a model for what happens in vivo)—from the interior outward, through several layers of tissue—it began tearing around the circumference of the aorta, or circumferentially. Haslach and his team's work demonstrates the application of mechanical engineering principles to soft tissue research and provides experimental data that could support a new fracture theory for soft tissue applications.

go.umd.edu/haslach-aortic-dissection

MECHANICAL ENGINEERING NATIONAL ACADEMY OF ENGINEERING MEMBERS

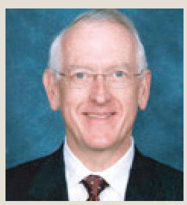
DR. JAMES W. DALLY
Glenn L. Martin Institute Professor of Engineering and Professor Emeritus

Elected in 1984 for his significant contributions to dynamic photoelasticity, stress wave propagation, and fracture mechanics.



DR. GEORGE E. DIETER
Glenn L. Martin Institute Professor of Engineering and Professor Emeritus

Elected in 1993 for contributions to engineering education in the areas of materials design and processing.



DR. MILLARD S. FIREBAUGH
Glenn L. Martin Institute Professor of Engineering and Professor of Practice

Elected in 2000 for innovation and U.S. Navy leadership in submarine design, propulsion, and construction.

DR. ROBERT E. FISCHELL
Professor of Practice

Elected in 1989 for pioneering contributions to satellite altitude control and for leadership and innovation in bringing aerospace technology to implantable biomedical devices.

DR. EUGENIA KALNAY
Distinguished University Professor

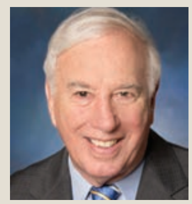
Elected in 1996 for advances in understanding atmospheric dynamics, numerical modeling, and atmospheric predictability and in the quality of U.S. operational weather forecasts.

DR. JEONG H. KIM
Professor of Practice

Elected in 2004 for contributions to national defense and security through improved battlefield communication.

DR. ALI MOSLEH
Professor Emeritus

Elected in 2010 for contributions to the development of Bayesian methods and computational tools in probabilistic risk assessment and reliability engineering.



DR. C.D. MOTE, JR.
Glenn L. Martin Institute Professor of Engineering and former President, University of Maryland, current President, National Academy of Engineering

Elected in 1988 for analysis of the mechanics of complex dynamic systems, providing results of great practical importance in vibrations and biomechanics.

DR. ELAINE S. ORAN
Glenn L. Martin Institute Professor of Engineering

Elected in 2003 for unifying engineering, scientific, and mathematical disciplines into a computational methodology to solve challenging aerospace combustion problems.

DR. HRATCH G. SEMERJIAN
Visiting Professor

Elected in 2000 for developing powerful laser diagnostics of flames, and for providing measurement methods, standards, and data to the chemical and biochemical industry.

All faculty members listed here are affiliated with the department as indicated. For the full list, see go.umd.edu/ME-NAE-members.

AWARDS & RECOGNITIONS

Associate Professor **SARAH BERGBREITER** has been named director of the Maryland Robotics Center, an interdisciplinary research center housed in the A. James Clark School of Engineering's Institute for Systems Research. *www.robotics.umd.edu*

The International Conference on Computational and Experimental Engineering and Sciences (ICCES) honored Professor Emeritus **JAMES M. DALLY** with a Lifetime Achievement Medal during their 2015 conference held in Reno, Nev.

Keystone Professor **JAMES DUNCAN** recently finished his chairmanship track. He was elected to the four-year chairmanship track of the American Physical Society's (APS) Division of Fluid Dynamics Executive Committee in November 2012. He will be the division's Past Chair in 2016.

Professors **ASHWANI GUPTA** and **JAMES DUNCAN,** along with professors **KENNETH KIGER** and **MIAO YU,** were recipients of 2016 Defense University Research Instrumentation Program (DURIP) funding through the Office of Naval Research (ONR). The funds support the acquisition of major equipment to augment current or develop new research capabilities to assist the Department of Defense (DoD).

