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MECHANICAL ENGINEERING

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MECHANICAL ENGINEERING

Dear Alumni and Friends,

Do you remember taking thermodynamics, fluid mechanics and statics? These fundamental courses — the building blocks of a mechanical engineering education — are as relevant today as they were in the days of Carnegie Tech.

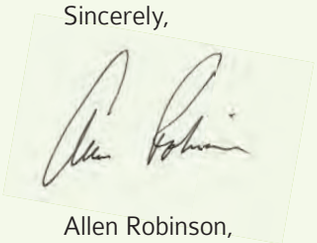
In this issue of our magazine, we explore new hands-on courses that build upon these fundamentals and apply them to emerging new technologies and manufacturing trends.

This innovative approach to the curriculum continues to prepare our students to be problem solvers in an ever-changing, interconnected world.

In these pages, we also recognize the many alumni who have made news headlines this year as award winners, entrepreneurs and recognized scientists. Your successes are our successes! Please keep the news coming so that we can celebrate with you.

I wish you the very best in 2018 and look forward to connecting with you at Spring Carnival (April 21-23, 2018).

Sincerely,



Allen Robinson,
Department Head, Mechanical Engineering

INNOVATION IN THE CLASSROOM

From game-based learning to the internet of things

GAME-BASED TEACHING APPROACH REVOLUTIONIZES CLASS CURRICULUM

Instead of learning the principles of materials science in a traditional lecture-based setting, students in **Assistant Professor B. Reeja Jayan's** upper-level engineering course mastered their principles in a game-based setting while playing Minecraft, a computer game in which users build worlds out of virtual blocks.

In her special topics course called Materials and Their Processing for Mechanical Engineers, Jayan 'fills in the gaps' for mechanical engineering students who have very little knowledge about materials science.

"Materials science is typically an area that mechanical engineers are not fully exposed to," says Jayan. "This new course teaches students how materials have specific internal arrangements of atoms and how processing techniques can change this structure and lead to differences in properties like mechanical behavior and strength."

To appreciate mechanical science, the design of materials and different advanced manufacturing processes, Jayan says that mechanical engineers must understand how the processing of materials influences atomic structures and their resulting properties.

Since traditional lab courses are often difficult to organize (due to safety hazards, lack of equipment or lack of staff), Jayan utilized a game-based teaching methodology to ensure that her students would still benefit from a hands-on learning environment.

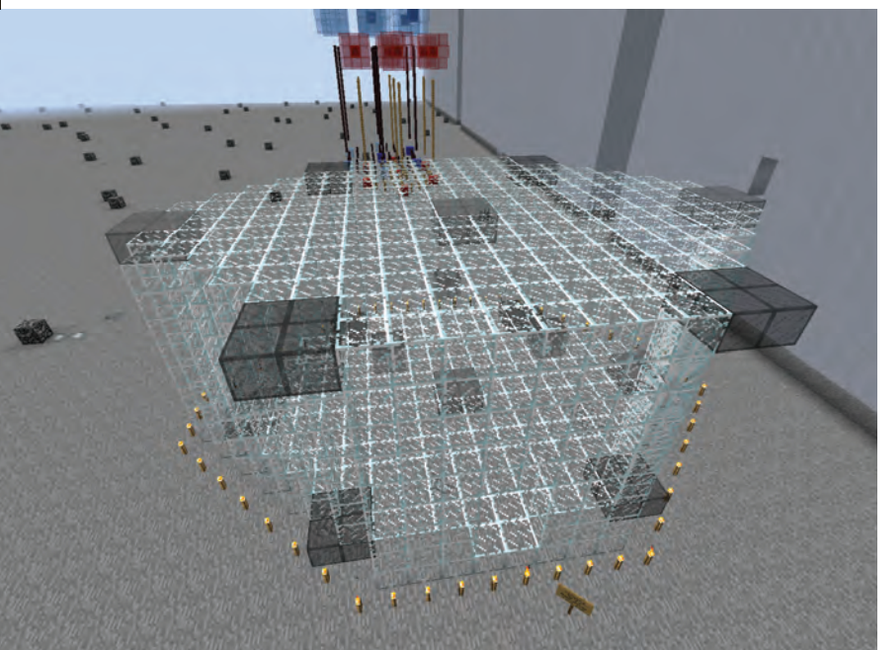
"When you make materials, it's like building things," says Jayan. "Minecraft is the maker's game. You can build anything. There are specific modules in the game that help students appreciate the properties of the materials they are building with. I was trying to use this culture of building to help students visualize ideas and think about what it was that they were building and how they would do it in a real-world scenario."

Minecraft appeals to a wide audience because players can customize their own playing experience in an open world, "sandbox" environment. Unlike a game that is created in a linear fashion (where players move neatly from one checkpoint to the next), Minecraft encourages players to wander, explore and interact with its environment, using tools and materials to modify and rearrange their surroundings.

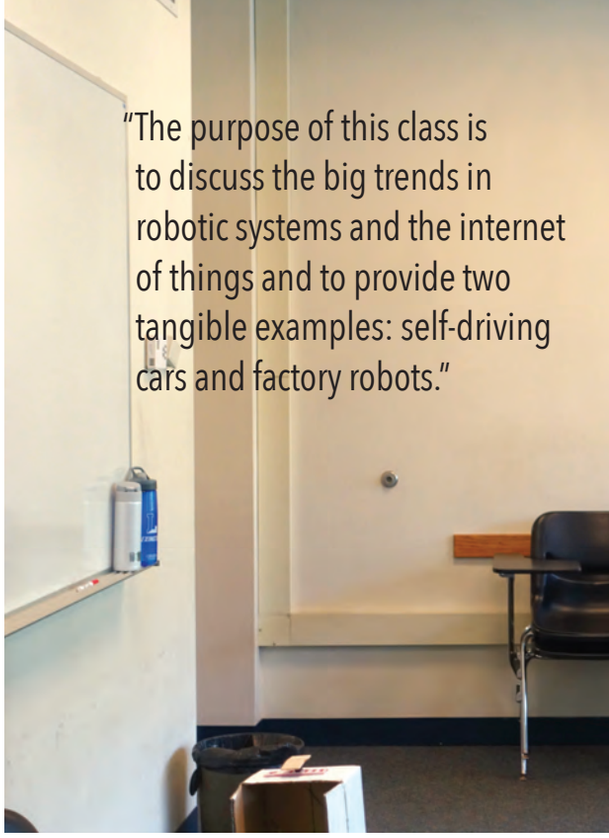
In Minecraft, players creatively solve problems they encounter when building their own structures.

At the end of the semester, students complete a final project in Minecraft by creating their own individual games and rooms within the classroom server. Students are challenged to produce unique projects that teach the principles of materials science in an interactive way.

