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2014

## ME-EM 2013-14 Annual Report

Department of Mechanical Engineering-Engineering Mechanics, Michigan Technological University

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# MEEEM

MECHANICAL ENGINEERING — ENGINEERING MECHANICS

2013-14 ANNUAL REPORT

## Human-Centered ENGINEERING

GLOBAL

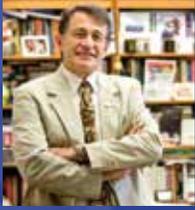
LOCAL

PERSONAL

**Michigan Tech**



# Human-Centered ENGINEERING



In his 'I have a Dream' speech, Dr. Martin Luther King Jr. declared, "What impacts one of us directly, impacts all of us indirectly." Over the past year, we have been communicating and raising awareness about mechanical engineering education and research through the concept of Human-Centered Engineering.

In this Annual Report, we present our education and research through this three-tiered lens. We first gauge our impact on people at the immediate, personal level, with prosthetic and medical research. As we back away from the individual, whole communities come into view and we present our impact at the local level, with transportation and smart microgrids. Still further away, the whole of humanity comes into view as we present work that impacts global and space systems. When all is said and done, mechanical engineering is about creating products and processes that help humankind.

Beyond research, I am proud to feature the awards and nominations achieved by our ME-EM faculty and staff. In particular, two of our faculty received the prestigious National Science Foundation CAREER award. We also welcome several new members to our department.

As I am keenly aware, our department is impacted by the many individuals and communities with whom we engage—from multidisciplinary researchers to alumni and corporate donors. On behalf of the students, faculty and staff, I personally thank you for your positive impact, and support.

*William W. Predebon*

William W. Predebon, PhD, Professor and Department Chair  
wwpredeb@mtu.edu



## MEET THE HEROES

The Wings of Angels documentary (free!)

follows two wounded war veterans and a dedicated group of mechanical engineering students as they design and build a better hand cycle for the vets to compete with. Inspired by the vets it becomes more than just a grade for the students; it becomes a passion.

Check out the film at  
<http://vimeo.com/96758950>

## ON THE COVER

Tom Davis drives a specialized hand-crank cycle in the Detroit Free Press Marathon. The cycle was designed by ME senior design capstone team members as part of a General Motors-sponsored project.

### ANNUAL REPORT COMMITTEE

Dr. William Predebon    Karen Bess    Marlene Lappeus  
Kimberly Geiger    Kathy Goulette    Jillian Spagnotti

### DESIGN

Monte Consulting

### PHOTOGRAPHY

Michigan Tech

### WRITING

Monte Consulting

# ME-EM RESEARCH

We have a vision. One of the five goals in our strategic plan is to achieve international leadership positions in all four of the Department's research thrust areas. It is a process. Each must first start as a research center or institute here on campus, and we have two—the Center for Agile and Interconnected Microgrids (AIM) and the Advanced Power Systems Research Center (APSRC). Our focus on interdisciplinary collaboration between faculty, staff, and students enables these research centers to increase engagement with national laboratories and industry partners. We are now working to establish these and other focus areas as national centers, funded by a national agency, and are on the path to do so.

Concomitant with these developments has been the exciting growth of our graduate program. We continue to attract students to our Master's and PhD programs by fully involving them in our research centers. We now have more than 300 Master's students and 100 PhD students in our Department.

Our formula for success? Hiring the best faculty—including eleven endowed faculty chairs/professorships.

## RANKINGS

### American Society of Engineering Education

- 9<sup>th</sup> in BSME enrollment  
14<sup>th</sup> in BSME degrees awarded
- 9<sup>th</sup> in MSME enrollment  
12<sup>th</sup> in MSME degrees awarded
- 32<sup>nd</sup> in PhD enrollment  
42<sup>nd</sup> in PhD degrees awarded

### National Science Foundation

- 22<sup>nd</sup> in research expenditures (\$13.981 million) among all mechanical engineering departments

### US News & World Report America's Best Graduate Schools

- 61<sup>st</sup> among the 171 (top 36%) doctoral-granting mechanical engineering departments

## OCULUS-ASR SET TO LAUNCH IN FALL 2015

A microsatellite system designed by students on the Michigan Tech Aerospace Enterprise team advised by Dr. L. Brad King will launch from Cape Canaveral, orbiting over the lower continental US at an altitude of 700 kilometers. Learn more at [aerospace.mtu.edu](http://aerospace.mtu.edu).

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## MISSION

Prepare engineering students for successful careers.

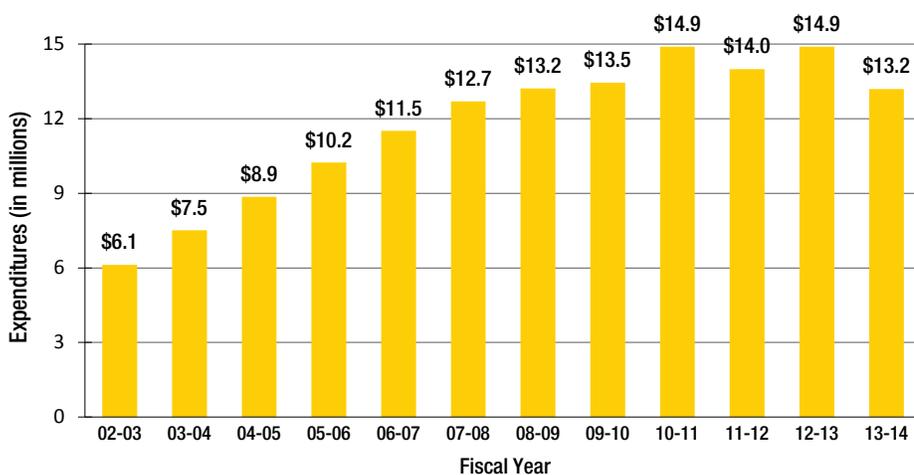
## VISION

Be a nationally recognized mechanical engineering department that attracts, rewards, and retains outstanding students, faculty, and staff—be a department of choice nationally.

## EXECUTIVE COMMITTEE

- Dr. Jason R. Blough**  
Design & Dynamic Systems Area Director
- Dr. William J. Endres**  
Manufacturing & Industrial Area Director
- Dr. Seong-Young Lee**  
Energy Thermofluids Area Director
- Dr. Ibrahim Miskioglu**  
Solid Mechanics Area Director
- Dr. Craig R. Friedrich**  
Associate Chair & Director of Graduate Studies
- Dr. Gregory M. Odegard**  
Associate Chair & Director of Undergraduate Studies
- Paula F. Zenner, MS**  
Director of Operations & Finance
- Dr. Rush D. Robinett**  
Research Director
- Dr. William W. Predebon**  
Department Chair

## ME-EM RESEARCH EXPENDITURES: 2002-2014



Note: The research expenditures are sometimes an estimate at the time of publication and, if needed, are corrected in the following year's annual report.

# Human-Centered ENGINEERING

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...on a **PERSONAL** level

**WE VIEW OUR HUMAN-CENTERED**

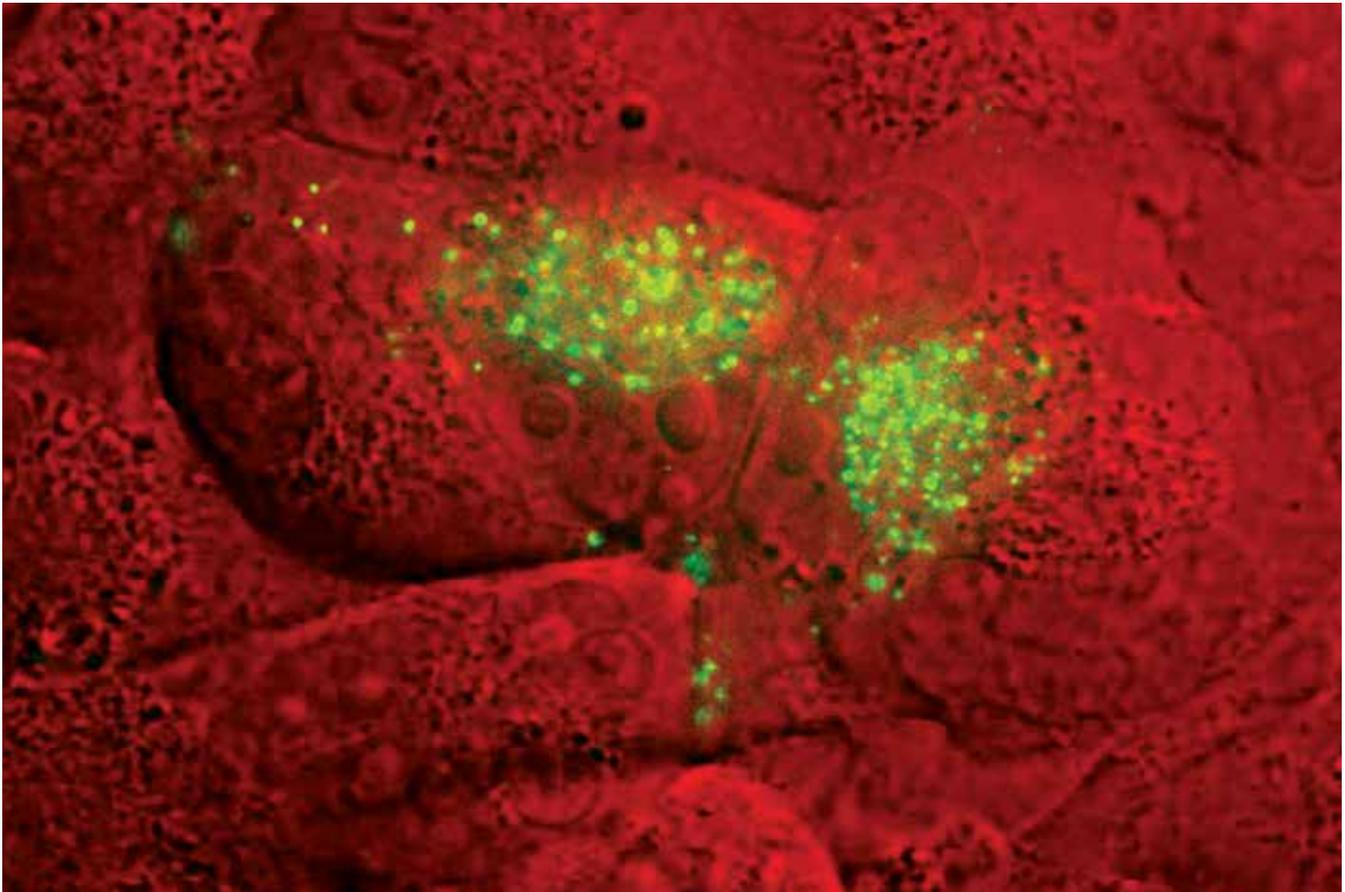
achievements in education and research across three scales: personal, affecting human life on a scale we can reach out and touch; local, affecting people in community-level spaces; and global, engineering systems that operate nationwide or across the globe.

**FEATURED ALUMNI**

- Margaret Cobb '83
- Christine Roberts '91
- Timothy Coffield '84
- Martha Sullivan '85

## PERSONAL

**BY IMPACTING HUMANITY** at scales below the very cells that make up human life, ME-EM research is both physical and personal.



*Research by Dr. Chang K. Choi enables health researchers to examine drug impacts at the cellular level.*

### **A TOTAL INTERNAL REFLECTION FLUORESCENCE MICROSCOPE**

captures an image of human T98G glioblastoma brain cancer cells carrying the green fluorescent protein-tagged gene NAG-1, which can be modulated by drug treatment.

### **Vision for Cellular Researchers**

For microscopic investigations into the behavior of cell cultures and tissues, **Dr. Chang K. Choi** is developing a multimodal imaging system coupled with a culture platform to improve *in vitro* data collection.

Choi's opto-electrical biosensor uses optically-transparent, electrically-conductive molecules of indium tin oxide as cellular sensors to simultaneously collect microscopic images of and electrical signals from live cells under various cellular environmental conditions. This new technology could enable health researchers to examine the effects of drugs and toxic agents on cellular morphology and cancer treatment.



*Dr. Mo Rastgaar's multi-axis prosthesis gives amputees greater freedom of movement and reduces falls.*

## Improving Mobility in Amputees

Mobility is a key factor to well being, both emotional and physical. Over a million US citizens are limb amputees, primarily lower-leg amputees. Prosthetic devices are typically designed to improve the mobility of individuals walking in a straight line. **Dr. Mo Rastgaar** has created a lightweight, cable-driven ankle-foot prosthesis capable of steering and even traversing slopes.

Rastgaar has developed a multi-axis joint that allows the foot to move from side to side and up and down. His robotic ankle-foot prosthetic is equipped with different sensors to detect how an amputee is walking and incorporate real-time force and trajectory feedback control. As the person walks, signals are sent to a microprocessor that adjusts the prosthesis to match the gait of the individual.

The additional degrees of freedom provided in this innovative ankle-foot prosthesis will not only improve the gait of amputees as they stride across undulating terrain, but also reduce the likelihood of falling. Rastgaar has received a National Science Foundation 2014 Faculty Early Career Development (CAREER) Award to further his research.

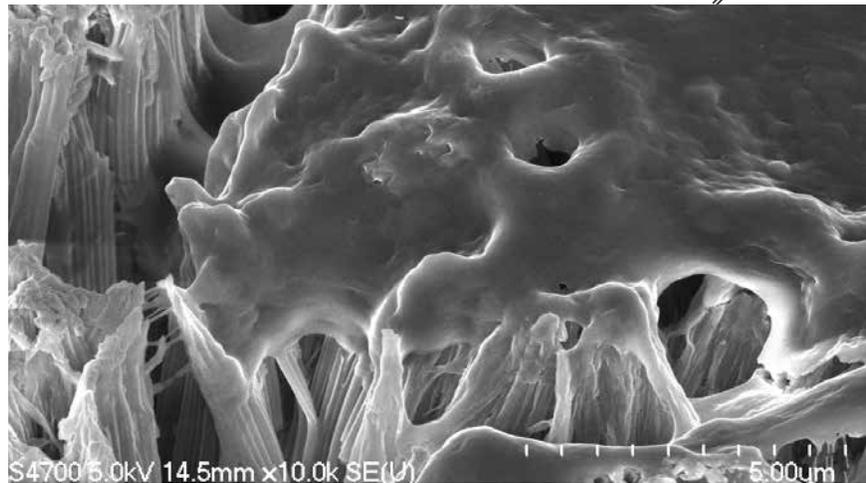
## Nanotextured Orthopedic Implants

Focused on improving health through nanomaterial research, **Dr. Craig Friedrich** and his students are developing methods to increase the performance of titanium alloy orthopedic implants for better bonding with bone and with long term antibacterial properties to reduce infection.

The research is centered around a simple and environmentally-friendly process for creating nanotextured surfaces on the implants that better mimic the mechanical properties and morphology of bone. At the cellular level, bone

has been shown to more strongly adhere to these surfaces. This same fabrication process can simultaneously integrate antimicrobial silver into the titanium nanostructures with the expectation that this will provide long term anti-infective properties.

Friedrich's group is working with several implant manufacturers and research hospitals in the United States to provide a direct clinical tie-in. The manufacturing process is currently undergoing studies for industrial scale-up to ensure that large numbers of implants can be made with identical performance.



*Improving the lives of those with implants is the focus of Dr. Craig Friedrich's research on antimicrobial nanomaterials.*

### **OSTEOBLAST CELL (BONE-FORMING CELL)**

showing strong attachment to nanotextured titanium surface. Entire field of view is approximately 1/8th the diameter of a hair.

## PERSONAL



*Dr. Tolou Shokuhfar's atomic-scale research on ferritin protein within the body will help determine its impact on neurological diseases.*

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### Identifying Disease Signatures with Engineering

Far below the acuity of human sight, the mysteries of neurodegeneration and other chronic diseases await the discovery that leads to prevention and cure. **Dr. Tolou Shokuhfar** is conducting research on ferritin, a protein within the body, to unveil the differences between healthy and dysfunctional ferritins.

When properly functioning, ferritins convert toxic ferrous irons to safe iron minerals that are stored in the core of the protein and later released when our body requires additional iron sources. Dysfunctional ferritins can cause iron toxicity, which can contribute to neurological diseases, such as Alzheimer's and Parkinson's.

Shokuhfar is able to examine the hydrated protein samples under an aberration-corrected scanning transmission electron microscope using a new technique she has developed. This method encapsulates the sample with a nano-scale graphene bubble that keeps water in place and allows electrons to pass through freely. Because the samples are not frozen, her team can watch how the sample reacts when iron ions are introduced.

Shokuhfar's research may help healthcare professionals identify disease signatures and may lead to the development of new approaches to treatment.



*Margaret Cobb oversaw the development of the family-friendly Xbox Live gaming system.*

## Software for the Family

### MARGARET COBB '83, MICROSOFT

Engineers have long collaborated with marketing and design experts to craft an effective user experience, and human interfaces have undergone rapid development over the past decade. Margaret Cobb ('83) has been deeply involved in the revolution of user experiences and has been responsible for expanding the appeal of the Xbox gaming console to women and secondary audiences.

To gain industry experience as an undergraduate, Cobb secured an internship with Scott Paper in Marinette, Wisconsin to develop code to monitor paper manufacturing machinery. After graduating and building her portfolio in the engineering field, she transitioned to sales and marketing, where she worked for Systems Northwest, Sundstrand Data Control, and Apple Computers before joining the team at Microsoft.

Cobb is currently serving as the Director for OEM Engineering & Services, leading the effort to market products for PC manufacturers worldwide. Her team develops and deploys systems, while offering product support, problem resolution, training and workshops to their customers. These services allow Microsoft's technology partners to shorten their development cycles and more rapidly deploy new devices.

## Seated Comfortably

### TIMOTHY COFFIELD '84, CIDIA PRODUCT DEVELOPMENT

Identifying an ergonomically sufficient chair in an office environment can be a struggle, but it is critical for maintaining personal comfort and optimal circulation. Timothy Coffield ('84) is a national design leader for ergonomically positioned chairs, and a driving force in the industry of office furniture.