Keystone Professor and Associate Dean of Engineering **WILLIAM FOURNEY** recently received the Society for Experimental Mechanics (SEM) 2016 C.E. (Chuck) Taylor Award. The award, established in 2000 and given no more than once every two years, recognizes both technical excellence and good citizenship within the field.

Professor **STEVEN GABRIEL** participated in the 44th Symposium for Humboldt Research Award winners held in Bamberg, Germany. The award recognizes a limited number of researchers throughout the world on topics that are noteworthy. He was also named an Associate Member by the Group for Research in Decision Analysis (GERAD). He was involved with GERAD during his recent sabbatical as Professeur Invité Trottier at the Institut de L'Énergie Trottier in Montréal.

Distinguished University Professor **ASHWANI GUPTA** was awarded the 2015 American Society for Engineering Education (ASEE) Mechanical Engineering Division Ralph Coats Roe Award at their annual conference. He was also awarded an Honorary Doctorate from the University of Derby. Additionally, Gupta was elected to the Fellowship of the Royal Aeronautical Society (RAeS), United Kingdom this year, the highest professional recognition bestowed by the RAeS.

Professor **BONGTAE HAN** and colleagues, received the Outstanding Paper Award at the 16th International Conference on Electronic Packaging Technology (ICEPT 2015). The team's paper explored the reliability of the standard discrete packaging (DPAK) component under passive temperature cycling and investigated combined passive and active temperature cycling. In addition, he was named the 2016 American Society of Mechanical Engineering (ASME) Mechanics Award winner in their Electronic and Photonic Packaging Division (EPPD). This honor highlights excellence in the area of engineering and science of structural mechanics of electronic systems.

Professor **JEFFREY HERRMANN** received the Institute of Industrial Engineers' (IIE) 2016 IIE/ Joint Publishers Book of the Year Award for his textbook, *Engineering Decision Making and Risk Management*, published by Wiley in 2015.

Associate and Keystone Professor **TENG LI** won the 2016 Society of Engineering Science (SES) Young Investigator Medal. It is awarded annually to a young researcher whose work has already had an impact in their field within Engineering Sciences.

Glenn L. Martin Institute Professor of Engineering and former UMD President, **C. D. MOTE JR.**, has been appointed a member of the Chinese Academy of Engineering (CAE). He is one of eight foreign members named this year, a list which included five Americans.

Professor **MICHAEL OHADI** recently received the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) E.K. Campbell Award of Merit. The award recognizes one ASHRAE member every year for their outstanding service and achievement in teaching.

Professor Emeritus **UGO PIOMELLI** was named a Fellow of the Royal Society of Canada. He is one of 87 new Fellows elected in 2015 as part of the RSC, which supports the field of research and education in Canada.

Professor **ELISABETH SMELA** was one of four teams to win a grant this year for her project "Development of an Implantable Device to Determine Cancer Cell Response to Chemotherapy in Real Time." The program, part of the University of Maryland: MPowering the State initiative, is intended to foster collaboration between disciplines and between the universities. She was also appointed a UMD ADVANCE Professor. She is the first faculty member in Mechanical Engineering to serve as an ADVANCE Professor.

NEW FACULTY

PROFESSOR STEVEN GABRIEL

Gabriel joins the department from the University of Maryland Department of Civil and Environmental Engineering. Gabriel has extensive experience in both mathematical modeling and algorithm design for optimization and equilibrium problems in a variety of engineering and economic areas such as energy, the environment, transportation, and telecommunications. He is also a faculty member in UMD's Applied Mathematics, Statistics, and Scientific Computation Program.

TENURE & PROMOTIONS

Associate Professor **LINDA SCHMIDT** has been promoted to the rank of Professor.

Assistant Professor **AMIR RIAZ** has been promoted to Associate Professor.

Associate Professor **BAO YANG** has been promoted to the rank of Professor.