Continued on page 5



INTERNET OF ROBOTIC THINGS

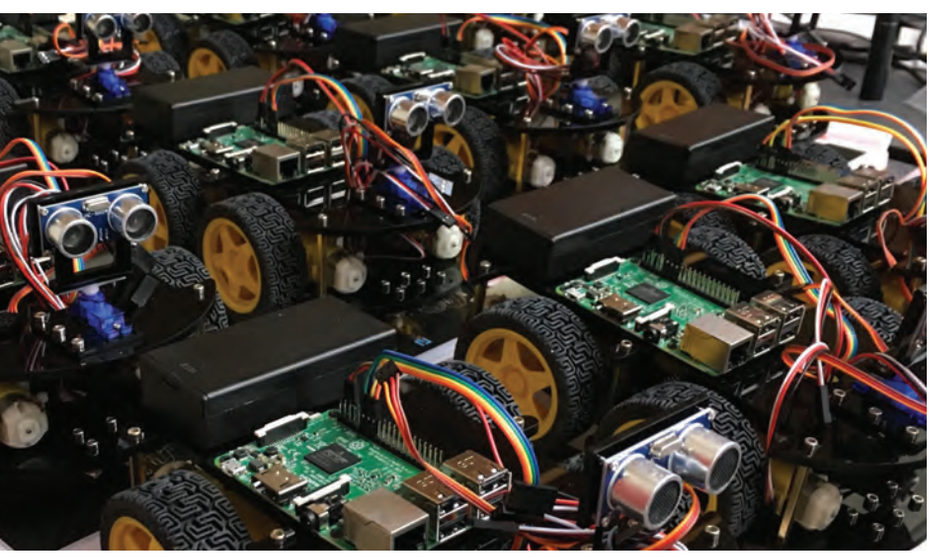


Mechanical Engineering **Professor Kenji Shimada** combines robots, self-driving cars and factory automation in one course for upper-level MechE students.

Self-driving cars seem to be the way of the future as the technology develops and they gain popularity. But for mechanical engineers, it opens a whole new realm of possibilities. What happens when you combine traditional mechanical engineering knowledge and the internet of things?

The internet of things (IoT) is the term for everyday objects that now have internet capabilities: think smart watches, Fitbits and smartphones. For the mechanical engineers who work on mechanical systems — like cars, factory machinery and other systems — they now need more than just traditional mechanical knowledge. They need to understand how mechanical and cyber systems interact and operate together.

To help mechanical engineering students bridge the gap, Professor Kenji Shimada and his co-instructor, Tomotake Furuhata, debuted their class, "Robotic Systems and IoT" this semester. The course provides graduate students and upper-level undergraduates with an overview of how robotic systems are integrated into a larger framework called the Internet of Robotic Things.



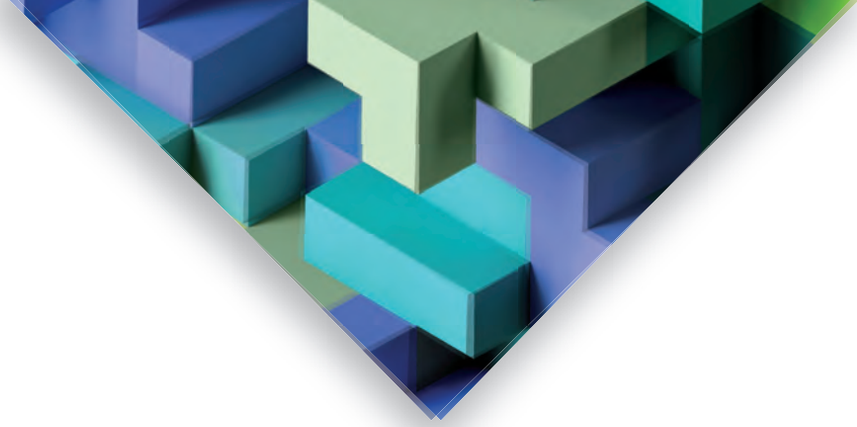
"The purpose of this class is to discuss the big trends in robotic systems and the internet of things and to provide two tangible examples: self-driving cars and factory robots," said Shimada.

According to Shimada, a robot has three key components: motors, sensors and a controller or planner. A robot navigates itself. But when it starts talking to a network (like a car communicating with Google maps to receive alerts about traffic patterns) then it becomes part of the internet of things.

The first half of the course provides students with an overview of the robotic systems that are connected to the internet. They learn how to write computer programs to teach a real industrial robot how to pick up and place objects on a turntable using machine vision.

They learn about a modern computational framework — the client-server framework — where each component reports its own status to the server and every other component can grab that data and decide its own action, rather than having one central software that controls everything. This lays the groundwork for the second half of the semester: student projects.

Master's students **Sarah Asano, Shun Yao, Peipei Li** and **Ashish Bajaj** created a virtual reality (VR) game system using a person's phone and sensors set up in a room for their final project. The sensors capture the person's movement and hand gestures, then transmits that information to the phone via a website. The student team was able to map the user into a walkable, virtual world, producing something like a more immersive, controller-less, VR version of a Nintendo Wii game.



"In mechanical engineering the focus is on mechanics, design, thermal systems," said Kaveh Nikou, another first-year master's student. "This course fills the gap and keeps up with the trend of mixing computer science with physical systems, which is the direction that industry is taking."

The course gives students a competitive edge when entering the workforce. If they know the trends and can demonstrate skills, they have a better chance of being offered a job at top-notch companies such as Uber, Google and Amazon, who hire mechanical engineers with skills in the latest information technology.

Shimada predicts that the next things to become automated are homes and hospitals — like having a dishwasher that starts from your smart phone. But what is certain is that mechanical engineers will play an important role in the design and development of these systems.

"I'm taking what I've learned from this class back to my company to get more people thinking about robotic systems and the internet of things," said Alexa Becker, another master's student who currently works in industry. "It's a lot of work, but it's exciting to be on the cutting edge."

GAME-BASED TEACHING

Continued from page 3

Last semester, several students created games that required players to build materials using the best material processing and synthesis techniques, while other students created museums of crystal structures and replicas of steelmaking factories. By completing these highly technical projects, students have an opportunity to learn the underlying principles of the materials science field.

"Minecraft has enabled me to understand materials science in a very tangible way" says MechE junior **Genevieve Parker**. "I loved the ability to walk around a model of a crystal structure and visualize content in three dimensions. You can't beat the interactivity that comes with a Minecraft classroom. The ability to build and be creative on homework assignments and our project motivated me to learn and kept me engaged as I did my work."

Although some high school teachers have started using Minecraft in their own classrooms, few college professors have incorporated the game into their own curriculum.