In 1998, Coffield founded Dahti Technologies, a company that quickly became the seat design

leader in office, recreation, automotive, marine, stadium, and public transportation industries. In 2006, his company was bought out by Illinois Tool Works Inc. In 2013 he left ITW-Dahti seating and founded Cidia Product Development.

Coffield has over eighty US and foreign patents in areas ranging from manufacturing processes to design innovation. His patented office chair

designs were developed to provide comfort to the workers through specific mesh material selection and increased adjustment opportunities based on worker height without increasing chair cost. Coffield's expertise was even leveraged in the manufacturing of the Herman Miller Aeron® Chair, widely considered the pinnacle of human-centered furniture design.



## PERSONAL



### Telecommunication Tools

**CHRISTINE (PRZYBYSZ) ROBERTS '91, GOOGLE**

The United Nations reports that over six billion people are currently using cell phones, making these behavior-shaping devices extremely personal for most of humanity.

Christine (Przybysz) Roberts ('91) has, in turn, shaped cell phone technology, when she joined Motorola following graduation from Michigan Tech. She has continued to advance in her career at the telecommunications leader Motorola Mobility, now owned by Google.

She leveraged her BSME degree to secure her initial position at Motorola as

a manufacturing engineer. After earning her MBA in 2000, she advanced to Director of Engineering and Program Management, a role that enabled her and her team to execute wireless infrastructure installations and upgrades around the world. Roberts is currently the Vice President of Global GTM Product Operations for Motorola where she manages a team that is responsible for globally launching mobile devices in over fifty countries. As mobile devices continue to advance through new technologies, Roberts explores new ways to improve the human condition, one satisfied customer at a time.

## Sense Around Us

### MARTHA SULLIVAN '85, SENSATA

Sensata Technologies is the world's leading supplier of sensors and electrical protection, improving safety, efficiency and comfort for millions of people every day. As president and CEO of Sensata, Martha Sullivan ('85) employs over 9,000 people in two major global business units with sales offices worldwide and business and manufacturing centers in nine different countries.

The name, Sensata, comes from the Latin word *sensate*, meaning "those gifted with sense." The company's logo is inspired by Braille, the writing system based on touch.

Sensata's high-precision devices are used in automotive, appliance, aircraft, industrial, military, heavy vehicle, heating, air conditioning, data, telecommunications, recreational vehicle, and marine applications. The company ships more than one billion units each year, including 1,500 circuit breakers and switches for commercial jets and burn-in and thermal solutions for millions of devices utilizing semiconductors. More than thirty Sensata sensors, switches, and safety devices are present in a typical home.



*At Sensata, Martha Sullivan integrates sensor safety features into vehicles to alert drivers leaving their lane, helping to ensure personal safety on the road.*



# Human-Centered ENGINEERING

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...on a **LOCAL** level

**OUR RESEARCH  
IMPACTS COMMUNITIES**

by improving power distribution controls, enhancing rescue missions, and developing intelligent systems and fuels to reduce the atmospheric carbon loading from mobility.

**FEATURED ALUMNI**

- Colleen Jones-Cervantes '83
- Pam Klyn '93
- Doug Parks '84
- Anthony Raimondo '62

## LOCAL

### BY ADVANCING TRANSPORTATION

and energy networks that connect us to work and vital power resources, ME-EM research is inherently communal.



*Researchers in the Center for Agile and Interconnected Microgrids (AIM) are working to prevent power shortages through a large-scale communication system.*

### Gaming for Smart Power Management

The earliest machines, such as the lever, allowed people to amplify the force of their muscles. Today we leverage the power of electricity to toast our bread and power our cell phones, but relatively simply: the one-way street of power grid to ground, with no communication between devices.

ME-EM researchers are giving personal power a new voice through the Center for Agile and

Interconnected Microgrids (AIM). By moving information along with energy, and establishing secure communication between devices, homes, and even electric cars, power can be shared intelligently.

AIM researchers **Dr. Gordon Parker**, **Dr. Rush Robinett**, **Dr. Steven Goldsmith**, **Dr. Laura Brown (CS)** and **Dr. Wayne Weaver (ECE)** are developing intelligent

management protocols, so that in case of a power shortage, appliances and vehicles on the grid can communicate with one another and the main power grid to limit or prevent a shortage.

The AIM researchers use optimization, simplified models, and an exergy-based control scheme to divide up the power consumed between devices and appliances at any given time.

The motivation for interconnectedness between devices is to set power requirements based on what the devices need or can provide. In order to establish these negotiations between devices, the team is developing agent-oriented controls that will help the system harmonize its power sharing. Their research goes beyond communication between devices in the home to communication in larger, more complex microgrid systems like neighborhoods, industrial parks, and military outposts.



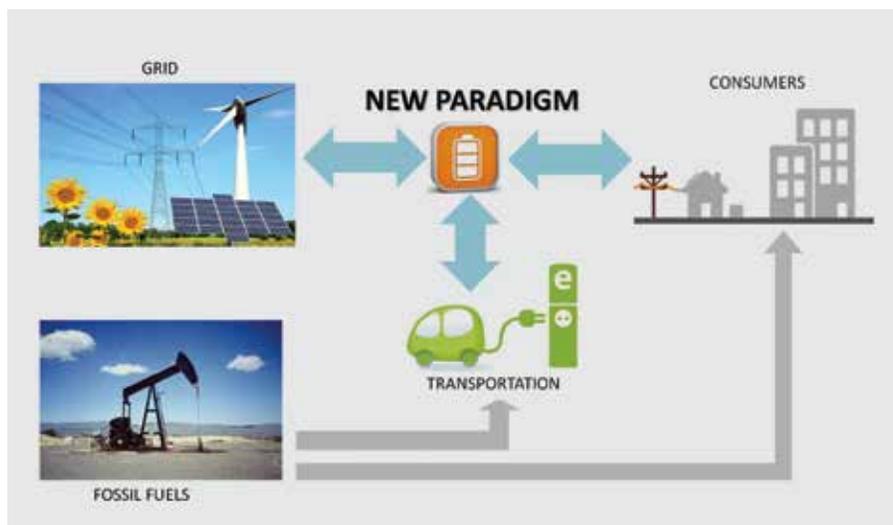
## Closing the Gap

Whether looking at powering a vehicle or powering a community, energy storage is critical. Exploring ways to integrate energy storage systems into the new paradigm of electrified transportation and microgrids is the focus of **Dr. Lucia Gauchia Babe's** research.

By studying the impact of the application on energy storage performance, aging, and product life,

Gauchia Babe hopes to be able to better design for optimal power in devices. As part of this research, she is developing analytical methods for communities to use when upgrading their energy storage systems.

The goal is to optimize the energy storage profile based on each community's environmental, technical, economic, and social needs.



Gauchia Babe is studying driving cycles and behavior to better predict vehicle performance. Her research in electrification will lead to more efficient battery usage with operational adaptability based on driving style, thus improving driver experience, battery life, and overall vehicle performance.

## LOCAL



### Powering Up; Giving Back

**COLLEEN JONES-CERVANTES '83, CHEVRON**

Advancing specifications and increased engine demands require lower viscosity lubricants formulated with a combination of premium base oils and the latest additive technology. As President of Chevron Lubricants, Colleen Jones-Cervantes ('83) leads an organization which provides innovative products that customers depend on for performance, uptime and lasting protection in commercial, industrial, marine and consumer environments globally.

Jones-Cervantes has an extensive history with Chevron, where she started immediately following graduation from Michigan Tech. She was introduced to Chevron as a project engineer and advanced through several roles to General Manager, Retail West, where she was responsible for retail sales and marketing for 3,000 Chevron and Texaco stations in the western United States. Eventually she became the Vice President of Global Marketing for the Asia Pacific region and then served as Vice-President for Product Supply & Trading.

Striving to develop young professionals through employee mentor programs is another way Jones-Cervantes impacts her community.



### Cooking Up Savings

**PAM (ROGERS) KLYN '93, WHIRLPOOL**

Evolving the products and every day appliances that help make consumers' lives easier is the focus of alumna Pam Klyn ('93) in her role as Vice President of Products and Brands at Whirlpool.

Klyn launched her career with Whirlpool twenty years ago in engineering and then transitioned into product development, global innovation, and sales and marketing roles. In her previous role she served as General Manager of Cooking Products for North America, where she was responsible for establishing multi-year business plans and product strategies, including building a new factory in Cleveland, Tennessee.

Her move up the corporate ladder was accelerated by the results achieved through a management-system approach focused on improving enterprise-wide accountability for cost-savings efforts on the small and large scale. Klyn's approach helped Whirlpool reduce internal structural costs in order to create funding for new and improved products across the portfolio.



## Gliding to Disaster Relief

Disasters can bring out the best in humanity, as the public rushes to aid those in need. In the ME-EM Department, they can also give rise to innovations.

**Dr. Nina Mahmoudian** and her team in the Nonlinear and Autonomous Systems Laboratory (NAS Lab) are developing control algorithms and tools to increase the effectiveness of response to environmental and human

disasters. Mahmoudian has developed Research Oriented Underwater Gliders for Hands-On Investigative Engineering (ROUGHIEs)—a fleet of underwater drones—powered by batteries that move through the water by adjusting their buoyancy and altitude. This feature was designed to make the autonomous underwater vehicles (AUV's) more effective in shallow waters where people and vegetation are prevalent.

Her systems use adaptive algorithms to lower deployment and operating costs, while increasing efficiency and endurance. These benefits increase the feasibility of deploying such systems to assist with wreckage searches, collection of climate change data, and contamination detection.

*Dr. Nina Mahmoudian wants to make a smarter vehicle, one that can search and make decisions on its own.*

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**ROUGHIES ARE DESIGNED TO BE MODULAR,** allowing users to swap out different components depending on what tasks the drones undertake.

## LOCAL

### Future of Fuel Cells

Reducing the carbon footprint of transportation is an important goal of several ME-EM research teams, whose approach involves advancing fuel cell technology. **Dr. Jeffrey S. Allen** is exploring two-phase capillary systems in gas flow channels, porous transport layers and catalyst layers to better manage fuel cell by-products.

Allen's research team is characterizing how water moves through the small channels and porous layers that distribute hydrogen and air to the fuel cell catalyst. To study water's behavior at micro and nanoscales, Allen's team has developed a high-speed microscopy technique that is paired with a mathematical model to predict how the water will behave in the cell. Water can be harmful to the catalyst and decrease future performance, shortening the lifespan of the system.

By examining the capillary forces driving the motion of the water, they hope to improve the management of by-products and improve the commercial viability of fuel cells in stationary and mobile environments.



*Dr. Jeff Allen and his team are working to improve the optimization methods of a new class of fuel cell catalysts.*



### Plugging In for Power

Bending the carbon curve in transportation is being achieved, in part, through electrification. ME-EM researchers are investigating technologies that reduce vehicle fuel consumption, including Hybrid Electric Vehicles (HEV) and Plug-In Electric Vehicles (PEV).

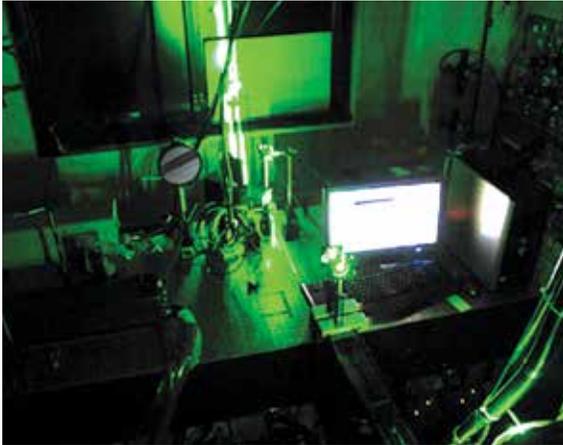
Extending the life of the battery and optimizing fuel economy through

battery performance analysis is the focus of **Dr. Bo Chen's** research.

To date, most battery models cannot predict capacity and power fade for lithium-ion battery packs. To advance the battery control, her research team has integrated a physics-based Li-ion battery model into an HEV simulation system. The team can

analyze HEV systems through hardware-in-the-loop simulation and test environments to measure real vehicle battery charge and discharge profiles under various temperature conditions.

Through optimization of fuel economy and improvement to battery life, Chen is paving the way for future electric and hybrid vehicles.



**DR. SEONG-YOUNG LEE'S LASER DIAGNOSTICS** setup for Mie scattering and PIV measurement in a combustion vessel.

## Clean Combustion Investigation

While electric and hybrid vehicles remain under development and the power grid prepares to support them, ME-EM researchers are also focused on reducing pollution and increasing efficiency of the next generation of engines. Selecting the optimal technology for controlling combustion with alternative fuels offers the promise of reduced emissions.

Research on advanced engine combustion by **Dr. Seong-Young Lee** is conducted in collaboration with several research laboratories investigating clean combustion and efficient power generation. His research explores renewable and alternative fuel spray combustion and plasma-assisted combustion. Lee's analysis employs chemical reaction models, computational fluid dynamics, and advanced laser-based techniques with the Engine Combustion Network at Sandia National Lab, Istituto Motori-CNR in Italy, the Army Research Laboratory, and Politecnico Di Milano in Italy.

The results from Lee's research could lead to improved air quality, decreased air pollution, and thermal efficiency to meet the growing demand for clean combustion and power generation.

*Developing renewable fuel sources optimized for each engine application is the focus of Dr. Scott Miers' research.*

## Enhancing Small Engines with Biofuels

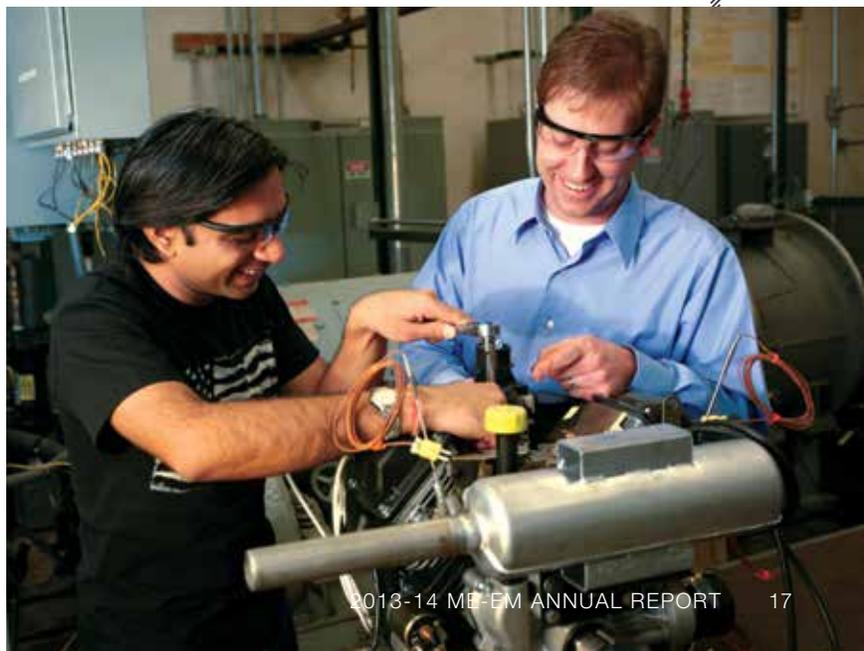
The rise of biofuels as a renewable energy source has expanded beyond its use as an automotive fuel and is becoming a green energy source for smaller forms of transportation, including snowmobiles, all-terrain vehicles, and even lawn equipment.

**Dr. Scott Miers** is examining the feedstock fatty acid profiles of alternative diesel fuels and various alcohol structures in alternative gasoline fuels to develop solutions optimized for each specific engine application. By targeting a particular use, the fuel chemistry can be "tuned" to result in higher efficiency with less pollution.

Historically, properties of alternative fuels, such as biodiesel, have been matched to petroleum fuel properties without capitalizing on the unique opportunities biodiesel

has to increase engine performance in each situation. To study these new fuels, Miers employs a Fourier transform infrared spectrometer emissions analyzer to measure the impact of biofuel properties on engine-out emissions and determine how these relate to the source feedstock.

Miers and his research team conduct stationary dynamometer tests in a dedicated engine laboratory but they also collect valuable information from recreational vehicles while traveling over the snow using a specially-designed sleigh that is towed behind the vehicle. While there likely will never be a perfect fuel available, Miers believes the future of transportation energy will be a suite of fuels to satisfy a variety of applications.



## LOCAL



### Controlling Chaos

Our energy portfolio for power generation and transportation continues to rely heavily on fossil fuels with existing and new alternative fuel pathways a critical course forward.

As center director of Advanced Power Systems Labs, **Dr. Jeff Naber** and his team work with industry and federal agencies that are focused on improving utilization and/or replacing fossil fuels for both power and transportation. Working closely with industry to increase efficiency and reduce emissions enables Naber's research team to have an immediate impact. His research activities include an industrial Diesel Aftertreatment Consortium with OEM's working with suppliers to develop methods to further reduce exhaust emissions from medium-and heavy-duty vehicles. Additional research related to new fuel systems for natural gas applications and advanced combustion and control systems for engines is also underway.

This work extends far beyond the laboratory with the results being integrated into vehicles. It also directly impacts University courses in advanced hybrid vehicles and engines. Through the Michigan Tech Mobile Lab, Naber and his team also have the opportunity to impact incumbent engineers via short courses and future engineers through K-12 outreach.

*Research conducted at APS Labs with support from industry partners enables Dr. Jeff Naber to find a path forward exploring alternative fuel options.*



## Driving for Success

### DOUG PARKS '84, GENERAL MOTORS

Changing fuel consumption, monitoring energy usage, and enhancing safety are the focus of hybrid vehicle manufacturers around the world. Doug Parks ('84) achieved those goals while working on the Chevy Volt at General Motors as the Global Vehicle Line Executive and Chief Engineer for Global Electric Vehicles.