IN MEMORIAM

PROFESSOR EMERITUS CLIFFORD L. SAYRE, JR. PASSES AT 88

Professor Emeritus Clifford L. Sayre, Jr. passed away on Thursday, January 14, 2016 due to kidney and heart failure as complications from Alzheimer's. The long-time resident of Silver Spring, Md. was a member of the University of Maryland faculty for more than 30 years.

Sayre, who received his Ph.D. in engineering from UMD in 1961, joined the faculty as an assistant professor in 1955. During his time at Maryland, he pursued his passion for teaching and enhanced the department's curriculum. He was particularly interested in the process of design and was instrumental in establishing the Senior Level Design Projects course in Mechanical Engineering. He extended the hands-on approach to learning engineering by adapting these methods to create an engineering college-wide freshman-level project design course to introduce engineering students to the concepts of design.

During his career at Maryland, Sayre served as both the Associate Dean of Engineering (1976-79) and Acting Chairman in Mechanical Engineering (1979), and had significant involvement in an engineering summer program for minority scholars and women to encourage them to enter and succeed in the field of engineering.

In 1985, he authored an early book on computer-aided design; "Design and Graphics Using the Apple Computer – an Engineer's Guide." In addition, he received numerous awards from industry and academic organizations. He received the first College of Engineering Outstanding Teaching Award in 1986, a Centennial Medal on the 100th Anniversary of UMD in 1994 and an A. James Clark School of Engineering Outstanding Commitment Award in 1998. He retired from Maryland in 1987.

Despite retirement, Sayre remained active in supporting the department through generous donations to scholarships, The Keystone Program and Dean's fund that supported students in Mechanical Engineering and beyond.

Sayre earned his B.S. in mechanical engineering from Duke University and his M.S. in mechanical engineering from the Stevens Institute of Technology. In 1947, he was commissioned as an Ensign in the U.S. Navy and assigned to the USS Hobson from 1947 to 1949, serving as an assistant engineer and damage control officer. After promotion to First Lieutenant, he served as the minesweeping officer. In addition to serving as UMD faculty, Sayre worked on projects in hydrodynamics at the David Taylor Model Basin in Washington D.C. from 1956 through 1960.

Sayre was the beloved husband of the late Rose Morton Sayre; father of Clifford L. (Catherine) Sayre, III and Marie (David) Cole; grandfather of Philip and Kimberly Sayre; brother-in-law of Terry Morton. Sayre was interred at Arlington National Cemetery in Arlington, Va.

DAVID KRIESBERG, SME '30 UNDER 30'

Senior David Kriesberg (B.S. '16) is making waves in additive manufacturing. Recently named to Society of Manufacturing (SME's) Advanced Manufacturing Media "30 Under 30," the recognition highlights young manufacturing professionals and students who have demonstrated leadership, excellence, and hard work in manufacturing.

Earlier this year Kriesberg had the opportunity to participate in a weeklong trip to Italy as a winner of the sixth Italian Machine Tool Technology Award (IMTTA) sponsored by the Italian Trade Agency. He was one of only six domestic students chosen for this opportunity, which focused on discussing innovations and best practices in machinery and technology sectors.

According to Kriesberg, the trip really expanded his views on some of the realities of manufacturing. "Italy was wonderful. The culture, the food, and the people are fantastic," he said. "[But] the tours we took to the different manufacturing and assembly line companies were mind opening. It gave me insights into the world of manufacturing, which I had not thought or experienced before. It makes me rethink my designs as now I consider designing for manufacturing as opposed to just fulfilling a need."

Kriesberg is the assistant manager of the department's machine shop. During his time there, he has learned the ins and outs of the shop machines such as the CNC and 3D printing machines as well as the more traditional lathes and mills. Now, he helps other students learn about the machines and helps them with their design projects.

"Using the tools and learning the different CAM software are my biggest takeaways. It allowed me to 'just do it,'" he explained. "I was shy with trying out my ideas or making something because of the fear that it wouldn't work in the first try or there was an intimidating tool. Now I feel more confident doing projects and attempting things because even if I fail it is a step closer to making something that works."