"There are really no other examples of Minecraft being used at the university level other than the University of Texas-Dallas and CMU," says Jayan. "The main difference with us is that it's the first time the game has ever been integrated into an engineering course full-fledged. That's a big deal because nobody else has done that."

REP. MIKE DOYLE

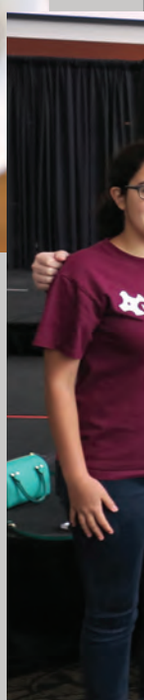
Students in Professor Maarten de Boer's Material Selection for Mechanical Engineers course shared tribology research projects with U.S. Representative Mike Doyle.

CULINARY MECHANICS

In Professor Phil LeDuc's Special Topics in Culinary Mechanics course, students experimented with sodium alginate — a natural gelling agent from algae — to create grape juice caviar.

FAREWELL

The department bid farewell to undergraduate academic advisor and mentor Bonnie Olson who left CMU to pursue new adventures.



Students in Special Topics in Culinary Mechanics 3-D-printed chocolate building blocks.

DESIGN EXPO

Seniors solve real-world problems and showcase their final capstone projects during the Design Expo.

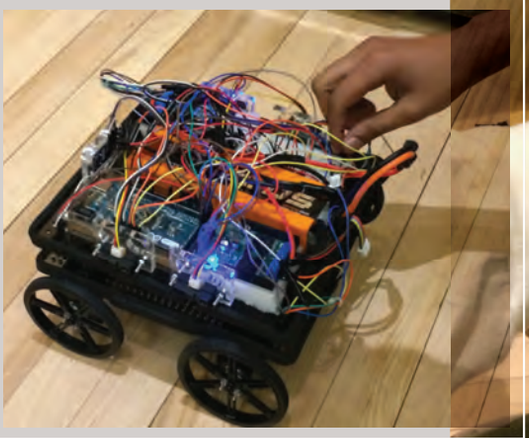
3-D

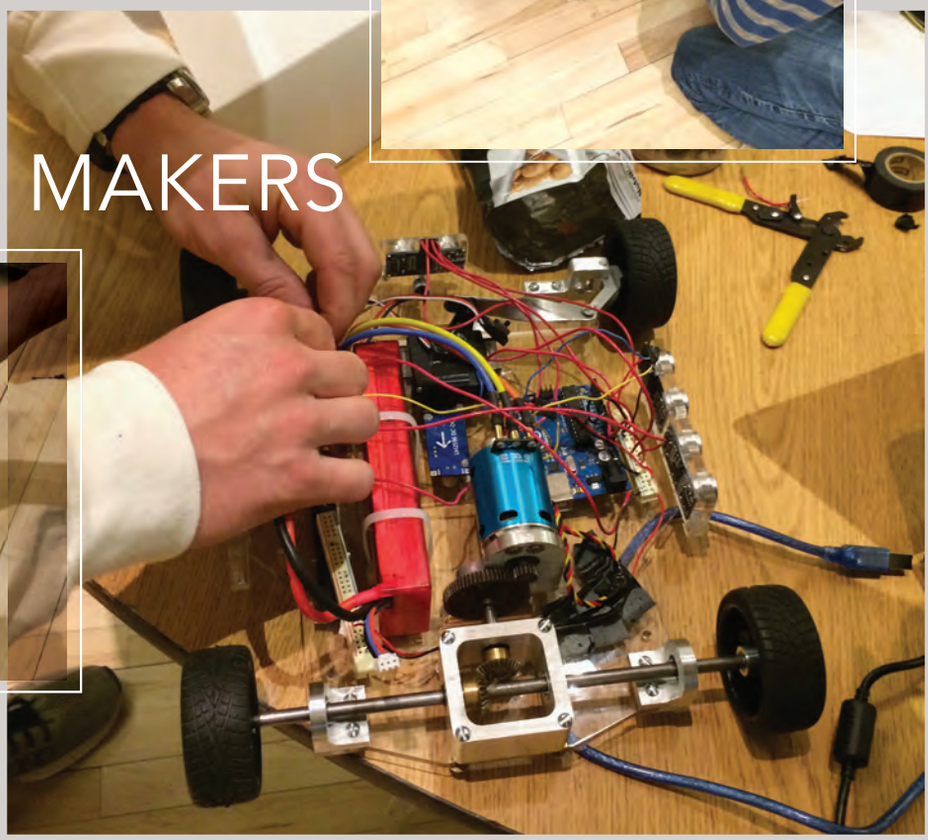
Student Advait Deshpande 3-D printed Scotty dog cuff links to wear as a conversation starter with recruiters at the Technical Opportunities Conference.

MechE students volunteered to judge the Pittsburgh Regional Science & Engineering Fair.

Teams of students built autonomous racing robots for a Master Makers competition.

MASTER MAKERS





DIY

In Professor Kenji Shimada's Special Topics in DIY Design and Fabrication course, students designed a personalized product and built it using various do-it-yourself fabrication methods.

STUDENT ACCOLADES

The Bill & Melinda Gates Foundation selected Ph.D. student **Justin Bobo** to be an alumni mentor at the 2016 Leadership Conference and a representative at the Gates Millennium Scholars Program at the Institute on Teaching and Mentoring Conference.

Ph.D. student **Dilip Krishnamurthy** received the 2017 Richard J. Kokes Travel Award from the North American Catalysis Society (NACS), an organization that seeks to promote and grow the science of catalysis and its related sciences.

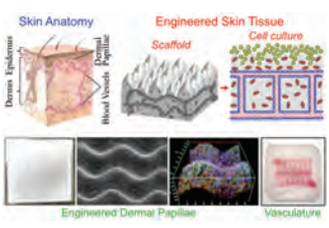
Undergraduate student **Brinda Malhotra** earned the Science, Mathematics and Research for Transformation (SMART) Scholarship from the Department of Defense.

Ph.D. student **Nathan Nakamura** received the National Defense Science and Engineering Graduate (NDSEG) Fellowship award. His work has resulted in the discovery of a groundbreaking method of crystallizing ceramic materials.

Ph.D. student **Patcharapit Promoppatum**'s team won the Modeling Challenge for Additive Manufacturing sponsored by America Makes and DARPA. The team represented the complex motion of the heat source associated with the build while providing thermal data that reasonably agreed with experimental results.

The Carnegie Mellon **Hyperloop** team earned 8th place in the design and construction category for their half-sized pod prototype during the SpaceX Hyperloop Pod competition in Hawthorne, California, in January.