For the Chevy Volt, Parks was responsible for maintaining product quality and remaining on budget in both the engineering and manufacturing processes, while also working through challenges to establish the Voltec propulsion system—the first system of its kind produced in the industry. His experience with the vehicle product line at GM ranges from the Chevrolet Cobalt to the Pontiac Solstice.

Following graduation from Michigan Tech, Parks joined GM as a tooling engineer before being appointed chief engineer. Today, he serves as Vice President of Product Programs, where he supervises twelve executive chief engineers who each operate their own product program from inception to production.

## Storing the Future

### ANTHONY RAIMONDO '62, BEHLEN MANUFACTURING

Getting food commodities from the field to the dinner table requires the dedication of an entire industry. Transportation of food is visible as trucks, trains, and freighters move across the landscape. But between the harvester and the distribution system comes the less dynamic, but no less important, aspect of the human food web: storage. Anthony Raimondo ('62) has built his career designing food storage systems

at Wickes Corporation and later at Behlen Manufacturing Company.

Raimondo started out at Wickes as General Manager in 1982 and led the successful buy-out of Behlen Manufacturing in 1984, where he became Chairman and CEO. Specializing in the manufacturing of pre-fabricated buildings, grain bins, silos, and grain dryers, the storage systems have handling capabilities for corn,

oilseeds, rice, wheat, and coffee beans to ensure that producers have the optimal system to store their products.

Today, the company thrives in the storage industry by delivering systems that surpass the growing food and energy needs of people worldwide and by ensuring that the raw ingredients for tomorrow's meals are properly stored today.



# Human-Centered ENGINEERING

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...on a **GLOBAL** level

**OUR FACULTY AND STUDENTS  
IMPACT THE SYSTEMS**

that span our nation, the globe, and even into space: reducing emissions from power plants, optimizing wind turbine designs, and plotting an ideal path to orbit.

**FEATURED ALUMNI**

- Melissa Marszalek '01
- Merrily Madero '85
- Paul Rogers '04

## GLOBAL

**EVEN ON A GLOBAL SCALE,**  
ME-EM research remains human-centered,  
with the goal of improving the human condition.



### Torrefied-Biomass as a Clean Replacement for Coal

There has been a push for power companies to incorporate renewable fuels into their portfolios, which often means retrofitting existing facilities to operate with the new energy source. Through research by **Dr. Ezra Bar-Ziv**, the retrofitting may not be required.

Bar-Ziv and his research team have developed a fuel—torrefied-biomass or simply, biocoal—that can be used as a drop-in fuel, producing clean and green electricity with a performance that is similar to coal, but without the associated high emissions from NO<sub>x</sub>, SO<sub>x</sub>, PAH, mercury, and CO<sub>2</sub>.

Using his expertise, Bar-Ziv oversaw the design and construction of an industrial facility at the 600MW Boardman Coal Power Plant of Portland General Electric that is producing 8,000-10,000 tons of biocoal for a 100 percent test burn in April 2015.

**BAR-ZIV AND HIS TEAM FURTHER EXPLORE THE TORREFACTION PROCESS** to convert municipal solid waste to biocoal in the APS LABS on the Michigan Tech campus.

## Helping Over the Horizon

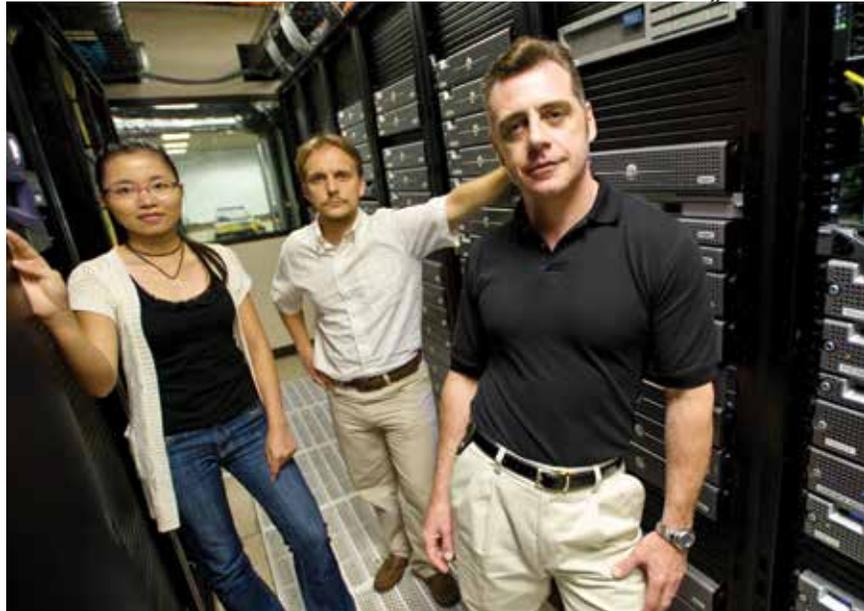
As renewable energy sources are pushed to the forefront by power companies, wind is being explored to a greater extent as an alternative energy source.

Power companies face issues with wind energy because the development of the blades is an involved process, requiring highly skilled workers. Beyond blade creation, the transportation of the huge blades and installation out in the field is an expensive operation.

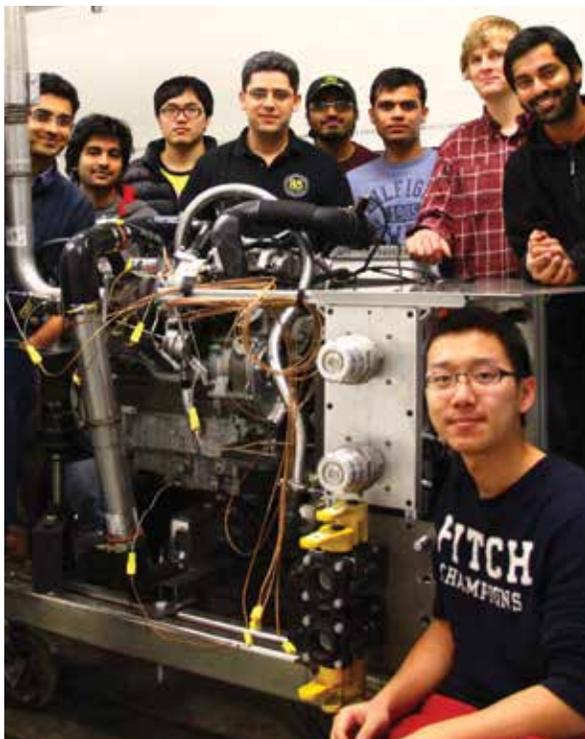
These are all problems **Dr. Fernando Ponta** is working to resolve, but introducing a new blade design into the market is often controversial because of the aerodynamic response. Under certain conditions, turbines can undergo strong harmonic oscillations and self destruct, leading to a conservative culture for wind energy investments.

To effectively address the industry push-back, Ponta and his team are developing a virtual environment to test blades under controlled, full-scale conditions. Using this system, he and his team have been reviewing their own segmented-blade design with the goal of mass production at a lower cost.

Ponta hopes that by using this virtual tool, others in the field will be able to introduce new options that solve the industry's existing problems in design, manufacture, transportation, and installation.



*Dr. Fernando Ponta hopes to design a wind turbine blade that is more cost effective to produce, install, and operate.*



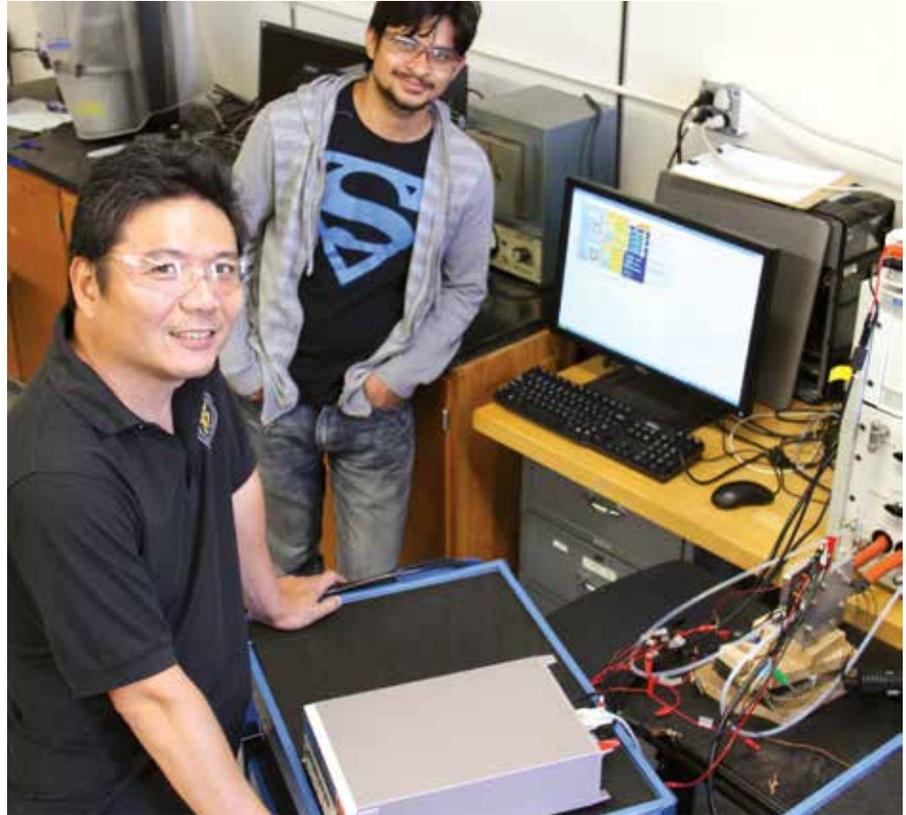
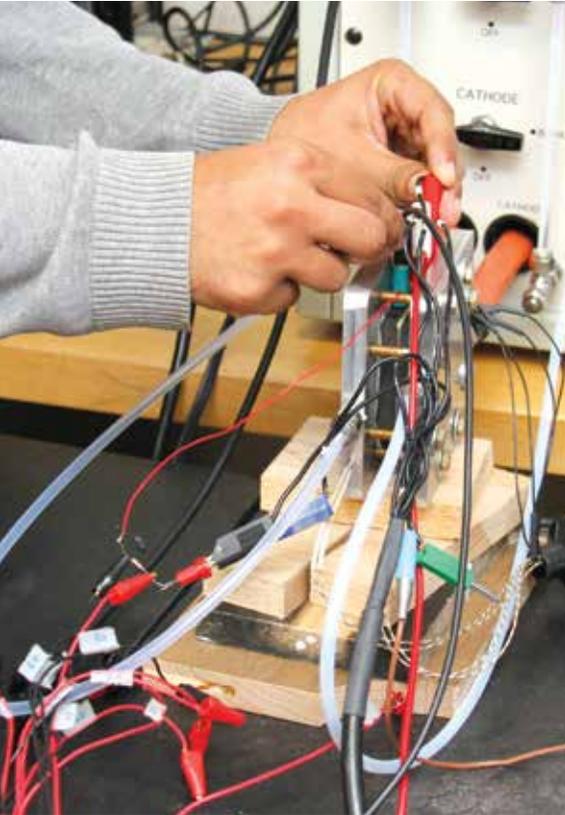
## Innovative Combustion

The reduction of fuel consumption and CO<sub>2</sub> greenhouse gas emissions is an area of crucial global impact, and a driver of innovation for ME-EM researchers investigating low temperature combustion regimes.

**Dr. Mahdi Shahbakhti** and his team combine both experimental and theoretical techniques to effectively blend the characteristics of gas and diesel engines, resulting in high efficiency, low emission operations. The team has built an operational engine using the effective pre-mixing of fuel-air at the intake ports with the compression-ignition approach of diesel engines to achieve a high efficiency, low CO<sub>2</sub>, low soot, and low NO<sub>x</sub> emission engine.

Shahbakhti also turns to technology from reactivity-controlled compression ignition and homogenous charge compression ignition to efficiently operate the system. The models being developed by Shahbakhti and his team will be used to enhance within-cycle or next-cycle combustion control strategies, leading to cleaner burning engines in the future.

## GLOBAL



*Investigating the multiscale transport of thermo-fluid systems, Dr. Kazuya Tajiri aims to bring clean energy to society.*

### **MEASURING CURRENT DENSITY DISTRIBUTION**

in the land channel direction of a submillimeter-scale PEM fuel cell.

### Characterization of Fuel Cells

Beyond applications in automobiles, proton exchange membrane (PEM) fuel cell technology has global impact with potential usage in data centers and communication systems. **Dr. Kazuya Tajiri's** research focuses on the liquid water in PEM fuel cells. His goal is to develop a fuel cell with enhanced performance and longer life.

Water produced in a PEM fuel cell must be removed from the system before it can cause problems with power reduction. To analyze the amount of liquid accumulated within fuel cell flow channels, Tajiri's team uses the pressure drop of channel flow as a diagnostic tool. His team has developed a new design and fabrication method to combat non-uniform current generation in the land-channel direction of PEM fuel cells. Through proven testing, Tajiri's new method is capable of resolving the local current generation and is now used for diagnostics in various situations.

Tajiri's research will aid in the development of fuel cell models and their design optimization, bringing society one step closer to the promise of clean energy.

## Propelling the Future

### MELISSA MARSZALEK '01, BOEING

From business trips to dream vacations and honeymoons, people rely on a range of transportation options, including automobiles, trains, and airplanes. Melissa Marszalek ('01) has contributed to each of these industries as a highly versatile mechanical engineer.

Her background in engines and propulsion at Boeing was complemented by her initial career experiences

with Caterpillar as a Commercial Engine Service Representative and in the Engine Development Group within the Electro-Motive Division of General Motors, which produces diesel engines for locomotives. She joined Boeing as a weight engineer on the 787 program in 2006 before shifting to Project Engineering for the Propulsion organization on the 787 program at Boeing.

Marszalek is currently a manager in Boeing Research and Technology's Manufacturing Technology Integration organization, where she leads the development team of the Fuselage Automated Upright Build technology process implementation. This represents the first major change in how Boeing assembles fuselages since the early 1950s and will save significant assembly flow time.



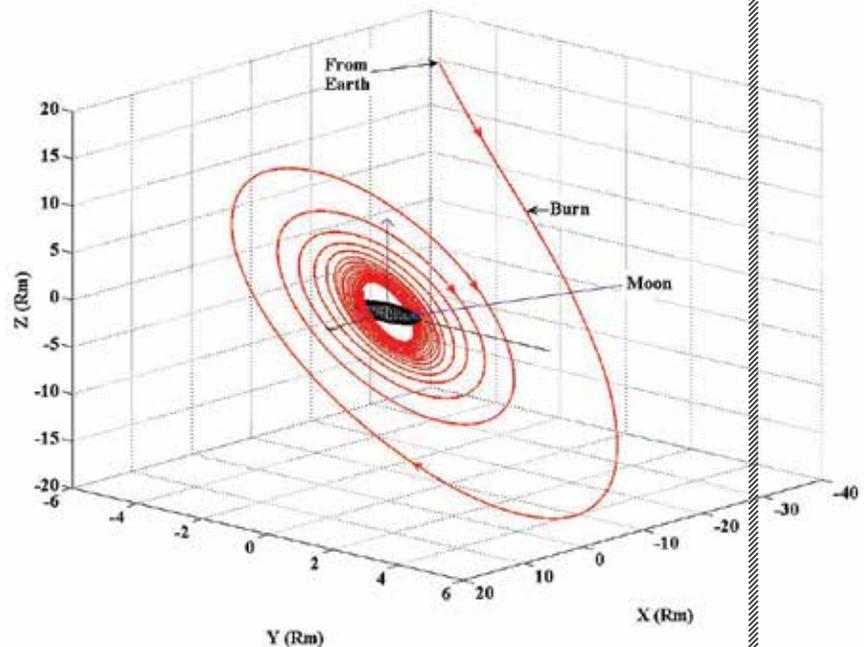
Marszalek has also held management roles within Boeing Commercial Airplanes' Product Development and Propulsion Engineering technology groups.

## Deep Space Maneuver Optimization

Images of spacecraft approaching an asteroid or the lunar surface captivate and inspire young people to consider careers in science, technology, engineering, and mathematics (STEM). But a rendezvous in space hinges on spacecraft trajectory planning and optimization.

**Dr. Ossama Abdelkhalik** develops plans for spacecraft positioning in situations where large asteroids pose a threat to the global environment. Beyond asteroid threat mitigation, spacecraft trajectory optimization is also necessary for all major space missions and is challenging because of the numerous variables involved.