In addition to his work in the machine shop, Kriesberg has also served as the treasurer on the executive board for the University of Maryland's Chapter of The Society of Hispanic Engineers (SHPE).

After graduation this fall, Kriesberg will stay on at Maryland to complete his master's degree under the mentorship of Professor Linda Schmidt, with a research focus on additive manufacturing and the creative process in engineering design. Looking beyond school, he would like to explore the idea of creating and opening his own additive manufacturing studio where he could continue helping others to bring their ideas to life.

In an article for #WhyMFG, an organization that promotes careers in manufacturing, Kriesberg said, "I think [3D printing] is the future of manufacturing. It has very little waste and brings prototyping to the homes of artists and creators—to anyone. I want to make the benefits of 3D printing more broadly accessible."

He will continue his studies in the Mechanical Engineering master's program at Maryland.

HOLLAND DELIVERS CLARK SCHOOL 2015 WINTER COMMENCEMENT STUDENT SPEECH

Senior Greg Holland was the student speaker for the Clark School of Engineering's Winter Commencement Ceremony held December 20th at the University of Maryland Cole Student Activities Building.

A Montgomery County native, Holland has always been interested in the mechanics of how things move. In high school, he and a friend came up with an idea for a levitation machine which consisted of running a high current through a copper-wire vest. Unfortunately, the project was cancelled after a phone call home from the school's physics teacher who was worried about him getting electrocuted. Nevertheless, Holland decided to study Mechanical Engineering to learn how to develop better, and safer, projects.

Outside of the classroom, Holland worked part-time as an Operations Assistant in a gym to repair broken and malfunctioning exercise equipment in order to supplement his engineering education with hands-on skills. He also worked as a teaching fellow for the fluid mechanics course to help communicate engineering concepts to his peers in simple terms.

Holland served as the Events Chair and President for Maryland's American Society of Mechanical Engineers (ASME). During this time, he organized visits to places such as NASA Goddard, and even a tour of the campus nuclear reactor. Holland is a member of the University Honors College and has a 4.0 GPA. He spent a semester abroad in Melbourne, Australia where he studied renewable energy technologies.

During his time at Maryland, Holland has been able to work on design projects ranging from handheld consumer-products, to large-scale industrial systems. He plans to use his engineering degree to work towards expanding the use of renewable energies across the country.

Undergraduate Awards & Honors

Academic Achievement Award (Junior 4.0)
DAVID ALCANTARA, JAIRUS CHANEY, CODY GRAHAM, GEDALIAH KHNIZHNIK, CHASE MANNY, JOHN O'NEILL, TRISHA PATEL, ALEXANDER PIQUE, CARLO ST. REGIS, AND LAURA SHUMATE

American Society of Mechanical Engineers (ASME) Senior Award
PATRICK HEALEY

Chairman's Award
RYAN CHOW, CHANA GARBOW, PATRICK HEALEY, ERIC HERRERA, DAEVIN HUGH, JONATHAN KORDELL, JULIAN LOFTON, ALINA MOOSVI, AND SARAH NIEZELSKI

Dean's Award
SARAH NIEZELSKI

Philip Merrill Presidential Scholars
RYAN CHOW AND SARAH NIEZELSKI

Pi Tau Sigma Memorial Award
BROGAN SHEEHEY

Pi Tau Sigma Service Award
NICHOLAS HOLTHAUS

Pi Tau Sigma Sophomore Award (4.0)
STEPHEN AARON, KATHRYN JAHN, SURABI KONDAPAKA, AND HENRY SPEAKER

Society of Automotive Engineers (SAE) Senior Award
DANIEL CORBIN

SAE Service Award
ASHISH SINGH

SAE Baja Rising Star Award
JAIME BEREZ

Graduate Awards & Honors

The Ann G. Wylie Dissertation Fellowship
HANNES GREVES

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Graduate Student Grant
MATTHEW DAHLHAUSEN