Master's students **Kevin Wang** and **Eugene Yu** were members of the HP and Intel Design Challenge winning team for "Muscle Maximus," a self-sustaining wearable resistance system to enhance muscle activity in space. It consists of wearable components that offer resistance to limb movements, thereby simulating a one gram workload for astronauts in space.



Jonelle Yu, a Ph.D. student, was awarded a Dowd Fellowship to develop tissue scaffolds to fabricate artificial skin with Professors Philip LeDuc and Burak Ozdoganlar.

ROBOMECHANICS: AARON JOHNSON'S ROBOTIC ZOO

Imagine a diverse zoo of robots — some legged, some with wheels or treads. These robots can do flips, jump over obstacles, climb rocky terrain and roll through sand with ease.

This is the vision of new Assistant Professor of Mechanical Engineering **Aaron Johnson**, who studies the interactions between robots and their environments — environments ranging from your kitchen table to the Mojave Desert.

"I look at the ways in which the things we can control, like a robot's actuators and sensors, interact with the uncontrolled environment," says Johnson. "I want to make robots that can intelligently interact with the world."

Johnson, who received his electrical and computer engineering undergraduate degree and did his postdoctoral research in the Robotics Institute at Carnegie Mellon, has worked on parkour robots, climbing snake robots and home assistance robots alike.

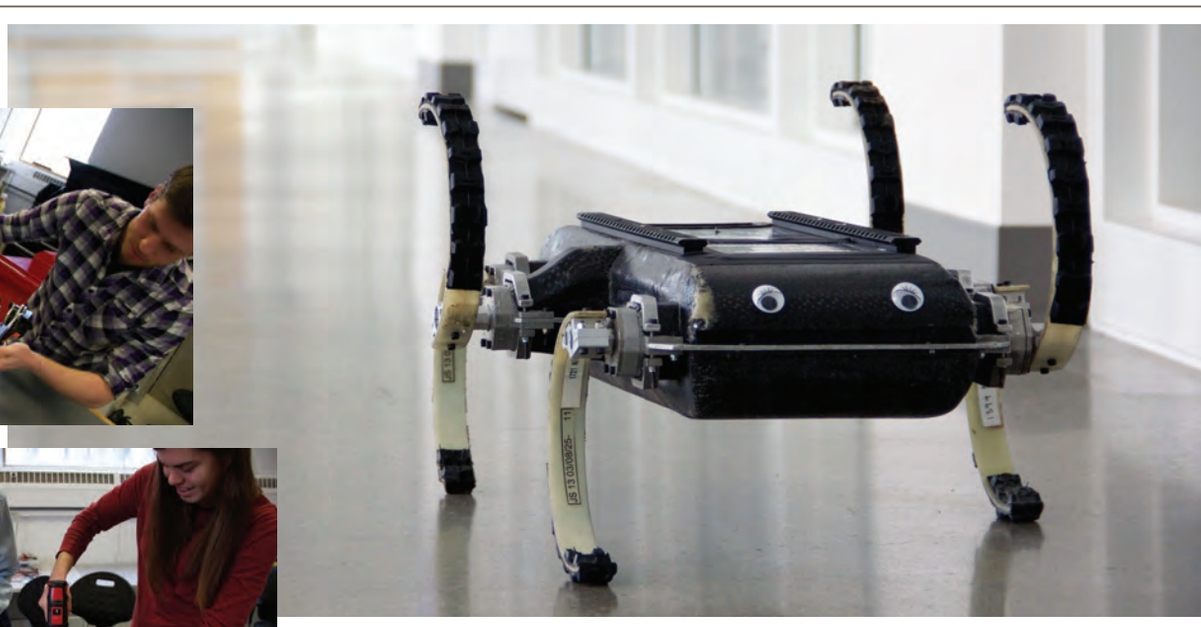
By looking at how each type of robot moves through the world and interacts with the terrain and objects that surround it, Johnson can then build new robots that can better, and more reliably, navigate and manipulate their environments.

"There's a large field called biomechanics that studies how animals move, and the mechanics of that movement through muscles and bones," Johnson explains. "The Robomechanics Lab will draw inspiration from the tools and methods of biomechanics, but applied to artificial systems."

Johnson's Robomechanics Lab looks at how robots can manipulate their terrain — in other words, how we can create robots that can dig in the sand and push rocks around, so that they can reach more terrain and shape the terrain in beneficial ways.

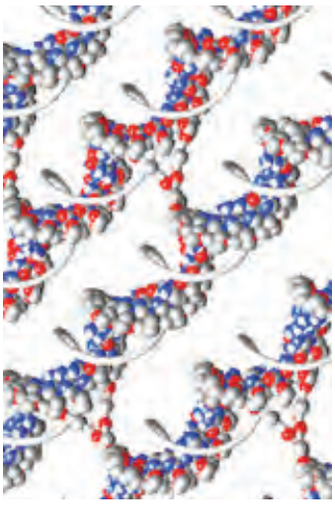
Much of what Johnson will be researching in his lab will have to do with how non-legged robots — wheeled, treaded or otherwise — can travel through difficult terrain equally well as, or even better than, robots with legs.

"A lot of us have this feeling that legs are important and great, but there have been very few cases of a legged robot doing something that a wheeled or tracked robot couldn't. Trying to understand what you can do with wheels, and what you really need legs for, will be a big part of the long-term goal of the lab," says Johnson.



Visit: **www.cmu.edu/me/robomechanicslab/**

NEW FACULTY MEMBER **REBECCA TAYLOR** DEVELOPS TOOLS TO INTERROGATE BIOLOGICAL SYSTEMS



An atomic rendering showing myosin molecules (the proteins that allow heart muscle to contract) on the DNA origami surface.

Life exists under strain — biological systems function even when cells and tissues are pulled, deformed and twisted. In fact, stretch is critical to the regulation and maintenance of tissue like muscle.

That's why Mechanical Engineering Assistant Professor **Rebecca Taylor** is taking a close look at these systems from an engineering standpoint.

By developing biomimetic tools for reconstituting and mimicking biological machinery, she hopes to deepen our understanding of muscle health and disease and to identify new treatments for heart disease.

Taylor's specific research interests lie in mechanobiology, or the study of the mechanics of cells, tissues and organisms. She creates tools to assess the function of cardiomyocytes, the cells that make up the heart muscle.

"As mechanical engineers and bioengineers, if you can build something, you've demonstrated you know how it works. This is critical for advancing basic science as well as developing new therapies and technologies."

"All throughout biology, form and function interact," said Taylor. "It's a beautiful phenomenon. For millions of years, biosystems have been evolving, and every component at every scale of an organ or tissue system contributes to its function. You can't ignore the mechanics of a system, which opens up the field for mechanical engineers to investigate."