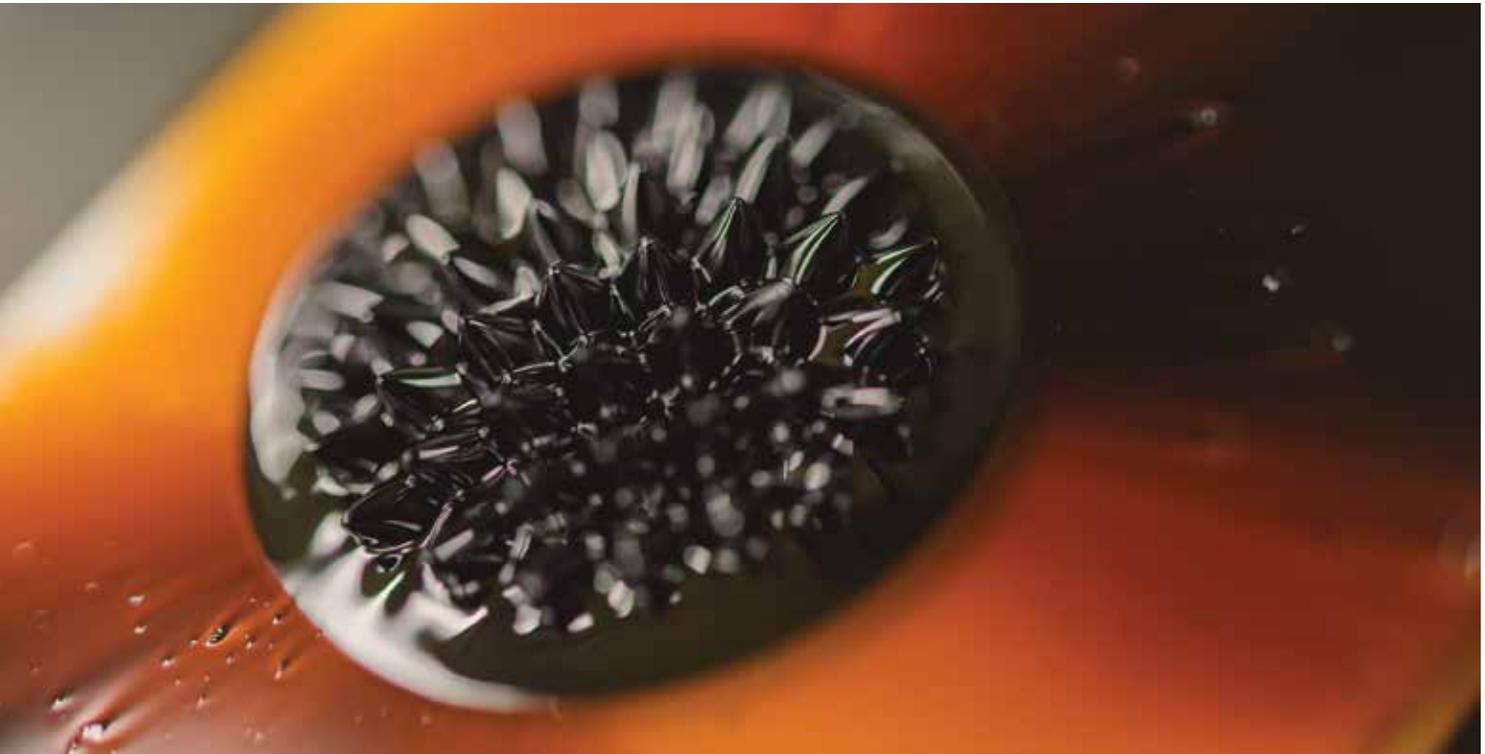
Abdelkhalik uses complex algorithms to determine the number of swing-bys, the optimal launch and estimated arrival dates, the number of deep space maneuvers, and the spacecraft's location and direction. This information is then utilized by Abdelkhalik's research team to determine the most efficient route for these spacecraft, thereby reducing weight, minimizing fuel usage, and lowering cost.



*Dr. Ossama Abdelkhalik helps reduce costs for deep space missions.*

**A LUNAR-CENTRIC PLOT** of a research satellite's optimized path to orbit minimizes the fuel required for the mission.

## GLOBAL



### Threading the Liquid Needle

Nanosatellites are in orbit around the Earth to perform data collection tasks for agencies such as NASA and the Department of Defense. Because of their small size, nanosatellites can easily accompany a rocket headed into space to deploy a larger spacecraft. Once in space, nanosatellites can accomplish more demanding missions if they have some means of on-board propulsion to

move them around and to change orbits to meet evolving needs. In the past, these maneuvers were accomplished with tiny ion thrusters constructed from microscopic hollow needles that are expensive to manufacture, fragile, and unreliable over time.

**Dr. L. Brad King** and his team are developing an alternative micro ion thruster using ionic liquid ferrofluids which consist of

magnetic nanoparticles dispersed in a liquid salt. The liquid shape can be manipulated with magnetic and electric fields, inducing an array of peaks, each of which emits a tiny beam of ions imparting a reactive thrust to the nanosatellite. Because the peaks are formed entirely out of propellant, they do not erode with use and retain their efficiency over time.

*Dr. L. Brad King uses ionic liquid ferrofluids to propel nanosatellites through space.*

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**IONIC LIQUID FERROFLUID PARTICLES** follow an electromagnetic interference pattern resulting in permanently sharp ion thrust emitters.

## Breakthrough Thermal and Power Systems Technologies

In aerospace and electronics, mass is an opponent of engineers, and development of advanced electronic-cooling, avionics-cooling, and spaced based operations is hindered by low heat removal rates, high pressure drops, and device- and system-level instabilities. To overcome these challenges innovation is underway in the ME-EM Department for shear dominated boiler and condenser operations to allow extremely high wattage density heat removal. This will, in turn, lead to lighter portable electronics, aircraft, and space systems.

**Dr. Amitabh Narain** and his team have proposed enabling breakthroughs based on fundamental fluid-physics-based experimental discoveries for boiler and condenser operations.

A key innovative procedure introduces passive recirculating vapor flows within the devices. This controls the flows and ensures that very stable boiling and condensing flows occur in a manner where a thin liquid film flow, typically 0.5 mm thick, covers the entire heat-exchange surface.

A second innovation is the introduction of large, amplitude waves through controlled resonant pulsations in the liquid film, leading to a 200-1000 percent enhancement of the heat removal rates.

Even large, industrial-scale boiler operations can benefit from these innovations as the next generation combined cycle (or related) electric power plant technologies are developing towards producing electricity in more efficient and sustainable ways.

*To meet industry challenges,  
Dr. Amitabh Narain has  
developed innovative solutions  
to address boiler operations.*



## GLOBAL



### Leading In Any Situation

#### **COLONEL MERRILY MADERO '85, UNITED STATES AIR FORCE**

Colonel Merrily Madero ('85) has been using the problem solving skills she initially learned as a mechanical engineering student at Michigan Tech to solve problems around the world.

Recently she was awarded the Bronze Star Medal for leading the Military Liaison unit at the US Embassy in Kabul, Afghanistan during multiple attacks. She also supported the US Embassy during fifty-three outside-the-wire missions in twenty different provinces throughout Afghanistan, bringing military support to numerous reconstruction and aid projects. She was the first Colonel to receive the US State Department's Meritorious Honor Award for her nearly thirteen months serving at the US Embassy, Kabul, Afghanistan.

Madero was selected to lead Air Force Space Command (AFSPC) through one of the largest force drawdowns, as the Director of Manpower, Personnel and Services. She also led the AFSPC Senior Steering Group to completely reorganize the AFSPC headquarters to most efficiently absorb significant personnel cuts and maintain their current critical space and cyber mission.

## Tracking Danger

**PAUL ROGERS '04, UNITED STATES ARMY**



Developing and transitioning game-changing ground system capabilities for the United States Army and Department of Defense remains the mission of the engineering and technology experts at the US Army Tank Automotive Research, Development and Engineering Center (TARDEC).

Paul Rogers ('04) leads a team of nearly 1,700 engineers, scientists, researchers, and support staff to ensure our soldiers and Marines are equipped with the most

technologically advanced manned and unmanned ground systems in the world. As TARDEC Director, Rogers is accountable for the strategic direction of investments that impact more than 270 Army vehicle systems with an annual budget of \$475 million.

In order to ensure the global impact of the Army—where ground systems can operate effectively in any location and in any environment around the world—Rogers promotes a culture of collaboration and innovation and leverages the talents of government, industry and academic partners. Rogers also remains a student in the field by seeking out new knowledge, ideas, and experiences, while promoting Science, Technology, Engineering, and Mathematics (STEM) to youth.



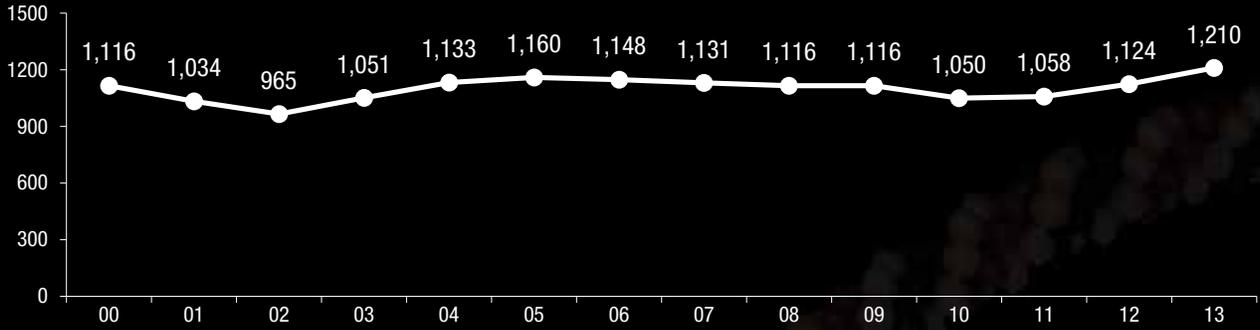
*“STEM education is very important to the future success of our nation and crucially important to TARDEC.”*

—Paul Rogers, United States Army

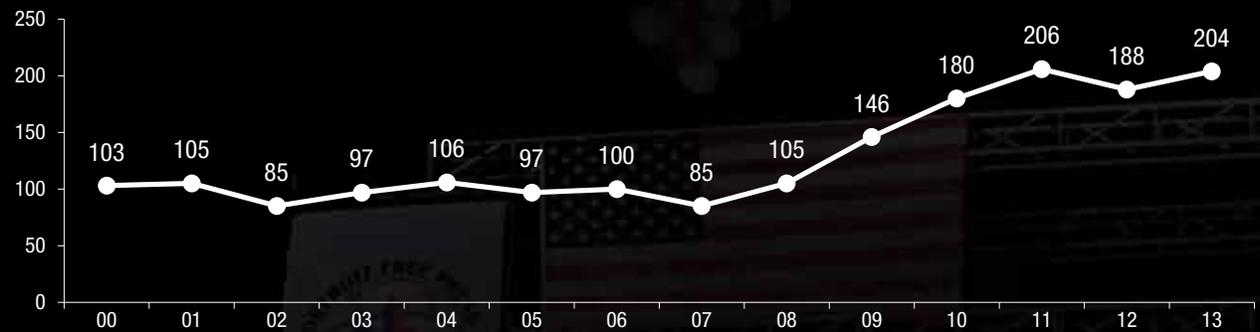
# ME-EM ENROLLMENT

*NOTE: In a few cases, the BS enrollment data shown below differs from past publications because the official final enrollment data is only available after this publication goes to press.*

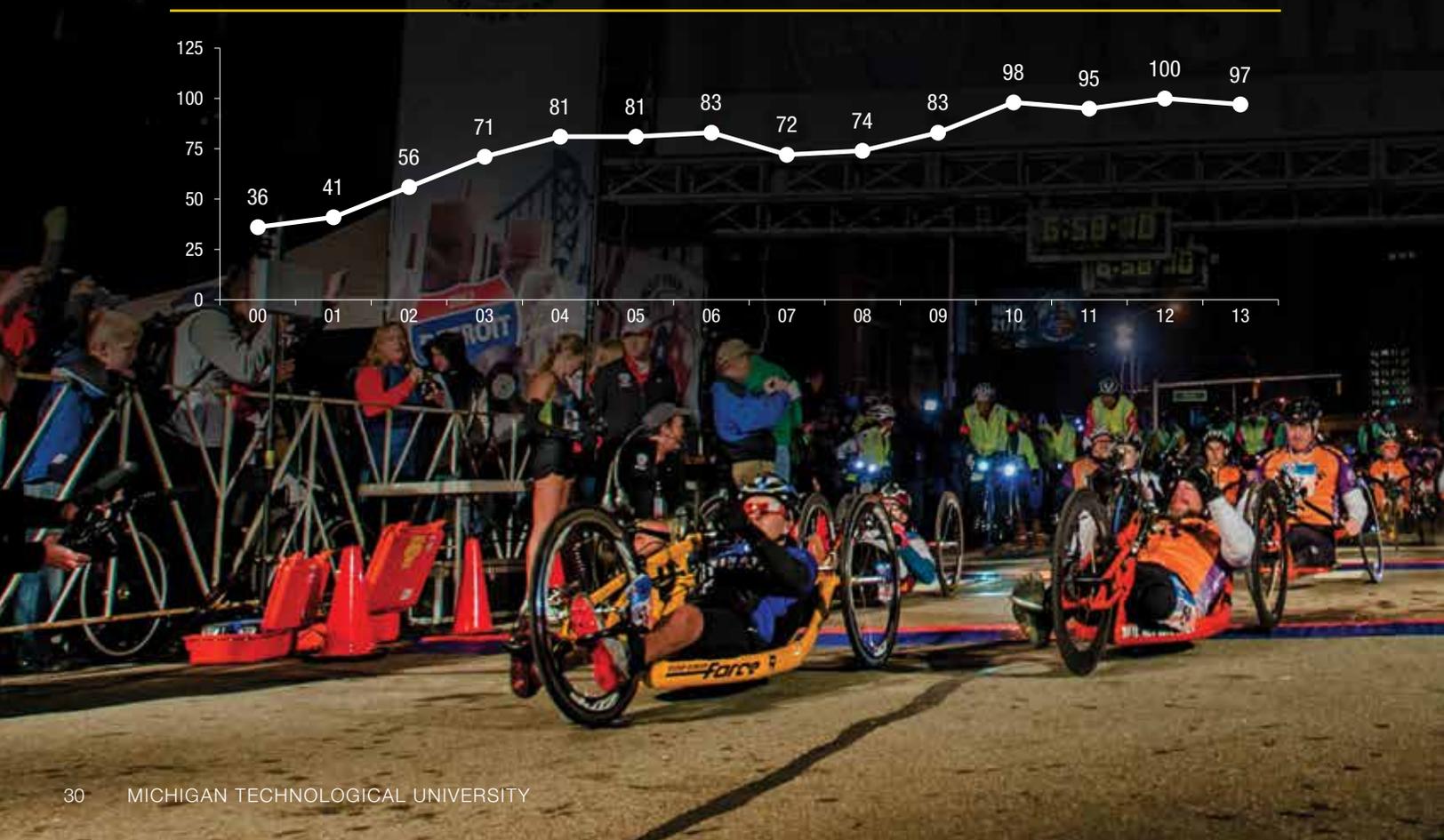
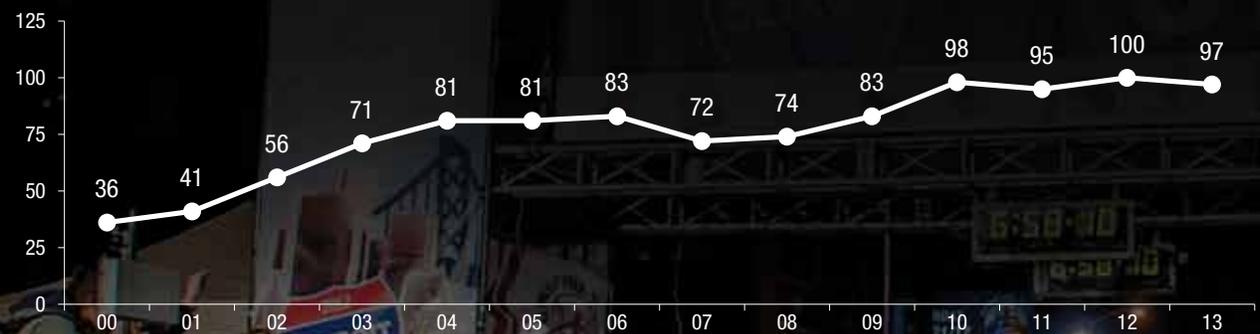
## BS ENROLLMENT



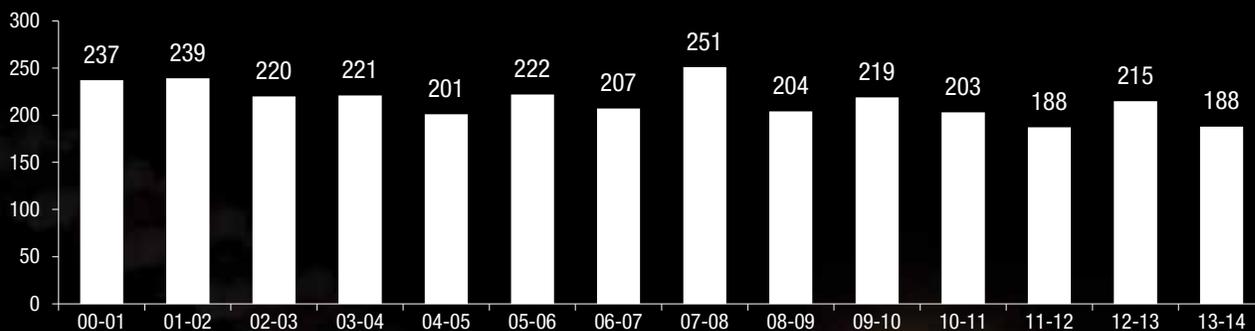
## MS ENROLLMENT



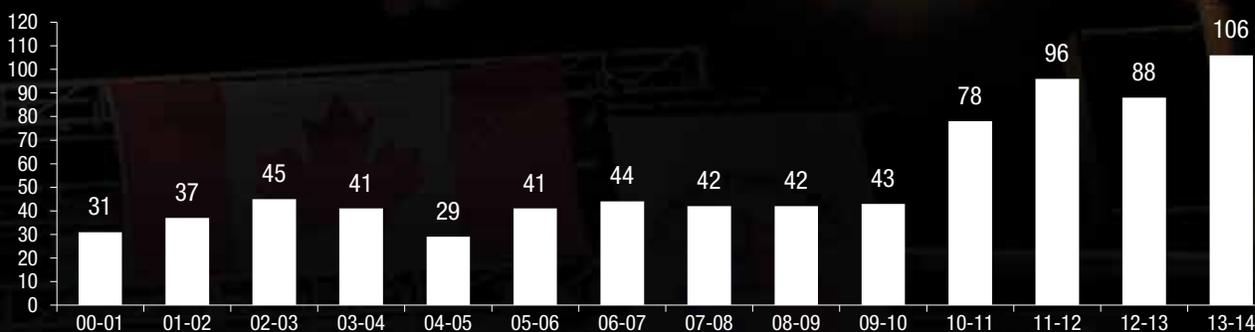
## PHD ENROLLMENT



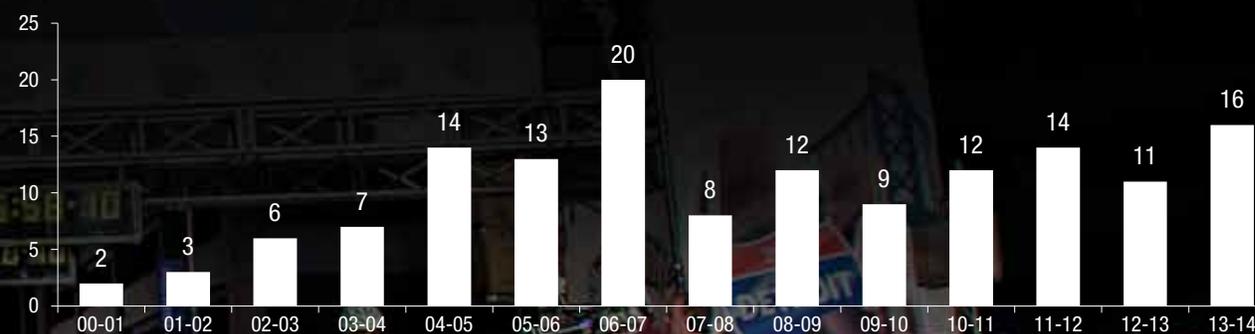
## BS DEGREES



## MS DEGREES



## PHD DEGREES





**EDUCATION IS THE MOST POWERFUL WEAPON WHICH YOU CAN USE TO CHANGE THE WORLD.**

— Nelson Mandela

## EXTERNAL SPEAKERS

### **Cord Christensen and Ryan Hayes,**

Arctic Cat, *Arctic Cat Snowmobile Engine Discussion*

**Dr. Samveg Saxena,** Lawrence Berkeley National Laboratory, *Powertrain Technologies for a Climate Constrained World: Advanced Engines, Vehicle Electrification and Vehicle-Grid Integration*