The ASHRAE National Capital Chapter Endowed Fellowship
ZHIWEI HUANG

The ASHRAE College of Fellows Graduate Travel Award
STEFAN BANGERTH

ASME Dynamic Systems and Control Conference Best Student Paper Finalist
RAMIN BIGHAMIAN

ASME International Petroleum Technology Institute Collegiate Council Member
SHAYANDEV SINHA

Department Best Dissertation Award
SHUZE ZHU

Department Best Thesis Award
ELAINE LIN

C. Raymond Knight Fellowship
TAOTAO ZHOU AND REUEL SMITH

Clean Energy Education and Empowerment C3E Women in Clean Energy Symposium Finalist ▷ **GUANG CHEN**

The Clark School's Future Faculty
RAMIN BIGHAMIAN, GUANG CHEN, ZHIWEI HUANG, COLIN MILLER, and **RYAN ST. PIERRE**

Department of Energy Building-Grid Integration Research and Development Innovators Program (BIRD-IP) Award
ITOHAN EBHOJIAYE

The GDF-Suez Fellowship
MOHAMED BESHR and **RADIA ELDEEB**

Graduate Dean's Dissertation Research Fellowship ▷ **RAMIN BIGHAMIAN**

Green Fellowship for Collaborative Research on the Environment ▷ **COLIN MILLER**

Institute of Electrical and Electronics Engineers (IEEE) Insulation Conference Travel Stipend ▷ **JORDAN JAMESON**

2016 IEEE EuroSimE Conference Keynote Presenters ▷ **DAVID LESLIE** and **HAO HUANG**

International Microelectronics Assembly and Packaging Society (IMAPS) Travel Grant
ANTO PETER AND NATHAN VALENTINE

IMAPS Best of Session and Outstanding Student Paper ▷ **ANTO PETER**

Jacob K. Golhaber Travel Grant
MOHAMED BESHR, ROHIT DHUMANE, AND ZHIWEI HUANG

James W. Dally Prize for Outstanding Instructional Support
PAUL ANDERSON

Kulkarni Summer Research Fellowship
SHAYANDEV SINHA

L-3 Communications Corporation Graduate Fellowship
CALEB HOLLOWAY and **JORDAN JAMESON**

Louis Stokes Alliances for Minority Participation (LSAMP) Bridge to the Doctorate ▷ **ITOHAN EBHOJIAYE**

The Miss Willie M. Webb Reliability Engineering Fellowship
ELAHEH RABIEI, KAYLIN CAGE, and **CHRISTA PETTIE**

National Science Foundation (NSF) Graduate Research Fellowship ▷ **BRYCE YAPPS**

NSF Research Fellowship Honorable Mention
LEON CHAO

NASA's Thermal and Fluids Analysis Workshop Poster Session, Third Place
MICHAEL FISH

National Defense Science and Engineering Graduate Fellowship ▷ **ROSE WEISBURGH**

The Northrop Grumman Graduate Fellowship in Engineering Education ▷ **GUANG CHEN**

Placement in the Los Alamos National Laboratory Computational Physics Student Summer Workshop Participant
KAILYN CAGE

The Outstanding Graduate Assistant Award
HANNES GREVES, SHAYANDEV SINHA, and **REUEL SMITH**

Richard and Stefanie Vogel Graduate Student Award ▷ **RYAN ST. PIERRE**

Samsung Human-Tech Thesis Competition Encouragement Award ▷ **DAE-SUK KIM**

AT RIGHT: 2016 GRADUATE AWARDS CEREMONY ATTENDEES

AUSTIN KENDALL RECEIVES FORD ALAN MULALLY LEADERSHIP IN ENGINEERING SCHOLARSHIP

Virginia native Austin Kendall (B.S. '17) was always interested in cars, but an introduction to designing in CAD by a high school technical drawing teacher really helped set him on a path to pursuing mechanical engineering. "Ever since then," he said. "I've been hooked."