At her previous lab, she worked to improve its motility assay — a test that studies the translocation of actin and myosin, the proteins that allow cells to move and make the heart contract. The assay uses a synthetic version of the heart's thick filament, a primary component of the minimal contractile unit muscle, to study contraction velocities of organized proteins that power the heart.

The test uses DNA origami, a process for creating engineered nanostructures from rationally designed, complementary DNA strands that self-assemble during an annealing process.

"If protein-level tests can mimic biological systems at the nanolevel," said Taylor, "then we can determine the minimal number of necessary components for biomachines to function. We can investigate the effects of additional proteins and drugs to see how these systems are regulated."

In her lab at Carnegie Mellon University, she continues this work by looking into stretch-induced actuation systems for biosensing and therapeutic applications. She also collaborates with professors in biomedical engineering and potentially with researchers in other departments.

"There are unlimited biological research questions for engineers to solve," said Taylor. "The heart is not the only organ system that is amenable to modeling and reconstitution by engineers. Once we develop a basic understanding of how a given system works, that can be translated into clinical therapies that will have a tangible impact on world health."

Visit: **www.andrew.cmu.edu/user/bex**

RESEARCH HIGHLIGHTS

Professor Jonathan Cagan used functional magnetic resonance imaging (fMRI) to investigate the brain's neural processes to learn more about how we make decisions about the products we buy and how they impact the environment.

Professors Jonathan Cagan and **Philip LeDuc** are working to optimize the design for synthetic myosin – the building block proteins of muscle – with a computational method. Areas like regenerative medicine, tissue engineering and bionanotechnology could benefit from this research.

Assistant Professor B. Reeja Jayan earned awards from both the U.S. Air Force and the U.S. Army's Young Investigator Programs to study different aspects of processing advanced materials using electromagnetics. She was also named to Who's Next: Technology, by The Incline.

Professor Shawn Litster is leading a $2M Department of Energy project to increase power density and durability of hydrogen fuel cells. The aim is to develop catalysts and electrodes from materials other than platinum grade metals, thus reducing fuel cell costs.

Associate Professors Carmel Majidi and **Jonathan Malen** developed a thermally conductive rubber material, representing a breakthrough for creating soft, stretchable machines and electronics. Nicknamed 'thubber,' it was featured in Wired magazine's Jargon Watch.

Associate Professor Jonathan Malen and **Professor Alan McGaughey** found that the thermal conductivity of superatom crystals is directly related to the rotational disorder within those structures. The findings could help to create a new paradigm for thermal transport.

Inspired by geckos, **Associate Professor Carmel Majidi** and **Adjunct Professor Metin Sitti** engineered a soft gripping system that outperforms current adhesion methods for robotics and precision manufacturing. The system demonstrates both soft, mechanically compliant interfaces and high adhesion strength.

Professor Yoed Rabin received nearly $500,000 from the National Heart, Lung and Blood Institute of the NIH for research on nanowarming technology for cryopreservation. He also co-authored a feature article on organ banking in ASME's Mechanical Engineering Magazine.

Professor Allen Robinson found that although new vehicles emit less particulate matter, the "cleaner" exhaust still forms particulate matter in the atmosphere long after exiting the tailpipe. This secondary organic aerosol can be just as harmful to human health.

Next-generation batteries will benefit from the discovery of lithium's exotic mechanical properties, thanks to **Assistant Professor Venkat Viswanathan's** research that represents a breakthrough in understanding dendrite formation and electrode/electrolyte interactions.

According to research by **Assistant Professor Katie Whitefoot**, regulations that set fuel-economy and greenhouse-gas emission goals for cars and trucks have lower costs and higher benefits than previous analyses have reported.

Professor Yongjie Jessica Zhang was selected to the 2017-2018 Executive Leadership in Academic Technology and Engineering (ELATE at Drexel) Program, a fellowship designed to advance senior women faculty in leadership roles.

In case you missed it...

Two Department of Mechanical Engineering faculty members were featured on PBS' SciTech Now with Hari Sreenivasan.

JACK BEUTH

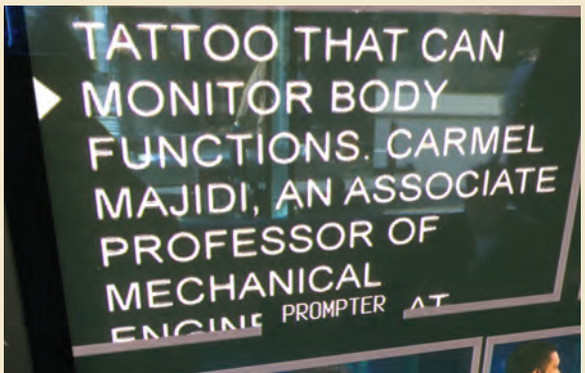
Professor **Jack Beuth**, co-director of CMU's NEXTManufacturing Center, talked about the role of metal 3-D printing.

WATCH:
www.scitechnow.org/videos/metal-3d-printing/#

CARMEL MAJIDI

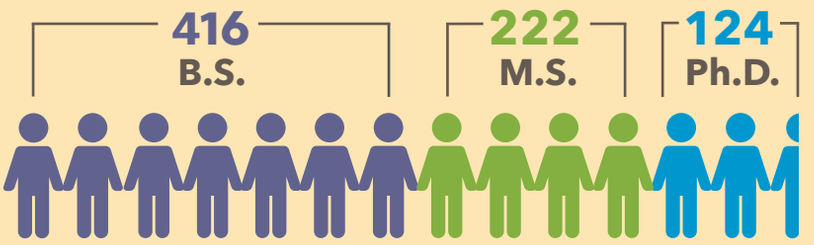
Associate Professor **Carmel Majidi** discussed soft electronics and flexible circuits.

WATCH:
www.scitechnow.org/videos/engineering-smart-tattoos/#



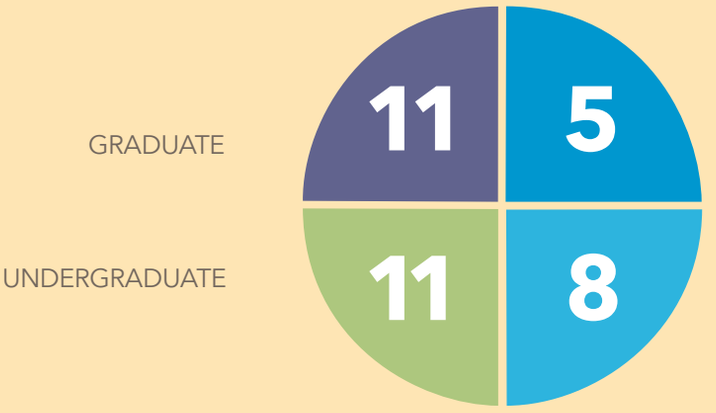
BY THE NUMBERS

2017 student population: **762**



2016 median salaries after graduation

Rankings 2018 | U.S. News & World Report



Mechanical Engineering | College of Engineering

PROFILE: HOW FOUR YEARS CAN IMPACT A LIFETIME

Dave Barakat with his wife, LaVerne.