**Dr. David Harvey,** Ballard Power Systems, *Challenges, Opportunities, and Open-source: A perspective on Fuel Cell Simulation for Performance and Durability*

**Dr. Edgar Choueiri,** Princeton University, *3D Audio*

**Dr. Andrea Mammoli,** University of New Mexico, *Turning Power Distribution Feeders into Microgrids: Challenges & Opportunities*

**Dr. David Garren,** Naval Postgraduate School, *Signatures of Surface Moving Targets within Synthetic Aperture Radar Imagery*

**Dr. William de Ojeda,** Navistar, *Relevant Research Areas in Heavy-Duty Engines*

**Dr. Robert Prucka,** Clemson University, *Automobile Engine Control and Calibration Strategies to Address Future Fuel Economy Standards*

**Dr. Partha Mukherjee,** Texas A & M University, *Mesoscale Perspective of Electrode Physics in Energy Storage*

**Dr. Frank Kulacki,** University of Minnesota, *Cooling of Embedded Electronics—Flow Boiling is the Key to High Power Density*

**Dr. Samveg Saxena,** Lawrence Berkeley National Laboratory and the University of California at Berkeley, *Fundamental Phenomena Affecting Low Temperature Combustion Engines High Load Limits & Strategies for Extending These Limits*

**Dr. Anna G. Stefanopoulou,** University of Michigan, *Control of Powertrain Systems at the High Efficiency Limit*

**Bashar AbdulNour,** General Dynamics Land Systems, *An Engineering Insight into Modern Product Development*

**Dr. Chang-Hwan Choi,** Stevens Institute of Technology, *Bioinspired Nanoengineering of Multifunctional Surfaces*

**Dr. Joshua Otaigbe,** University of Southern Mississippi, *New Inorganic Glass/Organic Polymer Hybrid Materials with Improved Properties—Current Status and Future Prospects*

**Dr. Cornel Sultan,** Virginia Tech, *Guaranteeing Accurate Decoupled Approximations Via Structural Design*

**Dr. Fumin Xhang,** Georgia Institute of Technology, *Control and Sensing Co-Design for Maritime Robotic Sensor Networks*

**Dr. Brandon T. Cesul,** US National Air & Space Intelligence Center, *Space Engineering for the Department of Defense*

**Dr. D.H. Shin,** Chung-Ang University, *Wettability Changes and Fringe Patterns of Contact Lines due to the Local Aggregation Effect on Nanofluids Droplets during Evaporation*

## MICHIGAN TECH SPEAKERS

**Dr. Lucia Gauchia Babe,** ME-EM Assistant Professor, *From the Lab to Your Car: Challenges that Batteries Face during Design and Development*

**Dr. Steven Walton,** Assistant Professor, Department of Social Sciences, *Engineering the Past: Using Modern Engineering to Understand Historical Technologies*

**Dr. Antonio Gauchia,** ME-EM Visiting Researcher, *Finite Element Modeling of a Real Bus Structure: Effect of Electrified Powertrain*

**Dr. Gregory M. Odegard,** ME-EM Associate Professor, *Overview of Presentation Guidelines*

**Jeremy Worm,** ME-EM Research Engineer and Instructor, *Hands-On Education with the Michigan Tech Mobile Lab*

**Evandro Ficanha,** ME-EM PhD Student, *Ankle Impedance and Ankle Angles During Step Turn and Straight Walk: Implications for the Design of a Steerable Ankle-Foot Prosthetic Robot*

**Dr. L. Brad King,** ME-EM Professor, *Advanced Space Propulsion Research at Michigan Tech*



## ORDER OF THE ENGINEER

FALL 2013

**Timothy P. Coffield**

Founder/VP Product Development,  
Cidia Product Development

SPRING 2014

**Lee Ann Rouse**

President and CEO,  
Omni Tech International Ltd.

## GRADUATE STUDENT FELLOWSHIPS

SUMMER 2013-SPRING 2014

**David Diesenroth**

NSF East Asia and Pacific  
Summer Institute Fellowship  
NSF Graduate Research Fellowship

**Xiaobao Geng**

Finishing Fellowship

**Gregory Hardy**

NSF Graduate Research Fellowship

**Bryan Steinhoff**

Dean's Fellowship

**Andrew Willemsen**

Finishing Fellowship

**WHOEVER CEASES TO  
BE A STUDENT HAS  
NEVER BEEN A STUDENT.**

— George Iles



## SUMMER 2013 (7)

Thomas Walter Daavettila  
 Michael Gardner Houghton  
 Le Lin  
 Yidan Lou  
 William Robert Lustig  
 Nathan Robert Wells Morris - Cum Laude  
 Luka Stupar

## FALL 2013 (68)

Jerry Lee Aeschliman  
 Jake L Albertson  
 Trent A Alexander  
 Benjamin Thomas Allard  
 Ian Thomas Bader  
 Evan T Biers - Magna Cum Laude  
 Tyler N Blumke  
 Scott Eric Boggess  
 David Martin Brown Strange  
 Daniel B Cartwright  
 Carly Elizabeth Charlier -  
 Magna Cum Laude  
 Trevor Alan Clearwater  
 Victor Imarogbe Condelee  
 Gregory Adam DeJong -  
 Magna Cum Laude  
 John Henry Dietz  
 Tyler John Ebben  
 David Edward Flint  
 Dominic Martin Frankini  
 Peter Jon Garfield - Cum Laude  
 Ashley Margaret Gough  
 Mark Arthur Graham - Cum Laude  
 Erik Arthur Gustafson  
 Neil P Hagerty  
 Keith John Halonen

Nicholas Joseph Harris - Cum Laude  
 Sarah Ann Hicks  
 Kristin Marie Horn  
 Cory Michael Jackovich  
 Colin M Johnston  
 Ashley Laurel Kerschen  
 Aaron Leigh King  
 Sean Warren Koski  
 Chad D Kromrey  
 Jordan Thomas Ledvina - Cum Laude  
 Jill Leslie Lemmer  
 Shawn Robert Lesko  
 Jacob R Liimatta  
 Benjamin Russell Mansfield  
 Kyle Scott Mentink - Cum Laude  
 Young Bin Na  
 Michael A Norland  
 John Robert Nowalski  
 Elizabeth A Nunn - Magna Cum Laude  
 Timothy Joseph Okkema - Cum Laude  
 Nicholas N Orlando  
 Jacob L Pederson  
 Jacob Andrew Pleshe  
 Eric A Pointer  
 Richard J Poljan  
 Joshua Kane Quintel -  
 Magna Cum Laude  
 Cory Jon Sarago - Cum Laude  
 Lauren Elizabeth Schaffer  
 Jacob Alan Schaub  
 Jeremy James Schnell - Cum Laude  
 Joshua P Schumaker  
 Cabot Michael Seguin - Cum Laude  
 Tyler James Sierakowski -  
 Magna Cum Laude  
 Gregory Francis Smolucha

Robert J Thomas  
 Dylan Thomas Truskolaski -  
 Cum Laude  
 Coty Drake Van Lannen  
 Meet Jagdishkumar Vasani  
 Eric J Volk  
 Steven Robert Weidt  
 Cole Anthony Welch  
 Nathan Thomas Wilder  
 Wesley Dean Woodhouse -  
 Magna Cum Laude  
 Jennifer Michelle Zarzecki

## SPRING 2014 (113)

Lina Amal Al-Omari -  
 Magna Cum Laude  
 Ethan Gregory Archambault  
 Caleb Scott Bauer  
 John G Bennett  
 Clayton T Bethke  
 Alec Edward Bolthouse -  
 Magna Cum Laude  
 Brian A Boyce  
 Collin M Brown  
 Margaret A Brunette - Cum Laude  
 Brady Russell Burby  
 Jaclyn Marie Burtka  
 Michael Peterson Carey -  
 Cum Laude  
 Daniel Nathan Carpenter  
 Timothy Kainz Reaume Cencer -  
 Cum Laude  
 Brock Adam Chiamulera -  
 Cum Laude  
 Nicholas James Christenson  
 Alisha Ryan Clark  
 Steven Joseph Clark  
 Tyler Lee Cohoon



**PLAY IS THE HIGHEST  
FORM OF RESEARCH.**

—Albert Einstein

William John Cretens -  
Magna Cum Laude  
Benjamin Michael Damschroder  
Sarah Maureen Daniels - Cum Laude  
Matthew A Dazell  
Zachary Christopher Denault  
Amit Shyam Dhedia  
Chad Patrick Dickenshied  
Benjamin Edward Dion  
Jeff William Dunstan  
Kyle David Feldpausch  
William M Fick  
Matthew T Frantz - Cum Laude  
Timothy Michael Frasier  
Thomas R Gruber  
Christian James Haiss -  
Magna Cum Laude  
Gregory Dwayne Hardy  
Ashley Dee Haren - Cum Laude  
Ryan Jonathan Hess  
Alison Lynn Hilditch  
Derrick D Hilliker  
Bryan Christopher Hughes  
Adam Matthew Jacobson  
Sumit Abhay Jaripatke  
Binxin Jiang  
Bradley Paul Johnson  
Mark William Johnson  
Kraig A Kadletz  
John James Keepers  
In Kyoung Kim  
Cody J Kippenhan - Cum Laude  
Michel David Knudsen - Cum Laude  
Jon Marcus Knutson  
Andrew Thomas Komurka -  
Summa Cum Laude

Austin William Korfhage  
Matthew Edward Kowalkowski  
Ryan Marshall Legato -  
Magna Cum Laude  
Daniel Jonathan Leppek - Cum Laude  
Michael Robert Leveille - Cum Laude  
Zhe Liu  
Matthew James Ljung  
Devin William Loeks - Cum Laude  
Jon Gregory Loesche  
Nicole Lynn Maggi  
Robert Michael Matthews -  
Magna Cum Laude  
Alan Richard Mattson -  
Magna Cum Laude  
Rachael Nicole McFarland  
Brandon Harvey Miller  
Jeremy J Moseley  
Mark A Nettell  
Andria Rae Nyenhuis -  
Magna Cum Laude  
Matthew M Oestreich  
Justin Matthew Osterhout  
Travis Richard Pennala  
Eric Wayne Phillips  
Earl Joseph Plimpton  
Andrew Scott Pospychala  
Tylor Crane Rathsack -  
Magna Cum Laude  
Max L Rebottaro  
Andrew James Reed  
Gregory David Reed  
Michael John Rinke  
Evan Michael Rosemore  
Kristi A Ross - Magna Cum Laude  
Steven Robert Saliga -  
Magna Cum Laude

Dustin Frank Scherr  
Becky Sue Schlak  
Zachary Scott Schneider  
Andrew Phillip Shaw  
Tyson George Shink  
Ritik Singh  
Rachel Rose Smith  
Jameson Robert Smits  
Jacob Strack  
David J Strobel  
Oskar Jacob Strojny  
Matthew Joseph St uut  
Jocelyn Louise Tervo -  
Summa Cum Laude  
Brent Michael Thoun - Cum Laude  
Jordan Dean Tobey  
Jennifer Marie Town  
John Thomas Troost  
Shawn Lowell Troyer  
Derek J Turner  
Daniel John VanAlstyne  
Joseph Keith Venier  
Kyle Gerrit Ver Hoef - Cum Laude  
Christian Chase Vreeland  
Jaymes Matthew Wainright -  
Summa Cum Laude  
Caleb Edward Walk  
Bethanie Marie Wojey  
Nathan M Wolak  
Jay Donald Woodbeck -  
Magna Cum Laude  
William S Yahr  
Ming Zhang



## SUMMER 2013 (23)

### Agashe, Pushkar

Advisor: Bo Chen

*Model-Based Design and Hardware-in-the-Loop Simulation of Internal Combustion Engine Control Systems*

### Chaudhari, Mangesh

Advisor: John David Hill

*Interactive Effect of Field Time Order Strategies Within a Supply Chain on Actual In-Stock Probabilities*

### Chaudhari, Rohan

Advisor: Craig R. Friedrich

*Course work only*

### Cook, Michael

Advisor: Craig R. Friedrich

*Course work only*

### Deng, Yichao

Advisor: Song-Lin Yang

*Lattice Boltzmann Method and Cellular Automata Simulation of Particle Motion and Deposition in 2-D Case*

### Deshpande, Satyaajeet

Advisor: Mohan D. Rao

*Development of a Low Cost Impedance Tube To Measure the Acoustic Absorption and Transmission Loss of Materials*

### Gavande, Sanjal Ashok

Advisor: Craig R. Friedrich

*Course work only*

### Godbole, Anuj

Advisor: Craig R. Friedrich

*Course work only*

### Han, Zhao

Advisor: Craig R. Friedrich

*Course work only*

### Honrao, Tushar Prakash

Advisor: Craig R. Friedrich

*Course work only*

### Jakhi, Manish

Advisor: Craig R. Friedrich

*Course work only*

### Kokkada Pruthul Ravindranath, FNU

Advisor: Gregory M. Odegard

*Molecular Modeling of PMR-15 Polyimide*

### Li, Jianyi

Advisor: Craig R. Friedrich

*Course work only*

### Parbat, Aniket Avinash

Advisor: Craig R. Friedrich

*Course work only*

### Patrale, Sharil

Advisor: Gregory M. Odegard

*Multiscale Modeling of Liquid Crystalline/Nanotube Composites*

### Shi, Mingqi

Advisor: Craig R. Friedrich

*Course work only*

### Socha, Jason

Advisor: Jeffrey Donald Naber

*The Setup and Experimental Results of Direct Water Injection in a Spark Ignited Natural Gas Engine at Varying Compression Ratios*

### Srivastava, Shankaransh

Advisor: Craig R. Friedrich

*Course work only*

### Tang, Meng

Advisor: Jeffrey Donald Naber

*Course work only*

### Vaidya, Advait

Advisor: Craig R. Friedrich

*Course work only*

### Velapure, Amruta

Advisor: Craig R. Friedrich

*Course work only*

### Wang, Zun

Advisor: Craig R. Friedrich

*Course work only*

### Zhao, Menghan

Advisor: Amitabh Narain

*Course work only*

## FALL 2013 (30)

### Anderson, Jeremy

Advisor: Scott Andrew Miers

*Comparative Analysis of Efficiency and Operating Characteristics of Automotive Powertrain Architectures through Chassis Dynamometer Testing*

### Arjunwadkar, Mandar

Advisor: Craig R. Friedrich

*Course work only*

### Cong, Liu

Advisor: Craig R. Friedrich

*Course work only*

### Daavettila, Tyler

Advisor: Jeffrey Donald Naber

*Development of the EcoCAR 3 Proposal and Guidelines for Modeling and Design in Year One of EcoCAR 3*

### Dashrathi, Rohit

Advisor: Craig R. Friedrich

*Course work only*

### Foley, Ryan

Advisor: Jeffrey Donald Naber

*Experimental Investigation into Particulate Matter Distribution in Catalyzed Particulate Filters Using a 3D Terahertz Wave Scanner*

### Gadre, Ameya

Advisor: Craig R. Friedrich

*Course work only*



**ONE'S MIND, ONCE STRETCHED  
BY A NEW IDEA, NEVER REGAINS  
ITS ORIGINAL DIMENSIONS.**

—Oliver Wendell Holmes

**Ge, Zicheng**

Advisor: Bo Chen  
*Course work only*

**Guan, Minglei**

Advisor: Craig R. Friedrich  
*Course work only*

**Hardy, Alexander**

Advisor: John David Hill  
*Course work only*

**Heath, Matthew**

Advisor: Gordon G. Parker  
*Realization of a DC Microgrid Using a  
Hamiltonian-based Controls Solution*

**Johnston, Luke**

Advisor: Jeffrey Donald Naber  
*Course work only*

**Joshi, Shreyash**

Advisor: Bo Chen  
*Modeling and Hardware-in-the-Loop  
Simulation of Power-Split Hybrid  
Electric Vehicles*

**Kalita, Bhaskar**

Advisor: John David Hill  
*Course work only*

**Kesav Talasila, Hari**

Advisor: Craig R. Friedrich  
*Course work only*

**Krishnamoorthy, Hari**

Advisor: Jeffrey Donald Naber  
*Course work only*

**Li, Yang**

Advisor: Bo Chen  
*Development of Hardware-in-the-Loop  
Simulation System for Hybrid Electric  
Vehicle Study*