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

He names Terps Racing as one of the largest factors in his decision to attend Maryland. During his initial visit to campus, the lab space, cars, and team members left a lasting impression on him. However, when he arrived the following fall, there was recent turnover in team leadership, few students returned for the Baja team, and the Formula team was struggling to get their car together.

While not the experience Kendall originally anticipated, his passion for engineering drove his decision to help the program move forward in a new direction. This commitment to his team started a journey full of educational opportunities that he could not have imagined.

"As a result, while I have been learning how to design and build racecars during my time here, I have also spent an equal amount of time both learning how to build a sustainable organization and be a leader amongst my peers," said Kendall.

Last year, Terps Racing held an incredibly successful Launch UMD campaign, earning funds in excess of their original goal, to purchase a new truck. The Formula team competed twice and the Baja team won awards at their competition in Tennessee. It could not have happened without the hard work and dedication of the members of the program, which has grown to more than 100 students.

Kendall's proven leadership ability and strong academic skills were part of what helped him win the Ford Scholarship, named for the former Ford Motor Company president and chief executive officer. Ford awards this competitive honor to only ten students a year globally.

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

Throughout his time at Maryland, Kendall has consistently proven his commitment to automotive engineering, his team, and his university. He believes his experiences here have best prepared him for the next chapter of his life, the workforce. The automotive industry has been Kendall's dream destination since high school, and we are excited to see where his passion for engineering will take him next.

AUSTIN KENDALL WITH HIS FAMILY, FORD REPRESENTATIVE GEORGE HALOW (B.S. AE '86) (LEFT), DEPARTMENT CHAIR BALA BALACHANDRAN (SECOND LEFT) AND CLARK SCHOOL DEAN DARRYLL PINES (RIGHT)

FALL FORD VISIT

During the 2015 fall semester, Ford representatives and UMD alumni George Halow (B.S. AE '86) and Mylene Motsebo (B.S. ME '14) visited campus. They spent time with the Terps Racing team and presented to students on "A Day in the Life at Ford."

WHY I GIVE

Alumni Bruce Dale

Alumnus Bruce Dale (B.S. '64, M.S. '67) didn't plan on being an engineer. In fact, he wanted to be a major league baseball player. A self-professed 'jock and car guy,' the Silver Spring, Md. native spent his high school years playing ball and not giving much thought of the future, until his dad asked him at 16 what he wanted to do after high school. "It never occurred to me I'd have to move from home," Dale said with a laugh. At that point, the majors were off his radar, so he thought he would get a job working at the local gas station, Pete's Gas Station. He liked cars, and that seemed like a good fit. But his brother Dick, a mathematics major at UMD, nudged him further. If you like cars, he asked, why not go to Maryland and become a mechanical engineer?

While not an exceptional student in high school, Dale succeeded at Maryland. Overwhelmed at first, "I listened to my Dad, who had expectations for me well beyond what I ever had," explained Dale, who buckled down, worked hard, and started getting straight As in all of his engineering classes. "I was really hooked! I started thinking 'Maybe I could do this thing,' and I had really good professors at Maryland."

On graduating from Maryland, Dale landed a job with Bell Labs, who not only took just the top 2% of students, but offered employees the chance to obtain their master's degree for free while working for the company. Working in Bell's Baltimore offices, Dale returned to UMD to complete his master's under Professor Bruce Berger.

From there, Dale became part of a charter program Bell offered at Purdue that allowed him to get his Ph.D. "When I got the Ph.D. offer from Bell, I wasn't looking for more formal education since I liked working, making valuable things. I like to improve things. But I knew the offer was too valuable to pass up". He moved to Lafayette, Indiana with his wife, Mickey, and their small son in 1967. "Bell paid for everything! Housing, stipend. Again, I didn't really want for anything," said Dale, who received his Ph.D. in 1970.

When major transitions began happening at Bell in the late sixties and early seventies, Dale found himself at a crossroads. "There were some serious problems at Bell, and they didn't have much to do with mechanical engineering," he said. "I had a choice, but because I felt so loyal to them and grateful for the opportunities they gave me, I jumped into software systems, and found myself in the middle of software development."