During his first year at Carnegie Institute of Technology, **Dave Barakat** lived in McGill Hall. On the first night of his first year, Barakat set out his sport coat to wear for a mixer that evening before leaving the room. When he returned, the coat was gone. At the mixer, he saw someone in a coat that looked just like his, so he introduced himself. Coincidence? No, he'd found the culprit: his roommate! This was the beginning of a friendship that has lasted more than 50 years.

In 1968, Dave Barakat graduated from Carnegie Mellon (called Carnegie Tech at the time) with a degree in mechanical engineering. Barakat started his education at the General Motors Institute, a program focused on the automotive industry, but after one semester he dropped out because he realized that he wanted a broader engineering education. When he found Carnegie Institute of Technology, it was clear that this was the right school for him.

"I spent four great years at Carnegie Mellon," said Barakat. "The sciences, arts and technology exist at their best all on one campus. I wish I would have gotten an even broader exposure to all of the disciplines while I was there."

After graduating from Carnegie Mellon, Barakat worked in modeling and simulation at Eastman Kodak in Rochester, New York. In 1969, both he and a colleague wanted to move to the west coast, so they both found jobs with TRW (a major aerospace company) and moved with their families to Los Angeles. At TRW, Barakat performed systems engineering and systems design for high-tech military and government systems while he earned his MBA from UCLA. He then progressed into various management positions including a division vice president. After Northrop Grumman acquired TRW in 2002, Barakat ultimately rose to be the Vice President of Programs, Engineering and Technology for the corporation. Although he was busy working, Barakat continued to pursue his interest in cars, establishing an automotive repair shop near his home, and also developed an interest in various real estate opportunities.

In 2008, Barakat retired from Northrop Grumman, but Carnegie Mellon University and Pittsburgh still remain an important part of his life. He and his wife, LaVerne, established a fellowship to fund Ph.D. students in the College of Engineering. A candidate is selected by the dean of Engineering, and, when possible, the research conducted by the candidate complements Northrop Grumman's own research endeavors.

The hands-on approach and professors at Carnegie Mellon stand out to Barakat as significant aspects of his education. In classes like fluids and thermodynamics, working in the lab gave him a chance to apply classroom learning.

"In any educational pursuit there are professors who leave an indelible mark on you," said Barakat.

For Barakat, Dr. Victor Del Bene was one such professor. Del Bene taught fluid dynamics, and according to Barakat, he was very down-to-earth, related well to his students and was well-known in his field. Five years ago Barakat reconnected with Del Bene who retired in Palm Springs, not far from Barakat's home.

Barakat and his wife currently live in Los Angeles and Santa Barbara where they stay busy with their kids, grandkids, dogs, real estate, their auto repair business and various charities.

"The problem-solving approach is the key thing I learned at Carnegie Mellon. Whether the problem is about management, technical aspects or personal, how you address it and how you find solutions is what really matters."

PROFILE: NAVIGATING NUCLEAR ENERGY

Since eighth grade, **Tina Kuhr** had wanted to be a nuclear physicist. As a high school student, Kuhr saw an ad from Carnegie Mellon University promoting women in engineering. "Why not?" the ad asked. Kuhr, who had always liked math and science, thought about what the ad was offering, and in 1977, Kuhr began her undergraduate career in mechanical engineering at Carnegie Mellon University.

Kuhr, originally from Slippery Rock, Pa., is now a lead nuclear engineer at Duke Energy in North Carolina. She received her bachelor's degree in mechanical engineering from Carnegie Mellon, with a second major in economics.

At Carnegie Mellon, Kuhr was one of only seven women in her mechanical engineering class. But she didn't let it daunt her.

"I completed my degree in three and a half years, because of a mix of summer school and AP credit. It was right after the Three Mile Island reactor accident. I graduated on a Friday, moved out on Saturday, and began my first job at Babcock and Wilcox in Lynchburg, Va., in the nuclear industry three months later," said Kuhr.

Thermodynamics was her favorite subject, which led her to enter a career in the nuclear field. Kuhr's first job involved design work on control systems for nuclear power plants. Her next job involved commissioning and later decommissioning emergency response facilities at one of the plants. It was here that she realized just how long projects could take.

"In undergrad, the longest project you work on is a semester. In the workforce, projects can take eight years to complete from start to finish," said Kuhr. "Competing priorities for time means finding the difference between important and urgent. Sometimes important projects get pushed to the side for the sake of higher priority projects."

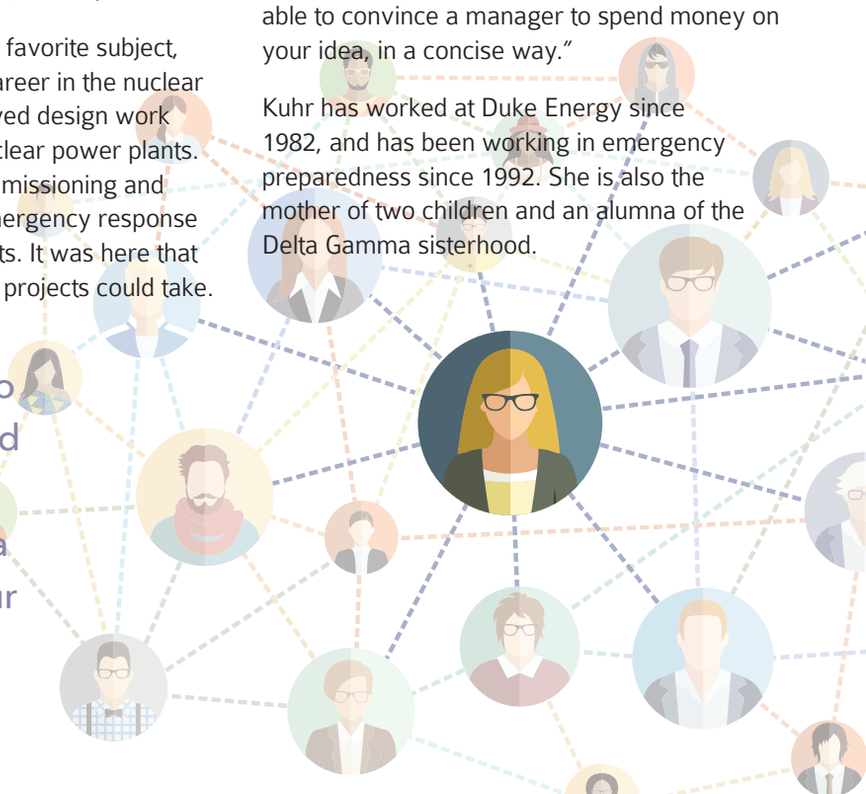
In the energy industry, things are operating 24 hours a day, seven days a week, 365 days a year. Projects can have tentacles, she says — one thing impacts another. If you change something and don't analyze all of its consequences, it can come back later as a complication.