**Mamun, Mohammad**

Advisor: Chang Kyoung Choi  
*Non-Invasive Method to Predict  
Viscosity and Size Using Total Internal  
Reflection Fluorescent Microscopy  
(TIRFM) System*

**Mitchell, Mathew**

Advisor: Jeffrey Donald Naber  
*Course work only*

**Muvva, Nagarjuna**

Advisor: Craig R. Friedrich  
*Course work only*

**Rakesh Babu, Kailasa**

Advisor: Craig R. Friedrich  
*Course work only*

**Rane, Prasad**

Advisor: Craig R. Friedrich  
*Course work only*

**Shah, Rachit**

Advisor: Craig R. Friedrich  
*Course work only*

**Stacy, Stephen**

Advisor: Jeffrey Allen  
*Characterization of Porous Media in  
Proton Exchange Membrane Fuel Cell  
Based on Percolation Studies*

**Steinhoff, Bryan**

Advisor: Desheng Meng  
*Course work only*

**Sujith Kumar, Gunti**

Advisor: Craig R. Friedrich  
*Course work only*

**Vashishth, Ravi**

Advisor: Craig R. Friedrich  
*Course work only*

**Wu, Baifan**

Advisor: Bo Chen  
*Study of Hybrid Electric Vehicle Battery  
Modeling and Control Using Autonomie*

**Wu, Hao**

Advisor: Bo Chen  
*Study of Spark Ignition Engine  
Combustion Model for the Analysis  
of Cyclic Variation and Combustion  
Stability at Lean Operating Conditions*

**Zhang, Hanfei**

Advisor: Desheng Meng  
*Co-Electrophoretic Deposition  
of Liquid Metal and Silicon for  
Lithium-Ion Battery Application*

**SPRING 2014 (53)**

**Agnihotri, Gaurav**

Advisor: Mohan D. Rao  
*Course work only*

**Alfulayyih, Yasir**

Advisor: Kazuya Tajiri  
*Course work only*

**Bakshi, Mriya**

Craig R. Friedrich  
*Course work only*

**Banerjee, Bhaskar**

Advisor: Craig R. Friedrich  
*Course work only*

**Biel, Michael**

Advisor: Jason R. Blough  
*Course work only*

**Chiddarwar, Vikrant**

Advisor: Craig R. Friedrich  
*Course work only*

**Clement, Charles**

Advisor: Gopal Jayaraman  
*An Experimental Study of Partial  
Low Risk Deployment in a Field  
Vehicle Environment*

**Darbha, Arjun Sai Santosh**

Advisor: Craig R. Friedrich  
*Course work only*

**Deisenroth, David**

Advisor: Jeffrey Allen  
*Thickness Measurement  
of Dynamic Thin Liquid Films  
Generated by Plug-Annular Flow  
in Non-Wetting Microchannels*

## SPRING 2014 (cont.)

### Desai, Almitra

Advisor: Craig R. Friedrich

*Course work only*

### Dhabe, Shreerang

Advisor: Gregory M. Odegard

*A Study of Passenger Car Acoustic Cavity Boom Simulation Methods*

### Ficanha, Evandro

Advisor: Mohammad Rastgaar

*Ankle Impedance and Ankle Angles During Step Turn and Straight Walk: Implications for the Design of a Steerable Ankle-Foot Prosthetic Robot*

### Galande, Amol

Advisor: Craig R. Friedrich

*Course work only*

### Ganguly, Debmalya

Advisor: Craig R. Friedrich

*Course work only*

### Girase, Abhijitsing

Advisor: Craig R. Friedrich

*Course work only*

### Gitapathi, Ajinkya

Advisor: Craig R. Friedrich

*Course work only*

### Gujar, Ajinkya

Advisor: Jeffrey Donald Naber

*Impact of Engine Calibration on PM Oxidation in a Catalyzed Particulate Filter Over a Transient Cycle: A Modeling Study*

### Gupta, Ashish

Advisor: Craig R. Friedrich

*Course work only*

### Jadhav, Amar

Advisor: Craig R. Friedrich

*Course work only*

### Jakhotia, Venugopal

Advisor: Craig R. Friedrich

*Course work only*

### Janarthanan, Rahul

Advisor: Craig R. Friedrich

*Course work only*

### Joshi, Abhishek

Advisor: Craig R. Friedrich

*Course work only*

### Kadam, Ashutosh

Advisor: Craig R. Friedrich

*Course work only*

### Kambale, Apurva

Advisor: Craig R. Friedrich

*Course work only*

### Kanabar, Yogesh

Advisor: Jeffrey Donald Naber

*Engine Tests with Imaging of "Nostrum Impinging Jet Injectors" and Results of Direct Water Injection in a Spark-Ignited Engine at Higher Compression Ratio*

### Karramreddy, Venkat Sai Rait

Advisor: Craig R. Friedrich

*Course work only*

### Karve, Vasudev

Advisor: Craig R. Friedrich

*Course work only*

### Khinvasara Vipul

Advisor: Craig R. Friedrich

*Course work only*

### Lucas, Evan

Advisor: Jason R. Blough

*Use of an Electrical Impedance Tomography Method to Detect and Track Fractures in a Gelatin Medium*

### Lunavat, Varun

Advisor: Craig R. Friedrich

*Course work only*

### Mahamuni, Pratik

Advisor: Craig R. Friedrich

*Course work only*

### Menon, Sunit

Advisor: Craig R. Friedrich

*Course work only*

### Moghe, Shashank

Advisor: Craig R. Friedrich

*Course work only*

### Mohanty, Aditya

Advisor: Craig R. Friedrich

*Course work only*

### Nagupalli, Venkata Krishna Teja

Advisor: Craig R. Friedrich

*Course work only*

### Patil, Amit

Advisor: Craig R. Friedrich

*Course work only*

### Patil, Amitkumar

Advisor: Craig R. Friedrich

*Course work only*

### Pendharkar, Koustubh

Advisor: Craig R. Friedrich

*Course work only*

### Piduru, Naag

Advisor: Craig R. Friedrich

*Course work only*

### Rege, Pradnil

Advisor: Craig R. Friedrich

*Course work only*

### Reynolds, Craig

Advisor: Jason R. Blough

*Course work only*

### Subramanian, Sriram

Advisor: Craig R. Friedrich

*Course work only*

### Sun, Zicheng

Advisor: Craig R. Friedrich

*Course work only*

### Syed, Faisal Ahmed

Advisor: Craig R. Friedrich

*Course work only*

### Uplane, Yogita

Advisor: Craig R. Friedrich

*Course work only*

### Vartak, Viraj

Advisor: Craig R. Friedrich

*Course work only*

### Vedam, Venkata Seetarama Hari Karthik

Advisor: Craig R. Friedrich

*Course work only*

### Ventrapragada, Veera Venkata Naga

**Durga Suresh Kumar**

Advisor: Craig R. Friedrich

*Course work only*

### Wang, Yun

Advisor: Craig R. Friedrich

*Course work only*

### Xiong, Guangchen

Advisor: Craig R. Friedrich

*Course work only*

### Xue, Anqi

Advisor: Kazuya Tajiri

*Course work only*

### Zhang, Yachan

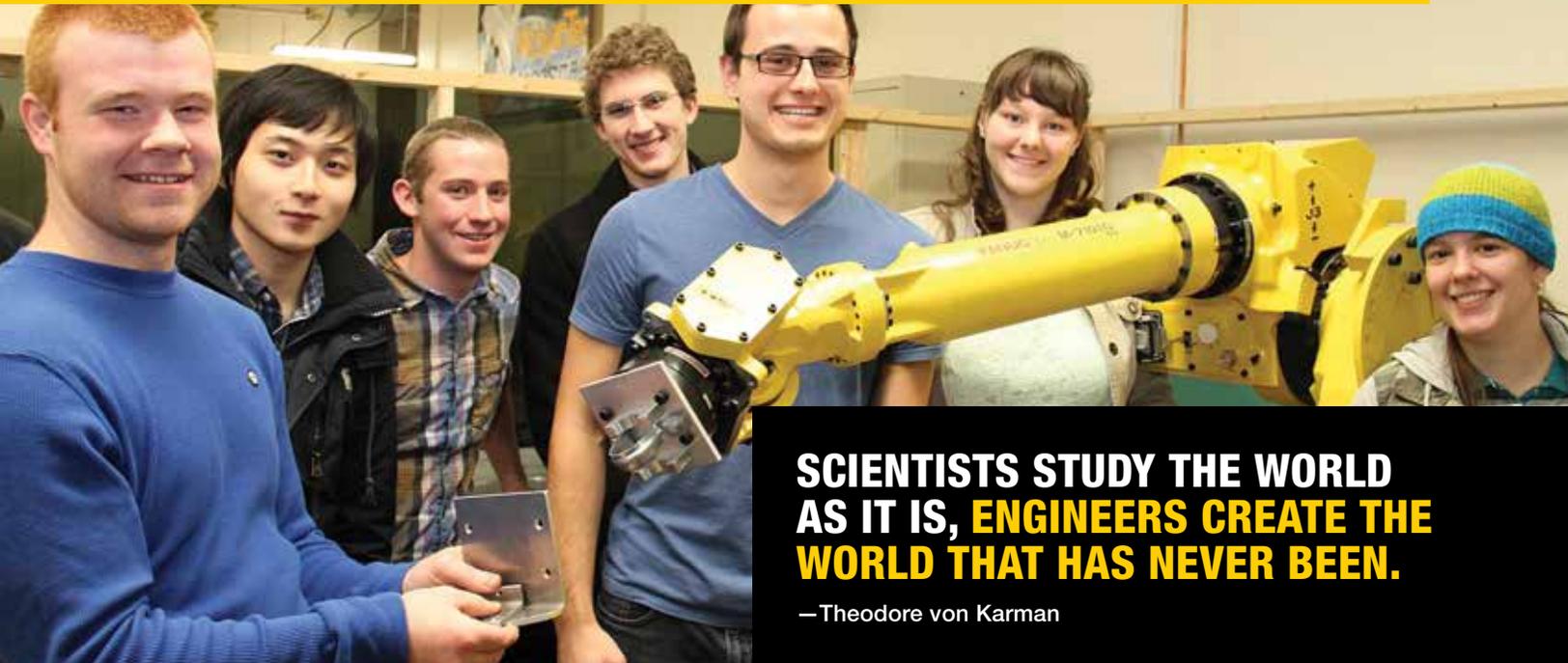
Advisor: Craig R. Friedrich

*Course work only*

### Zhou, Bin

Advisor: Craig R. Friedrich

*Course work only*



**SCIENTISTS STUDY THE WORLD  
AS IT IS, ENGINEERS CREATE THE  
WORLD THAT HAS NEVER BEEN.**

—Theodore von Karman

## SUMMER 2013 (4)

### Armstead, John

Advisor: Scott Andrew Miers  
*Novel Automotive Waste Heat  
Recovery Techniques*

### Pyrkosz, Michael

Advisor: Charles D. Van Karsen  
*Reverse Engineering the Structural  
and Acoustic Behavior of a Stradivari*

### Song, Xiaobo

Advisor: Jeffrey Donald Naber  
*A SCR Model Based on Reactor  
and Engine Experimental Studies  
for a Cu-zeolite Catalyst*

### Violin, Surenahalli Harsha

Advisor: Gordon G. Parker  
*Dynamic Model Based State  
Estimation in a Heavy Duty Diesel  
Aftertreatment System for Onboard  
Diagnostics and Controls*

## FALL 2013 (7)

### Edel, Zach

Advisor: Abhijit Mukherjee  
*Experimental Investigation of Regular  
Fluids and Nanofluids during Flow  
Boiling in a Single Microchannel at  
Different Heat Fluxes and Mass Fluxes*

### Gao, Qi

Advisor: Reza Shahbazian-Yassar  
*Nanoscale Electrochemistry by In-Situ  
Transmission Electron Microscopy*

### Madison, Daniel

Advisor: Scott Andrew Miers  
*Thermal Characterization of a Gasoline  
Turbocharged Direct Injection (GTDI)  
Engine Utilizing Lean Operation and  
Exhaust Gas Recirculation (EGR)*

### Narendranath, Aneet

Advisor: Jeffrey Allen  
*Influence of Mechanical and Thermal  
Boundary Conditions on Stabilizing/  
Destabilizing Mechanisms in  
Evaporating Liquid Films*

### Premchand, Kiran

Advisor: John H. Johnson  
*Development of a 1-D Catalyzed Diesel  
Particulate Filter Model for Simulation of  
the Performance and the Oxidation of  
Particulate Matter and Nitrogen Oxides  
Using Passive Oxidation and Active  
Regeneration Engine Experimental Data*

### Santhanagopalan, Sunand

Advisor: Desheng Meng  
*High Voltage Electrophoretic Deposition  
for Electrochemical Energy Storage and  
Other Applications*

### Sepoori, Martin Susheel

Advisor: John David Hill  
*Driver Safety in Far-Side and Far-  
Oblique Crashes: A Study of Patrol  
Vehicles in the United States of America*

## SPRING 2014 (5)

### Ciavola, Benjamin

Advisor: John K. Gershenson  
*Reconciling Function- and  
Affordance-based Design*

### Hernandez, Joseph

Advisor: Jeffrey Allen  
*Development of Confocal Imaging  
Techniques for Probing Interfacial  
Dynamics in Microscale, Gas-Liquid,  
Two-Phase Flow*

### Jia, Libin

Advisor: Jeffrey Donald Naber  
*Modeling of the Transfer Path for  
Determination of Combustion and  
Noise Metrics on Diesel Engines*

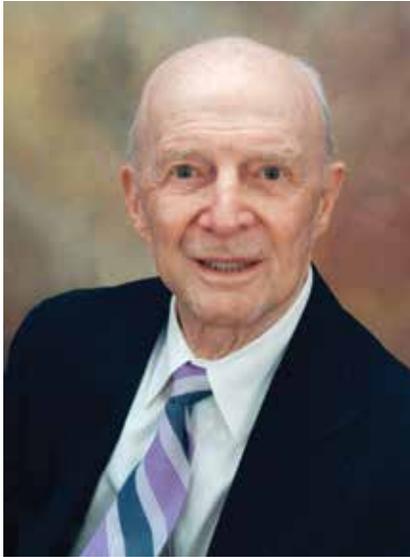
### Jensen, Benjamin

Advisor: Gregory M. Odegard  
*Predicting the Mechanical Properties  
of Carbon-Based Materials Using  
Molecular Dynamics*

### Zhang, Fengli

Advisor: Dana Mary Johnson  
*Development of an Optimization  
Model for Biofuel Facility Size and  
Location and a Simulation Model for  
Design of a Biofuel Supply Chain*

## Richard & Elizabeth Henes Establish ENDOWED ASSOCIATE & FULL PROFESSORSHIPS



This past year we learned about the passing of Elizabeth Henes, who with her husband, Richard, have been lifelong friends to the University. Even as we mourn the loss of Elizabeth, we report here on their family's continuing support.

Over the past fifteen years, Richard and Elizabeth Henes have established and donated toward the Henes Endowed Scholarship that supports students in several engineering programs, along with the Henes Chair in the Department of Mechanical Engineering-Engineering Mechanics. Their generous donations to the University have also funded laboratory renovations across campus to enhance research and education.

Richard Henes earned a Bachelor of Science degree in Mechanical Engineering from Michigan Tech in 1948, followed by a law degree from the University of Michigan. After practicing law and working as an engineer, he moved to Arizona in 1958 to establish Henes Products and Henes Stamping, later named Henes Manufacturing Company.

Henes developed a dynamic organization, manufacturing a wide variety of products from semiconductor parts to aircraft components. Over time his business success translated into philanthropy, with Michigan Tech as one of his family's primary beneficiaries.

Earlier this year, he was honored by the Michigan Tech Board of Control with their highest honor, the Melvin Calvin Medal of Distinction. He has been further recognized for his significant contributions with the Distinguished Alumni Award from the Michigan Tech Alumni Association. He is a member of the ME-EM Academy for excellence in leadership. Both Richard and Elizabeth are members of Michigan Tech's Hubbell Society for their lifetime giving and the McNair Society for their estate gift commitments.

**This year the Henes family has added support for three ME-EM faculty members through the Richard and Elizabeth Henes Endowed Associate and Full Professorships.**

*Through generous donations from the Henes family, students work in state-of-the-art labs and faculty are supported in education and research.*



### RICHARD & ELIZABETH HENES PROFESSOR IN COMPUTATIONAL MECHANICS

**Dr. Gregory M. Odegard** joined the faculty at Michigan Tech in 2004, bringing research opportunities in multiscale modeling of aerospace composites and biological tissue to the Department.

He earned his PhD in Mechanical Engineering from the University of Denver in 2000 before taking a position as a staff scientist at the NASA Langley Research Center. During his tenure at Michigan Tech, he has been recognized as a Fulbright Research Scholar at the Norwegian University of Science and Technology and has been named an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA).

Odegard has graduated twenty MS and PhD students and is currently advising ten additional students. This endowment will help him continue advancing his research in multiscale modeling, while maintaining guidance and support for graduate students in the Department.

## RICHARD & ELIZABETH HENES ASSOCIATE PROFESSOR IN WIND ENERGY

After earning his PhD in Engineering Science at the University of Buenos Aires, Argentina, **Dr. Fernando Ponta** stayed on as a tenured assistant professor from 2002 to 2007 before joining the faculty at Michigan Tech.

His research on theoretical and computational continuum mechanics, vortex dynamics, and advanced numerical methods for fluid-structure interaction analysis applies directly to his study of wind turbine aerodynamics and other renewable energy systems.

In 2010, he received the Faculty CAREER Award from the National Science Foundation on research to reduce uncertainties related to wind turbine blade dynamics. This endowed associate professorship will help him to foster educational and research opportunities for his graduate students, while continuing his research on blade dynamics for renewable energy sources.