According to Dale, his friends thought he was 'nuts' for getting into software development. "In those days, men built circuits, machines, and wrote erudite technical papers. Women wrote software," reflected Dale. "But, software systems was where the solutions were, and it became the future. Not what they were doing."

Eventually, Dale would go on to pioneer satellite technology development through his work on the Iridium Satellite System, an integrated, global network of satellites working in conjunction with ground systems that could transmit signals across every square foot of the globe. "It was audacious, it was bold. It was the type of project you dream about," said Dale.

While the network was robust, the company misjudged the market place, ultimately leading them to bankruptcy. It was during this tumultuous time that Dale's wife Mickey was diagnosed with cancer. He dropped everything to care for her. Within nine months she was gone.

Despite being on the brink of retirement, in the aftermath of Mickey's loss, Dale received an opportunity to write his own ticket with Bell once again, and took a position in England to support their international third generation wireless development. It was at a suggestion from Bell colleagues that he decided to set up a foundation in his wife's name to honor her legacy, and to give back in the many ways they had been helped over the years.

In 2007, he established the Mickey Dale Family Foundation Scholarship in Engineering to provide a helping hand to engineering students who otherwise might not be able to afford the chance for an education. Five students have realized their education through support from this fund.

Dale met Mickey while they were both in high school, she was a year behind him and they later married during his senior year at Maryland and she was working at the University of Maryland University College. Both having Maryland ties made supporting scholarships at the university important to both Dale and his wife.

"Education is something you never lose," said Dale. "Use the money purposefully, and they'll go on to do good things."

"The way I got into engineering was a crazy series of lucky breaks, and it's one of the reasons I give back to Maryland. Why do I give back so much? Because I feel like a lottery winner."

Kim Receives 2016 Horatio Alger Award

Alumnus Dr. Jeong H. Kim (Ph.D. '91) was selected for the prestigious Horatio Alger Award given by the Horatio Alger Association of Distinguished Americans, Inc. Kim, executive chairman and co-founder, Kiswe Mobile Inc., and president emeritus, Bell Labs, was selected for membership in the organization. He joins 12 other accomplished business and civic leaders from across North America in receiving this honor in 2016.

Since its establishment in 1947, the Horatio Alger Award is annually bestowed upon recognized leaders who succeeded, despite facing adversity, and who are committed to both philanthropy and higher education.

"We are proud to welcome Kim as a Member of the Association," said Byron Trott, president and CEO of Horatio Alger Association and 2011 Horatio Alger Award recipient in an association press release. "From overcoming the challenges that stem from moving to a new country as an adolescent to his unwavering determination to pursue his educational and professional dreams, Kim's life exemplifies a true Horatio Alger story. He sets a wonderful example for our Scholars and I am confident that all will benefit from hearing his story."

"As a distinguished alumnus, Dr. Kim has been a source of inspiration for both students and faculty of the Reliability Engineering Program. We at the Center for Risk and Reliability are proud of having him as a professor of practice and I am particularly honored to be a recipient of one of his endowed professorships."

Mohammad Modarres
Nicole Y. Kim Eminent Professor of Engineering and Director of the Center for Risk and Reliability at Maryland

Career Paths Contributers

The department would like to thank all of our friends and alumni who participated in the 2015-2016 Career Paths class. This class provides students an overview of the wealth of opportunities and career choices available to them as mechanical engineers, offering students the chance to ask questions of folks in various fields.

Fall Speakers

ERIC COMPTON (B.S. '99)
IP Counsel
Army Research Laboratory

JON HUANG (M.S. '00)
Vice President, Fidelity Investments

SAM HOLLENBACH (B.S. '07)
Innovation Engineer, Under Armour

TOM HICKS (B.S. '90)
Deputy Assistant Secretary of Energy
U.S. Department of the Navy

CARA MARTIN (B.S. '06, M.S. '07)
Chief Operating Officer
Optimized Thermal SysteM.S., Inc.