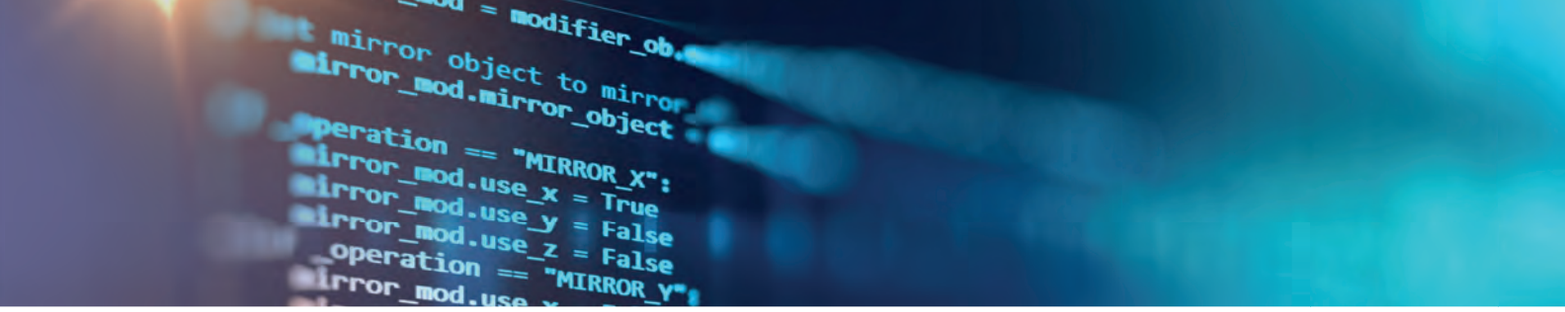
In her current position, Kuhr deals with fleet emergency response procedures. In addition to hands-on work, she crafts licensing and regulatory arguments, and researches precedents for compliance. This experience informs her advice to aspiring nuclear and mechanical engineers — she recommends taking a technical writing course or something to be able to effectively communicate.

"In industry, you need to be able to sell your idea," said Kuhr. "Those speaking and presenting skills are invaluable. You have to be able to convince a manager to spend money on your idea, in a concise way."

Kuhr has worked at Duke Energy since 1982, and has been working in emergency preparedness since 1992. She is also the mother of two children and an alumna of the Delta Gamma sisterhood.

"In industry, you need to be able to sell your idea. Those speaking and presenting skills are invaluable. You have to be able to convince a manager to spend money on your idea, in a concise way."





PROFILE: LAUNCHING A PATH FROM ROCKET SCIENCE TO AI

At 26, it seemed a large feat to say you have already worked for NASA, completed a master's thesis in collaboration with Blue Origin, and now work as a research engineer at the forefront of artificial intelligence (AI). But for alumnus **Alex Lavin**, it was all in a day's work.

Driven by intellectual curiosity and problem-solving, Lavin was named one of Forbes' 30 Under 30 in Science in 2016 for his significant contributions to science and his love for the field.

Lavin is a senior research engineer at Vicarious, a company striving to build an algorithmic architecture for artificial general intelligence: human-level AI. He and the team are currently focused on visual perception problems — like recognition, segmentation and scene parsing — and their relationship with motor control tasks.

He first became interested in AI while completing a master's degree in mechanical engineering at Carnegie Mellon, where he was inspired by the many cross-disciplinary projects that characterize the university.

"Carnegie Mellon is the most intellectually stimulating environment I've been a part of," said Lavin. "There's such a wealth of smart people working hard on cool projects. You'd have to go out of your way not to get wrapped up in it."

With a focus on computational engineering, Lavin tuned the curriculum to what suited his interests while developing relationships with his professors, both great aids to launching his career. What originally attracted Lavin to Carnegie Mellon was the effort led by **Red Whittaker** to get a rover on the moon. Most of Lavin's time and efforts while at Carnegie Mellon were dedicated to 'Andy,' the lunar rover.

"I saw this as an incredible learning opportunity," Lavin recounts, "I value every minute working with that team. I like to think of Red as a mentor."

Lavin led the student team working with Professor Whittaker and Astrobotic. Together the team designed, built and tested the prototype rover for the Google Lunar XPrize mission. Lavin completed his master's thesis on finite element-based optimization of spacecraft fuselage structures in collaboration with Blue Origin.

Prior to his time at Carnegie Mellon, Lavin interned with a research team at NASA Ames, where he realized that in order to work on robotics, you need to know software. At Carnegie Mellon he was exposed to the possibilities of software and became enthralled with the world of AI.

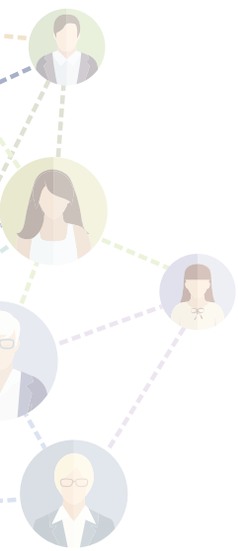
After graduation, Lavin worked at a startup called Hyperloop Transportation Technologies as a mechanical engineer. He was soon leading the capsule design team, about a dozen engineers around the world.

"Studying finite element analysis (FEA) and computer-aided design (CAD) was very helpful here, particularly with **Professor Kenji Shimada** as both a professor and my advisor; he's a CAD guru," said Lavin.

Yet all the while he was teaching himself AI and programming in order to pivot his career. Lavin soon joined Numenta, where he worked for two years as a software and research engineer developing machine intelligence algorithms derived from the neocortex.

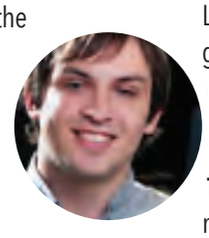
And even after all of his accomplishments on his journey from rocket science to AI, Lavin remains incredibly humble and driven.

"You can learn literally anything you want, given you work at it, so do what you're passionate about. Being named a 30 Under 30 was certainly a surprise, and if anything it's made me work harder, to live up to the hype! I recall seeing Carnegie Mellon alum **Matt Rogers** speak about starting Nest. He had no clue how to make a thermostat, but he was determined to figure it out. I took that to heart."