## RICHARD & ELIZABETH HENES ASSOCIATE PROFESSOR IN NANOTECHNOLOGY

With a focus on nanotechnology and applications of nanomaterials for energy, electronics, and biocomposites, **Dr. Reza Shahbazian-Yassar** will be able to make an

impact with his associate professorship from Richard & Elizabeth Henes. Shahbazian-Yassar earned his PhD in Material Science from Washington State University and worked as

a postdoctoral research fellow at the Center for Advanced Vehicular Systems at Mississippi State University before coming to Michigan Tech. He currently serves on the steering committee of the ASME Nanoengineering for Energy & Sustainability Group and is the materials science director on the Executive Council of the Midwest Microscopy and Microanalysis Society.

With this endowment, he will continue to collaborate with graduate students, building on his research in energy applications relating to rechargeable Li-ion and Na-ion batteries and proton exchange membrane (PEM) fuel cells.

## A TOTAL OF ELEVEN FACULTY MEMBERS ARE SUPPORTED

through endowed assistant professor, associate professor, professor, and chair level positions.

### DR. JEFF ALLEN

John & Joan Calder Endowed Professor in Mechanical Engineering

### DR. BO CHEN

Dave House Associate Professor of Mechanical Engineering and Electrical Engineering

### DR. CRAIG FRIEDRICH

Richard & Bonnie Robbins Chair

### DR. L. BRAD KING

Ronald & Elaine Starr Endowed Professor in Space Systems Engineering

### DR. JEFF NABER

Ronald & Elaine Starr Endowed Professor in Energy Systems

### DR. GORDON PARKER

John & Cathi Drake Professor of Mechanical Engineering

### DR. RUSH ROBINETT

Richard & Elizabeth Henes Chair Professor in Mechanical Engineering

## NEW FACULTY



**DR. LUCIA GAUCHIA BABE**  
**RICHARD & ELIZABETH HENES ASSISTANT**  
**PROFESSOR OF ENERGY STORAGE SYSTEMS**

**Dr. Lucia Gauchia Babe** joins Michigan Tech as the Richard and Elizabeth Henes Assistant Professor of Energy Storage Systems with dual appointments in ME-EM and the Department of Electrical and Computer Engineering. She earned a BSE in Industrial Engineering specializing in Electric Power Systems, an MSc in Electrical, Electronic and Automation Engineering, and a PhD in Electrical, Electronic and Automation Engineering all from the University of Carlos III of Madrid, Spain. Her research interests are energy storage systems and state estimation for batteries and supercapacitors. Dr. Gauchia Babe comes to Michigan Tech from McMaster University, where she was a postdoctoral research associate and Canada Excellence Research Chair in the Hybrid Powertrain Program.

## NEW STAFF



**KEVIN JOHNSON**

Kevin Johnson joined the ME-EM Department as a research engineer/scientist. He comes to Michigan Tech from Oldenburg Group Inc. in Iron River, Michigan where he was a product engineer. Steve has a BS degree in Mechanical Engineering from Michigan Tech.



**STEVEN LEHMANN**

Steven Lehmann joined the ME-EM Department as a research associate. He comes to Michigan Tech from Engineered Machined Products in Escanaba, Michigan where he was a senior instrumentation engineer. Steve has a BS degree in Electrical Engineering from Michigan Tech.



**AMY MENSCH**

Amy Mensch joined the ME-EM Department as an office and account assistant. She was formerly an office assistant in Michigan Tech's Center for Diversity & Inclusion.

## DR. JEFFREY ALLEN

Nominated for the Michigan Tech Distinguished Teaching Award in the associate professor/professor category.



## NANCY BARR (above right)

Developed a series of modules for ME-EM graduate teaching assistants to help develop their technical communication skills. The modules, adapted from Writing Across the Curriculum, are training sessions that teach evaluators how to provide effective feedback on writing.

Featured in the March edition of *PE* magazine for her work in teaching technical communication skills.

Named an Outstanding Link Coordinator by the Recognition Committee of the Order of the Engineer. She was one of four link coordinators in the nation to receive this honor. Link coordinators are instrumental in organizing their units' Ring Ceremony, inducting graduates into the Order of the Engineer.

## DR. JASON BLOUGH

Nominated for the Michigan Tech Distinguished Teaching Award in the associate professor/professor category.

## DR. BO CHEN

Promoted to associate professor with tenure. Named the Dave House Associate Professor of Mechanical Engineering and Electrical Engineering. She is an expert in embedded sensor

networks, multi-agent systems, and vehicle electronics and control. Dr. Chen who formerly held a sole appointment in ME-EM will now hold a joint appointment with ME-EM and ECE with the majority in ME-EM.

## DR. JAMES DECLERCK

Selected as a winner of the CTL's Creative Canvas Course Contest (C4) for his Canvas course, ME-EM 3502.

## DR. MAHESH GUPTA

Selected as a Fellow of the Society of Plastics Engineers. Fellows are selected based on outstanding achievements in the field of plastics engineering, science or technology or in the management of such activities.

Partnered with Solidworks to support Solidworks' 3D design software with new capabilities for simulating the flow of plastics through extrusion dies with his company, PlasticFlow.

## DR. JACLYN JOHNSON

Selected as a recipient of the 2013 SAE Excellence in Oral Presentation for her presentation titled "Investigation of Key Mechanisms for Liquid Length Fluctuations in Transient Vaporizing Diesel Sprays Using Experimental Results and CFD Modeling."

## DR. JOHN JOHNSON

Selected by the National Research Council (under the National Academies) to chair the Committee on the Review of the 21st Century Truck Partnership, Phase 3.

## DR. L. BRAD KING

His research, "Satellite Propulsion: It's Not Rocket Science" was featured in a story in *The Economist*. It described his work developing a new type of satellite engine and focused on its serendipitous aspects.

Highlighted in Michigan Tech news for his research on nanosat micro rockets.

## MICHAEL LACOURT

Recognized by the University for thirty-five years of service.

## DR. SEONG-YOUNG LEE

Promoted to associate professor with tenure. His research interests are spray combustion, fuel flexibilities, soot emissions, internal combustion engines, gas turbine engines and laser-based combustion diagnostics.

## JAY MELDRUM

Elected to the Board of Directors of SAE International.

## DR. DESHENG (DENNIS) MENG

Promoted to associate professor with tenure. His research interests are self-regulating micro fuel cells for portable military/civilian electronics, nano-structured surfaces for energy and environmental applications, micro and nano fluidics for energy harvesting, and self-healing.

## DR. SCOTT MIERS

Nominated for the Michigan Tech Distinguished Teaching Award in the assistant professor/lecturer/professor of practice category.

Selected as a recipient of the Department Teacher of the Year award which is awarded by a vote of the students only. This is the second time he has received the Department award.

## DR. JEFFREY NABER

Served as cohost for a six week research experience for teachers (RET). As part of the Sustainable Futures Institute at Michigan Tech, seven middle and high school teachers from Michigan and Wisconsin were on campus to conduct state-of-the-art biofuels research.

## DR. AMITABH NARAIN

Recognized by the University for thirty years of service.

## **DR. GREGORY ODEGARD**

Recipient of the Props for Profs program through the Jackson Center for Teaching and Learning. Nominators lauded his willingness to design and teach new courses and his general approach to teaching with “enthusiasm and good humor.” His openness to consultation outside of class (“and not just during office hours”) was also mentioned. The most striking quote from a nominator speaks for itself: “It’s always good when you learn without getting stressed out and have a good relationship with a professor.”

Selected as the Richard and Elizabeth Henes Associate Professor in Computational Mechanics.

## **DR. GORDON PARKER**

Selected as a winner of the CTL’s Creative Canvas Course Contest (C4) for his Canvas course, ME-EM 4700.

## **DR. CHRIS PASSERELLO**

Recognized by the University for thirty-five years of service.

## **DR. FERNANDO PONTA**

Selected as the Richard and Elizabeth Henes Associate Professor in Wind Energy.

## **DR. WILLIAM PREDEBON**

Received the Clair M. Donovan Award at the 19th Annual Student Leadership Awards ceremony held on April 26th, 2013. The Clair M. Donovan Award is awarded to a member of the faculty, staff, or student body of Michigan Technological University who has contributed the most outstanding service during the preceding year. The Michigan Tech chapter of Blue Key Honor Society sponsors the award.

Received the 2014 ASME Distinguished Service Award.



## **DR. MOHAMMAD RASTGAAR**

Awarded a National Science Foundation CAREER Award for his work on “Steerable Powered Ankle-foot Prostheses for Increased Mobility in Amputees.”

Featured on CBS Detroit and its Technology Report for his NSF CAREER Award regarding his work developing a better-working prosthetic foot.

## **DR. TOLOU SHOKUH FAR**

Awarded a 2014 NSF CAREER award for her work on “A New Perspective on Biomineralization in Healthy and Dysfunctional Ferritins.”

Her research on graphene, entitled “It’s the Water: Graphene Balloon Yields Unprecedented Images of Hydrated Protein Molecules,” was featured in Science Daily, Phys.org, Graphene Times, and ScienceNewsline.

## **DR. SHERYL SORBY**

Appeared in the April 17 edition of the *Wall Street Journal*. The article, “Can New Building Toys for Girls Improve Math and Science Skills?” mentions Sorby’s 2005 study showing that when middle school girls took a spatial visualization course, they took more upper-level math and science courses in high school.

*Dr. Tolou Shokuhfar (pictured) and Dr. Mo Rastgaar both received 2014 NSF CAREER Awards for their research.*

## **CONNIE TUOHIMAA**

Nominated for the Michigan Tech Staff Council Making a Difference Awards in the Unsung Hero category.

## **DR. CHARLES VAN KARSEN**

Recognized by the University for twenty-five years of service.

## **DR. CARL VILMANN**

Recognized by the University for thirty-five years of service.

## **ROBERT WHIPPLE**

Recognized by the University for his retirement.

## **JEREMY WORM**

Quoted in the article “Can an Engineer Prevent the Unknown?” in *Design News*.

## **DR. REZA SHAHBAZIAN-YASSAR**

Selected as the Richard and Elizabeth Henes Associate Professor in Nanotechnology.

Named a recipient of an Air Force Summer Faculty Fellowship. The Air Force Summer Faculty Fellowship Program offers hands-on exposure to Air Force research challenges through eight to twelve week research residencies at participating Air Force research facilities. Full-time science, mathematics, and engineering faculty at US colleges and universities are eligible.

His article “Atomic resolution images show what happens when lithium ions enter battery electrodes” was published in *ACS Nano* and subsequently selected as a spotlight article on Nanowerk.com.

## ME-EM ACADEMY LIST\*

Frank Agosti, BSME 1958  
 Carl Avers, BSME 1962  
 Richard Bayer, BSME 1944  
 John M. Beattie, BSME 1963  
 Wilfred Bobier, BSME 1943  
 John Calder, BSME 1967, MBA 1976  
 Timothy P. Coffield, BSME 1984  
 John Cook, BSME 1942  
 Charles Cretors, BSME 1963  
 Charles Cronenworth, BSME 1944  
 Robert D'Amour, BSME 1948  
 Dean Diver, BSME 1965  
 John Drake, BMSE 1964, MSBA 1969  
 Theodore Edwards, BSME 1950  
 Paul W. Fernstrum, BSME 1965  
 Edward Gaffney, BSME 1951  
 Joseph Gemignani, BSME 1953  
 Dr. James C. Gerdeen, BSME 1959  
 John Hallquist, MSEM 1972,  
 PhD ME-EM 1974  
 Douglas J. Hamar, BSME 1984  
 William Hartwick, BSME 1948  
 Gerald Haycock, BSME 1968  
 Ralph Hayden, BSME 1933  
 Ray H. Herner, BSME 1954  
 Colleen L. Jones-Cervantes,  
 BSME 1983  
 Daniel R. Kapp, BSME 1976  
 Raymond Kauppila, MSME 1960  
 Pete Knudson, BSME 1964  
 Martin Lagina, BSME 1977  
 Charles Lamoreaux, BSME 1956  
 Charles Laurila, BSME 1959  
 Gary Lawrey, BSME 1979  
 Craig Lazzari, BSME 1942  
 Albert Maki, BSME 1948  
 Paul Masini, BSME/BBA 1969  
 Tom McKie, BSME 1947  
 Fred Mitchell, BSME 1961  
 Tom B. Moore, BSME 1966  
 Bob Monica, BSME 1950



*In memory of Ray Trehwella '56, 1935-2013,  
 Chairman and CEO, Glassmaster Co. (center).*

Lawrence Mulholland, BSME 1955  
 Eric Nielsen, BSME 1980  
 Merle Potter, BSME 1958,  
 MSEM 1961  
 Norman Pratt, BSME 1942  
 Anthony F. Raimondo, BSME 1962  
 Kamlakar Rajurkar, MSME 1978,  
 PhD ME-EM 1981  
 Jack Real, BSME 1939  
 James L. Reum, BSME 1953  
 Dan Rivard, BSME 1959  
 Richard Robbins, BSME 1956  
 Dale J. Roberto, BSME 1969  
 Vijay K. Sazawal, PHD 1975  
 Harold Schock, BSME 1974,  
 PhD EM 1979  
 Fred Sherriff, BSME 1963  
 James Sorenson, BSME 1960,  
 MSEM 1961

James Stone, BSME 1940  
 Martha Sullivan, BSME 1980  
 Paul Swift, BSME 1933  
 Maurice Taylor, BSME 1968  
 Camiel Thorrez, BSME 1970  
 Robert Thresher, BSME 1962,  
 MSME 1967  
 Raymond M. Trehwella, BSME 1956  
 William Turunen, BSME 1939  
 James Vorhes, BSME 1947  
 Thomas Walker, BSME 1968  
 Donald G. Wheatley, BSME 1962,  
 MSME 1963  
 Harold Wiens, BSME 1968  
 Dr. Terry J. Woychowski, BSME 1978  
 Hussein M. Zbib, BSME 1981,  
 MSME 1983, PhD ME-EM 1987

\* Only Michigan Tech degrees listed



## 2014 OUTSTANDING YOUNG ALUMNI

### JILLIAN ROTHE, CATERPILLAR

In 2014, Jillian Rothe was recognized by the Michigan Tech Alumni Association with the Outstanding Young Alumni Award.

Rothe has established a sterling career at Caterpillar in a short period of time, using her mechanical engineering and business administration degrees with a minor in Spanish. She’s also given her time and talents to many worthwhile causes.

She is currently Caterpillar’s Energy and Transportation Marketing Support Representative for Asia Pacific based in Singapore. Within this newly created role, she ensures that business partners have the Extended Protection Products to support their go-to-market strategies. Rothe has held increasingly responsible management roles in Peoria; Monterrey, Mexico; Minneapolis; and Nashville.

Outside of her job duties, Rothe has been involved in the Caterpillar Latino Connection Leadership Team, Women’s Leadership Forum, Military Support Network, Asia Synergy Network, Caterpillar Young Professionals, Women’s Initiative Network, Cat LAMBDA (LGBTQ Group) and the Nashville Chapter of Girls on the Run. She is also a 70.3 Ironman triathlete, an Independent Marketing Executive for Melaleuca Inc.: The Wellness Company, and is part of the Michigan Tech Technical Marketing Recruiting Team and Society of Women Engineers.

## ME-EM PCA

*The Presidential Council of Alumnae (PCA) at Michigan Tech recognizes successful Michigan Tech women graduates for their educational excellence, past student service, professional accomplishments, and community contributions.*

### ME-EM PCA MEMBERS (as of Fall 2014)

Mary Barker  
 Elzbieta Berak  
 Diana Brehob  
 Margaret Cobb  
 Nancy Cragel  
 Laura Farrelly  
 Mary Fisher  
 Kathy Grisdela  
 Cynthia Hodges  
 Sabina Houle

Susan Jesse  
 Colleen L. Jones-Cervantes  
 Tanya Klain (deceased)  
 Pamela Klyn  
 Rose Koronkiewicz  
 Wendy Kram  
 Merrily Madero  
 Christine Roberts  
 Jillian Rothe

Lee Ann Rouse  
 Sylvia Salahutdin  
 Sandra Skinner  
 Sheryl Sorby  
 Martha Sullivan  
 Judy Swann  
 Susan Trahan  
 Kimberly Turner  
 Paula Zenner



## ME-EM EAB

*The External Advisory Board (EAB) is a select group of corporate, university, and government leaders, many of whom are alumni.*

EAB members share their expertise and provide assistance with curriculum direction, research topics, resource development, and education-industry partnership. They offer professional insight and provide valuable input—shaping the state-of-the-art engineering education that takes place in the ME-EM Department. Members can serve a maximum of two four-year terms.

**JOHN ADAMS**  
Calpine Corporation

**JAMES HELDT**  
Mercury Marine

**MELISSA MARSZALEK**  
Boeing

**PETER SANDRETTO**  
Chrysler

**DR. KIRBY BAUMGARD**  
John Deere

**MICHAEL HOFMAN**  
Roush Industries

**MARK MASCO**  
Bayer MaterialScience

**JENNIFER TRICE**  
3M Corporation

**BRETT CHAUDINARD**  
Altair Engineering

**COLLEEN L. JONES-CERVANTES**  
Chevron Corp

**BRENDA MOYER**  
Dana Corporation

**JASON VERBOOMEN**  
Kimberly-Clark

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The following list encompasses the many people who have generously shared their treasure to create an outstanding ME-EM department. We are extremely grateful for their ongoing support. Those contributing from May 2013 to April 2014 are listed below. This year the company matching gifts are included with the individual gift.