Spring Speakers

LEO BRETON (M.S. '90)
Technology Development Manager
U.S. Department of Energy

KYLE CARSON (B.S. '08)
Sr. Engineer, Baltimore Gas & Electric

JAY DEVENY (B.S. '91)
Senior Director, Engineering
AxleTech International

ED GOLDMAN (B.S. '87)
IT Consultant, Oceantyr (Previously Enterprise CTO, Intel Corporation)

KRISTEN KERN (B.S. '12)
Engineer I, Baltimore Gas & Electric

DIRK THOMAS (B.S. '82)
Principal, McKool Smith

INTERESTED IN PARTICIPATING IN A FUTURE CAREER PATHS CLASS? CONTACT NATALIE GRANDISON AT NATALIEG@UMD.EDU

Alumni Notes

DR. THOMAS STADTERMAN (Ph.D., Reliability '03) was appointed senior campaign scientist to oversee the Army Research Laboratory's (ARL) analysis and assessment campaign.
go.umd.edu/stadterman-arl

JOHN MADDOX (B.S. '87) was promoted to CEO of the American Center of Mobility.

FRANCIS SMITH (B.S. '14), co-founder of Diamondback Brewing Company, was named to the *Baltimore Business Journal's* 40 under 40.

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

Alumni Appointments

HYUNGDAE BAE (Ph.D. '13)
Assistant Professor
Department of
Mechanical Engineering
Howard University
Advisor: Associate Professor
Miao Yu

J. EDMON PERKINS (Ph.D. '15)
Assistant Professor
Department of
Mechanical Engineering
Auburn University
Advisor: Minta Martin Professor
Balakumar Balachandran

SUXIN QIAN (Ph.D. '15)
Assistant Professor
Department of Refrigeration
and Cryogenic Engineering
Xi'an Jioatong University
Advisor: Minta Martin Professor
Reinhard Radermacher

Visiting Committee Supports 2nd Annual ME Scholarship Golf Tournament

Committee Member Charley Kilmain, Professor and Director of Undergraduate Studies Ken Kiger, and Committee Members Maria Korsnick, and G. Lee Lushbaugh, Jr. at the 2016 Mechanical Engineering Scholarship Golf Tournament held April 15 at the University of Maryland Golf Course. The tournament is organized by Pi Tau Sigma, the Mechanical Engineering Honors Society, and helps support students pursue an education in mechanical engineering.
go.umd.edu/me-golf2017

SAVE THE DATE FOR THE 2017 TOURNAMENT!
APRIL 21, 2017

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) President and CEO
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 of
Engineering
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) Partner, IBM
Global Business Services,
Public Sector and
Commercial Healthcare

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
Talara Oil and Gas LLC

A. JAMES CLARK
SCHOOL OF ENGINEERING

The Department of Mechanical Engineering
2181 Glenn L. Martin Hall
University of Maryland
College Park, MD 20742

WE NEED YOU!

HELP US SUPPORT THE NEXT GENERATION OF MECHANICAL ENGINEERS.

GET INVOLVED

ALUMNI AND FACULTY CAME OUT TO SUPPORT THE 2016 MECHANICAL ENGINEERING SCHOLARSHIP GOLF TOURNAMENT HELD APRIL 15. READ MORE ON PAGE 17.

GIVE YOUR TIME

ALUMNUS LEO BRETON (B.S. '84) SPEAKS TO STUDENTS IN OUR CAREER PATHS CLASS ABOUT ENGINEERING OPPORTUNITIES IN THE ENERGY FIELD. HE SHARES HIS VIEWS ON ENERGY RESEARCH ON PAGE 5.

SHARE YOUR STORY

IN THIS ISSUE OF METRICS, ALUMNUS BRUCE DALE (B.S. '64, M.S. '67) SHARES HIS STORY ON PAGE 15 ABOUT WHY HE GIVES TO SUPPORT ENGINEERS AT MARYLAND.

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*