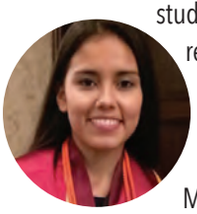
ALUMNI MAKING HEADLINES

Hahna Alexander (2012), CEO and co-founder of SolePower, was inducted into Toyota's Mothers of Invention program for technology that harvests the kinetic energy in footsteps to charge portable electronics, lights and sensors. In SmartBoots, this technology can keep firefighters, construction workers and soldiers safe.



Doug Bernstein's (2012), company PECAlabs has received European CE mark certification (similar to FDA approval in the U.S.) for exGraft, a conduit that allows surgeons to detect twisting or kinking during pediatric heart surgery.

Asi Burak (2006), co-authored the book "Power Play: How Video Games Can Save the World." He explained how video games can be used for social good in an interview with From the Grapevine.



Nicole Bustos (2017), a graduate student at MIT, was the first MechE recipient to earn the Judith A. Resnik Award at Commencement. The award, which honors the 1970 Carnegie Mellon alumna and space shuttle Challenger astronaut Judith Resnik, recognized Bustos for her academic performance, creativity and vision.

Josh Caputo (2010, 2015), president and CEO of CMU spinoff HuMoTech, was named to The Incline's Who's Next: Technology, for building robotic exoskeletons and prostheses to improve the quality of life for amputees. His work was featured in TechCrunch.

Lili Erlich (2017) ,was on the design team for a "wearable tech" dress worn at the 71st Annual Tony Awards. The dress, which lit up in response to the wearer's heartbeat, featured LED lights and laser-cut graphics representing the multidisciplinary experiences of CMU students.

Thomas Healy (2014), was named to Forbes 30 Under 30: Energy. He is the CEO of Hyliion, a company that developed a regenerative braking device for tractor-trailers that captures otherwise wasted energy and reduces fuel use by 30 percent. He spoke about this technology at the 2017 World Economic Forum.

Rachel Jackson (2017), a postdoctoral researcher in Associate Professor Steve Collin's Biomechatronics Lab, was interviewed by Live Science about customizable exoskeletons. Her team's findings were published in the journal Science (see Zhang, on page 19).

YongTae Kim (2011), a bioengineering assistant professor at Georgia Tech, earned a 2017 National Science Foundation CAREER award for research on integrated microfluidic systems for scalable manufacturing of hybrid nanoparticles for drug delivery.

David M. Kirr (1959, 1960, 1962), an emeritus trustee of CMU and a reunion and campaign volunteer, received the university's Alumni Distinguished Service Award at the 67th Annual Alumni Awards Ceremony and Reception during Commencement weekend.

Tolga Kurtoglu (2001), CEO of Silicon Valley research company PARC, was interviewed on an episode of Recode Decode about topics ranging from artificial intelligence and automation to the internet of things.

Dave Rollinson (2006, 2010, 2014), a co-founder of HEBI Robotics, was interviewed by Popular Mechanics in the article, "Is your job robot-proof?" His startup makes motorized modules and joints that assemble into the knees and elbows of custom robots.

We want to hear from you! Email your news to

Arden Rosenblatt (2013, 2017), CEO and co-founder of PieceMaker Technologies, was named to The Incline's Who's Next: Technology. His 3-D printing company provides automated, easy-to-use systems for on-demand, personalized products and was named "Best of Toy Fair 2016" by Popular Science Magazine.

Wilfred T. Rouleau (1951, 1952, 1954), and his wife, Ruth Osborne Rouleau (1952, 1953), received Carnegie Mellon University's Alumni Service Award as longtime members of the CMU community and class reunion volunteers.

Pablo Sanchez Santaeufemia (2015) was named to Forbes 30 Under 30 Europe Social Entrepreneurs. He founded Bridge for Billions, an online incubation platform that connects early-stage startups with training and mentors around the world.

Joseph Stas (1978), was featured in the article "Self-driving cars may offer market niche for Pittsburgh Glass Works" in the Pittsburgh Post-Gazette. Stas is president and chief executive of the company.

R. Subramanian (2004), developed real-time affordable multi-pollutant (RAMP) air quality monitors to educate citizens in the Pittsburgh region about air pollution risks in their neighborhoods. The project was featured in The Allegheny Front.

Bowei Tang (2012), founder of Beijing Ewaybot Technology, showcased the MoRo robot at the Consumer Electronics Show in Las Vegas. **Haotian Shi** (2014) and **Wei Jing** (2014, 2017) were part of the team that developed this human assistant robot.

Hau Thai-Tang (1988), was named executive vice president of product development and purchasing at Ford Motor Company.

John Thornton (2007), CEO of Astrobotics, was quoted in a TribLive article about partnering with ATLAS Space Operations to bring laser communication to the moon.

Eric Wise (2014), founder and CEO of BreatheWise, was named to The Incline's Who's Next: Technology. He developed internet-connected gas sensors that allow distributors to monitor medical oxygen therapy supply and use in real-time.

Iryna Zenyuk (2011, 2013), an assistant professor of mechanical engineering at Tufts University, earned a 2017 National Science Foundation CAREER award. Her research investigates the specific factors that limit the performance of polymer electrolyte fuel cells using thin-film electrodes.

JuanJuan Zhang (2016), an associate professor at Nankai University, was quoted in The Verge about a software algorithm that, when combined with emulator hardware, can automatically identify optimal walking assistance for individuals. She was the lead author on the paper previously mentioned (see Jackson, on page 18).

IN MEMORIAM

James W. Banner James W. Banner passed away peacefully on June 22, 2017, in South Bend, Indiana. He had earned his B.S. in mechanical engineering in 1961 and was very proud of his degree.

In addition to a career spanning experiences with U.S. Steel, Morton Salt and R&R Regulators, he was active in his community as a coach, a school board participant, a leader in the Lion's Club and a competitive chess player.

Our thoughts are with his family and friends.

me-alumni@andrew.cmu.edu

Celebrating Diwali with his community, riding a camel in China on a Rotary trip and as Uncle Sam in Cupertino's July 4th children's parade.




Give strategically, Support generously.

ORRIN MAHONEY (MechE 1967), knows how important it is to make a difference. After 35 years with Hewlett-Packard, he served his community in Cupertino, California as mayor (twice), district governor of the Rotary Club, soccer coach and volunteer. At Carnegie Mellon University, he has created a lasting legacy through a gift that will benefit the university for generations to come.

Learn how easy it is to achieve your philanthropic vision through a planned gift. Contact the Office of Gift Planning today at 412.268.5346 or askjoebull@andrew.cmu.edu, or visit giftplanning.cmu.edu.

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