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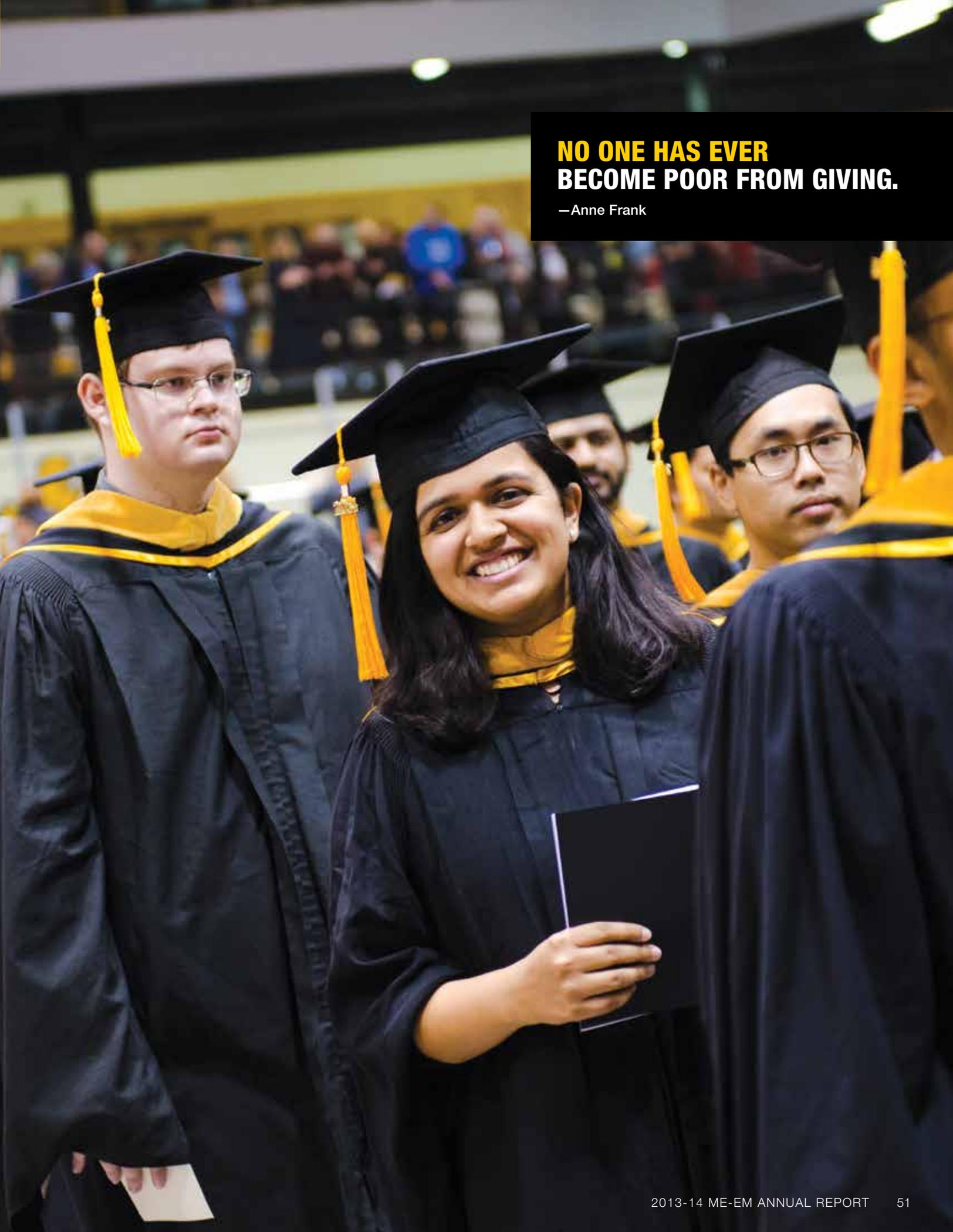
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BECOME POOR FROM GIVING.**

—Anne Frank

## PERSONAL

**\$1,569,289**

TITLE	NAME	SPONSOR	AWARD
Microsensor for Intramuscular Pressure Measurement	PI: Greg Odegard	Mayo Clinic	\$50,314
CAREER: Steerable Powered Ankle-foot Prostheses for Increased Mobility in Amputees	PI: Mo Rastgaar	National Science Foundation	\$640,412
CAREER: A New Perspective on Biomineralization in Healthy and Dysfunctional Ferritins	PI: Tolou Shokuhfar	National Science Foundation	\$554,593
Senior Design: Lightweight Pop Rivet Tool with Reporting Capability	PI: William Endres	Chrysler, LLC	\$26,765
Senior Design: Piston Phone Adapter Design (Team 6)	PI: William Endres, Co-PI: James DeClerk	Modal Shop, Inc	\$11,896
Senior Design: Aquatic Fitness Tool	PI: William Endres	BeachFit, LLC	\$17,844
Enterprise: Bluetooth Remote Chock Actuation	PI: John Gershenson	Cane Creek Cycling Components	\$7,435
The Michigan AGEP Alliance for Transformation (MAA): Mentoring and Community Building to Accelerate Successful Progression into the Professoriate	PI: Jacqueline Huntoon (Graduate School), Co-PIs: Craig Friedrich; Christopher Wojick (Civil & Environmental); Chandrashekhar Joshi (Biological Sciences)	National Science Foundation	\$245,160
Enterprise: Pump in a Hub	PI: Paulus Van Susante, Co-PI: John Gershenson	Specialized Bicycle Components	\$14,870

## LOCAL

**\$7,693,259**

TITLE	NAME	SPONSOR	AWARD
Assist in Planning of Development of RMCP Platform Concepts	PI: Jason Blough	Quantum Engineering Design, Inc	\$16,500
Support of RMCP Phase II SBIR	PI: Jason Blough	Quantum Engineering Design, Inc	\$31,000
Low-Cost Underwater Glider Fleet for Littoral Marine Research	PI: Nina Mahmoudian	Office of Naval Research	\$139,231
Microgrid Modeling and Optimization for High Penetration Renewables Integration	PI: Gordon Parker, Co-PI: Wayne Weaver (Electrical & Computer Engineering)	Sandia National Laboratory	\$386,490
Agent-Based Control with Application to Microgrids with High Penetration Renewables	PI: Gordon Parker, Co-PIs: Steven Goldsmith; Wayne Weaver (Electrical & Computer Engineering)	Sandia National Laboratory	\$117,500

## LOCAL (cont.)

**\$7,693,259**

TITLE	NAME	SPONSOR	AWARD
Vehicle-to-Vehicle Resource Sharing	PI: Gordon Parker, Co-PIs: Steven Goldsmith; Weaver Wayne (Electrical & Computer Engineering)	Mississippi State University	\$148,433
SGAS Drive Train Model Calibration	PI: Gordon Parker, Co-PI: Ed Trinklein	IMECO	\$47,598
Distributed Agent-Based Management of Agile Microgrids	PI: Wayne Weaver (Electrical & Computer Engineering), Co-PIs: Laura Brown (Computer Science;) Gordon Parker, Steven Goldsmith	US Department of Defense, Army Research Laboratory	\$1,907,135
Modeling and Control Technologies for Near-Term and Long-Term Networked Microgrids	PI: Wayne Weaver (Electrical & Computer Engineering), Co-PI: Gordon Parker	Argonne National Laboratory	\$250,000
Advanced Control and Energy Storage Architectures for Microgrids	PI: Wayne Weaver (Electrical & Computer Engineering), Co-PI: Ossama Abdelkhalik	Sandia National Laboratory	\$38,000
Senior Design: Chrysler Ram Tailgate	PI: William Endres	Chrylser, LLC	\$20,432
Senior Design: Roadside Repair Module	PI: William Endres	Chrysler, LLC	\$26,765
Michigan Tech Capstone Design Program: Design Challenge	PI: William Endres	US Department of Defense	\$59,859
Senior Design: Rear Differential Case Testing	PI: Kevin Johnson, Co-PI: Bob DeJonge	American Axle Manufacturing	\$8,541
Senior Design: Infrared Vibratory PET Crystallizer (Team 10)	PI: Greg Odegard, Co-PI: William Endres	Advanced Blending Solutions, LLC	\$30,780
Enterprise: Cold Plate Design/Optimization	PI: Page, Bob, Co-PIs: John Lukowski (Electrical & Computer); Rick Berkey (College of Engineering)	LG Chem Power Inc	\$19,516
Collaborative Research: Self-circulating, Self-regulating Microreactor for On-chip Gas Generation from Liquid Reactants	PI: Dennis Desheng Meng, Co-PI: Craig Friedrich	National Science Foundation	\$252,216
New Sulfur-Carbon Cathode Material with Improved Electrochemical Performance	PI: Reza Shahbazian-Yassar	UChicago Argonne, LLC	\$18,042
Collaborative Research: Stronger than Glass Fibers, Stiffer than Steel Wires: A New Perspective into the Mechanics of Cellulose Nanocrystals	PI: Reza Shahbazian-Yassar, Co-PI: Greg Odegard	National Science Foundation	\$371,802

## LOCAL (cont.)

**\$7,693,259**

TITLE	NAME	SPONSOR	AWARD
High Performance, Durable, Low Cost Membrane Electrode Assemblies for Transportation Applications	PI: Jeffrey Allen	3M Corporate R&D	\$653,620
Titan Agriculture and Off-Road Tire Test Fixture	PI: John Beard	Titan Tire	\$120,275
Characterization of Torque Converter Cavitation Level during Speed Ratio Operation: Year 3	PI: Jason Blough, Co-PIs: Carl Anderson; Mark Johnson (School of Technology)	General Motors Corporation	\$84,811
Nostrum Continued Engine Research	PI: Bo Chen, Co-PI: Jeffrey Naber	Nostrum Energy	\$25,571
Ford Diesel Spray Studies: Rate of Injection Measurement Phase 2	PI: Jaclyn Johnson, Co-PIs: Jeffrey Naber; Seong-Young Lee	Ford Motor Company	\$10,379
Michigan Tech Consortium in Diesel Engine Aftertreatment Research-John Deere/Cummins	PI: John Johnson, Co-PIs: Jeffrey Naber; Gordon Parker	Various Sponsors	\$88,0841
High Impact STEM Outreach Utilizing the Michigan Tech Mobile Laboratory at the 2014 Michigan Civil Air Patrol Summer Cadet Encampment	PI: Marlene Lappeus, Co-PI: Jeremy Worm	University of Michigan - Michigan Space Grant Consortium	\$10,001
NSF/DOE Partnership on Advanced Combustion Engines: Ignition and Combustion Characteristics of Transportation Fuels under Lean-Burn Conditions for Advanced Engines	PI: Seong-Young Lee, Co-PI: Jaclyn Johnson	NSF/DOE	\$71,2274
Michigan Tech Combustion Vessel Test Phase 1: Effect of Low Turbulent Velocity on Spark Channel and Flame Kernel Formation Processes in Propane-EGR Mixtures	PI: Seong-Young Lee	GM Advanced Powertrain	\$48,000
Nostrum Energy Statement of Work for Continued Engine Research	PI: Jeffrey Naber, Co-PI: Bo Chen	Nostrum Energy, LLC	\$56,800
Development and Research of Nostrum Energy's Novel Fluid Injector Technology through Experimentation and Computational Fluid Dynamics (CFD) Simulation	PI: Seong-Young Lee, Co-PI: Jeffrey Naber	Nostrum Energy, LLC	\$121,469
Enhancement of Corn-based Fuel for Recreational Engines and Vehicles	PI: Scott Miers	Minnesota Corn Growers Association	\$192,578
IP8 Ignition and Liquid Length Studies	PI: Jeffrey Naber	Mississippi State University	\$98,352
Combustion Control for SI Engines	PI: Jeffrey Naber, Co-PI: Bo Chen	Ford Motor Company	\$113,827

## LOCAL (cont.)

**\$7,693,259**

TITLE	NAME	SPONSOR	AWARD
Ignition Studies	PI: Jeffrey Naber, Co-PIs: Seong-Young Lee; Jaclyn Johnson	Ford Motor Company	\$95,752
Engine Development and Instrumentation for the Nostrum Cycle on Cummins ISB Diesel Engine	PI: Jeffrey Naber, Co-PI: Jeremy Worm	Nostrum Energy, LLC	\$202,694
Engine Preparation and Instrumentation for Development and Test of the Nostrum Cycle on a Cummins ISB Diesel Engine	PI: Jeffrey Naber	University of Michigan	\$37,357
John Deere Denso GS CB Injector Spray Characterization	PI: Jeffrey Naber, Co-PIs: Seong-Young Lee; Jaclyn Johnson	John Deere Company	\$73,855
Testing on Single Cylinder DI SI Engine for Injector Evaluation and Validation	PI: Jeffrey Naber, Co-PI: Paul Dice	Nostrum Energy, LLC	\$8,350
An Overview of Powertrain Testcell Technologies	PI: Jeremy Worm	Affiliated Construction Service	\$5,979
High Impact STEM Outreach Utilizing the Michigan Tech Mobile Laboratory at 2013 Heroes Alliance Parental Bootcamp	PI: Jeremy Worm	US Department of Defense, Army, TARDEC	\$19,099
Investigation of Igniter Geometry as an Enabler for Improved Dilution Tolerance and Increased Burn Rates in SI Engines	PI: Jeremy Worm	MultiSpark, LLC	\$5,094
Mobile Lab HEV Courses for Ford Motor Company	PI: Jeremy Worm	Ford Motor Company	\$20,997
Collaborative Teaching	PI: Jeremy Worm, Co-PI: Jeffrey Naber	Northcentral Technical College	\$7,719
Hands-On Education in Engines & Experimental Studies	PI: Jeremy Worm	John Deere Company	\$48,964
Hands-On Experiential Learning Through Development of an Electric Drive Vehicle	PI: Jeremy Worm	National Center for the Advancement of STEM Education (nCASE)	\$18,866
Experiencing Hybrid Electric Vehicle Technologies at the Center for Advanced Automotive Technology 2014 Conference	PI: Jeremy Worm	Macomb Community College	\$8,500
Diagnosing Induction System Degradation and Evaluation of Remedial Chemicals in Automotive Engines	PI: Jeremy Worm, Co-PI: Jeffrey Naber	Illinois Tool Works (ITW)	\$121,395



## GLOBAL

**\$4,249,886**

TITLE	NAME	SPONSOR	AWARD
Trajectory Optimization for Solar Electric Propulsion Satellites	PI: Ossama Abdelkhalik	ExoTerra Resource, LLC	\$10,000
Michigan AFRL Center of Excellence in Electric Propulsion (MACEEP)	PI: Lyon Brad King	University of Michigan	\$939,442
Deposition Rate of Propellant Backflow from a Magnesium Hall-Effect Thruster	PI: Mark Hopkins, Co-PI: Lyon Brad King	National Science Foundation	\$126,000
Mass Measurements of an Electro spray Beam from a Single Emitter Ionic Liquid	PI: Lyon Brad King, Co-PI Kurt Terhune	National Aeronautics and Space Administration	\$68,000
A New Experiment for Determining Evaporation and Condensation Coefficients of Cryogenic Propellants and Development of an Efficient Computational Model of Cryogenic Film Stability in Microgravity	PI: Jeffrey Allen, Co-PI: Chang Kyoung Choi	National Aeronautics and Space Administration	\$526,784
Flow Prediction and Fluctuation-sensitivity Investigations for Quasi-Steady Shear Driven Condensing Flows in Milli-meter to Micro-meter Scale Two-Phase Systems	PI: Amitabh Narain	National Science Foundation	\$356,601
Fundamental Investigations for Very High Heat-Flux Innovative Operations of Milli-Meter Scale Flow Boilers	PI: Amitabh Narain	National Science Foundation	\$299,781



**EDUCATION IS NOT THE  
LEARNING OF FACTS BUT THE  
TRAINING OF THE MIND TO THINK.**

—Albert Einstein

## GLOBAL (cont.)

**\$4,249,886**

TITLE	NAME	SPONSOR	AWARD
Multiscale Model Development and Validation of Graphene/ULTEM Composites for Structural and Noise Reduction Applications	PI: Gregory Odegard, Co-PIs: Julia King (Chemical Engineering); Warren Perger (Electrical and Computer Engineering)	National Aeronautics and Space Administration	\$354,693
Multiscale Modeling of Graphite/CNT/Epoxy Hybrid Composites	PI: Gregory Odegard	US Department of Defense, Air Force Office of Scientific Research	\$252,555
I/UCRC: Novel High Voltage/Temperature Materials and Structures	PI: Gregory Odegard	National Science Foundation	\$637,495
Senior Design: Gear Housing Joint Design	PI: William Endres	Linamar, Corp	\$25,279
Senior Design: Automated Sealant System	PI: Aneet Narendranath, PI: William Endres	HGS Aerospace	\$30,780
NSF Graduate Research Fellowship: Technologies for Developing Countries	PI: Benjamin Tymrak, Co-PIs: Michele Miller; Joshua Pearce (Materials Science Engineering)	National Science Foundation	\$126,000
Collaborative Research: Nexus of Simulation, Sensing, and Actuation for Aerodynamic Vibration reduction of Wind Turbine Blades	PI: Dai, Qingli (Civil & Environmental), Co-PI: Ponta, Fernando	National Science Foundation	\$346,476
Development of Biomass Torrefaction for Coal-fired (CF) Power Industry	PI: Predebon, William	EB Clean Energy	\$150,000

**NOTE:** **Bold text** indicates ME-EM faculty members and *italicized text* indicates ME-EM students.

## PATENTS

**Allen, Jeffrey S.:** Water Removal from Gas Flow Channels of Fuel Cells, Patent No. US8524410 B2, September 2013.

**Friedrich, Craig R., Lueking,**

**Donald R.:** Bacteriorhodopsin-based Sensors, Patent No. US8551407 B2, October 2013.

## SOFTWARE

**Gupta, Mahesh:** PolyXtrue: polymer extrusion die-design software, Release No. 3.7.30, Plastic Flow, LLC, Hancock, MI, January 2014.

## BOOKS

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**TELL ME AND I FORGET.  
TEACH ME AND I REMEMBER.  
INVOLVE ME AND I LEARN.**

— Benjamin Franklin

**NOTE:** Bold text indicates ME-EM faculty members and *italicized text* indicates ME-EM students.

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# MichiganTech

## ME-EM DEPARTMENT

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### TRAVIS WOOD, MEMBER OF THE ACHILLES FREEDOM TEAM OF WOUNDED VETERANS, CELEBRATES FOLLOWING THE 2012 DETROIT MARATHON.

Michigan Tech mechanical engineering students worked with Wood and other veteran-athletes who have lost limbs in Iraq and Afghanistan to design hand cycles that are both comfortable and able to withstand the stress of long-distance racing.

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