

MECHANICAL & AEROSPACE ENGINEERING



College of Engineering University of Missouri





Dear friends,

The Department of Mechanical and Aerospace Engineering at Mizzou is thriving! We continue to grow both in terms of enrollment and faculty. This past year, we've brought in researchers with expertise around advanced design, additive manufacturing, energy - including biomass-based materials for energy storage - micro/nano engineering, fabrication of nanomaterials and more.

This year, we were also thrilled to receive a \$3 million award from the National Science Foundation to launch an NSF Research Traineeship program to prepare graduate students to work in materials science and data analytics. We are currently recruiting for the inaugural class. Participants will enroll in materials-relevant academic disciplines and will complete a graduate certificate in Data Science and Analytics with an emphasis area devoted to materials.

We've celebrated several faculty, student and alumni achievements this past year, as well, and we were thrilled to see Jim Fitterling, B.S. MAE '83, Chair and CEO of Dow, inducted into the Mizzou Hall of Fame.

As always, tha<mark>nk you</mark> for your support of MAE at Mizzou!

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Bill Ma Chair, Professor Mechanical & Aerospace Engineering

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Developing Wearable Devices

Associate Professor Zheng Yan is developing a variety of wearable technologies to assess and monitor health conditions.

Last year, Yan received a \$2.6 million grant from the National Institutes of Health (NIH) to create a breathable material to develop a multifunctional wearable heart monitor. The device is designed to continuously track a heart's electrical signal and vibrations, providing information that could be shared with a healthcare provider to identify signs of heart disease.

Yan has also created a skin-like material capable of tracking multiple vital signs such as blood pressure, heart activity and skin hydration.

Both materials have integrated antibacterial and antiviral properties to help prevent harmful bacteria from accumulating on site.

"Our overall goal is to help improve the long-term biocompatibility and the long-lasting accuracy of wearable bioelectronics through the innovation of this fundamental porous material which has many novel properties," Yan said.



Probing the Matter/Life Nexis

Equipped with funding from the Alfred P. Sloan Foundation's Matter-to-Life Program, Roseanna N. Zia is using a special class of physics to explore what it means to be alive.

Zia-Wollersheim Professor and Associate Dean for **Research**—studies colloidal gels, glasses and suspensions. Although colloidal materials are found in more than 95% of biological fluids, only recent advances in computational modeling have shed light on the material structure that makes them useful.

The Zia Lab was the first to accurately model a spherically confined colloidal suspension using large-scale modeling.

"My group has shown that colloid physics regulate life-essential processes in biological cells," Zia said. "This funding allows us to further explore and explain properties and behavior of biological systems using principles of colloidal physics."



Studying Supercritical CO2

In the atmosphere, carbon dioxide (CO2) is a gas known for its negative impact on the environment. But bring it to an unusual fluid state above critical pressure and temperature points, and this supercritical carbon dioxide has some pretty exciting superpowers.

"CO2 can actually be an excellent fluid for engineering systems, for example, power generation and cooling," Associate Professor Chanwoo Park said. "The benefit of supercritical CO2 is that its property is very different from subcritical CO2 and it allows energy and cooling systems to operate at very efficient conditions."

Park received funding from the U.S. Army to apply supercritical CO2 to cooling systems for unmanned airborne vehicles (UAVs) that take advantage of CO2 in this abnormal state, which is somewhere between a vapor and a liquid.

With the funding, Park will extend previous Army-funded research for conventional UAV thermal management to advanced cooling systems for large autonomous drones. The idea is to use supercritical CO2 to create lightweight and compact cooling systems that can dissipate the waste heat from unmanned aerial vehicles more efficiently.





Advancing Technology to Meet Energy Demands

Yue Jin, assistant professor and director of the Advanced Flow and Heat Transfer Lab, is working to advance technology to solve climate challenges and meet growing clean energy demands. He's studying fluid flow and heat transfer behavior spanning different scales and alternatives to water, such as liquid metals and molten salts. that can be used as cooling agents in power generation and energy conversion systems.

"The ultimate goal is to increase energy efficiency and safety," he said. "Nuclear industry energy components are getting smaller and more compact, and as a result the energy density gets higher and higher. We need a novel way to cool highly dense, compact energy systems." Jin recently received two grants for his work. With funding from MU's Research Council, he is developing an innovative model that combines physics-based principles and data-driven techniques to predict crucial heat flux.

A separate grant from the Nuclear Regulatory Commission, through Penn State, focuses on the study of droplet dynamics and twophase flow heat transfer in the 7-by-7 rod assembly found in nuclear power plants using a specialized laser imaging test facility. Specifically, researchers are simulating accident scenarios and how coolants can be reintroduced into a system following a loss of coolant accident.

Turning Everyday Objects into Electronics

A Mizzou Engineering team has developed a new technique to fabricate electronics onto everyday objects.

Essentially, the method allows sensors and electrodes to become part of another structure. Without disturbing their own properties, trees could be equipped to measure wind speeds; shells could record water flow; and rocks could detect harmful gases.

"We're developing a process by which different materials, including those with irregular surfaces, could be made into sensing applications," said Jian Lin, associate professor of mechanical and aerospace engineering. "The advantage is that these sensors are part of a surface and part of a structure. It opens a lot of routes to manufacturing multifunctional structures and materials."

Lin developed the laser induced graphene production process as a post-doctoral fellow at Rice University in 2014. That process creates patterned sheets of laser induced graphene (LIG) — a carbon material — from polymers by burning it with lasers equipped in a 3-axis machine.

The novelty of the current work is that the 5-axis laser processing platform directly fabricates 3D conformable electronics on targeted surfaces with arbitrary surface topologies. Adding two more rotational axes allows engineers to make patterns from all possible directions, increasing precision and the number of possible surfaces to turn into electronics.

With the original 3-axis machine, researchers could turn flat, smooth objects like tables or notebooks into electronic devices. A 5-axis machine opens possibilities for more objects, even those in nature, to become multifunctional structures with integrated sensors.

In a paper published in Advanced Functional Materials, the team demonstrated this novel technique to fashion functional devices on clam shells, bread and wood surfaces.



Advancing Autonomous Algorithms

Assistant Professor Mushuang Liu is working to improve algorithms behind autonomous vehicles.

"We need the algorithm to always ensure that self-driving cars are safe, reliable and trustworthy," she said. "But that's challenging because it requires knowing the intentions of other vehicles and drivers."

To better calculate those unknowns, Liu is using game theory, a branch of mathematics that takes into consideration decision-making situations where outcomes depend on choices made by others. Specifically, she's developing a receding horizon potential game approach, which not only considers the needs of pedestrians, cyclists and other road participants to model their behaviors, but also enables extended prediction horizon for the selfdriving cars. By integrating the merits of model predictive control and game theory, the algorithms can anticipate everyone's varying goals and behaviors and respond accordingly.

Liu has funding from both Ford and MU to focus on creating a methodical approach to develop advanced control systems for automated driving. The goals are to ensure safety and enhance passenger comfort.

Controlling Energy Waves in the Fourth Dimension

Guoliang Huang, the Huber and Helen Croft Chair in Engineering, and his team have successfully created a new synthetic metamaterial with 4D capabilities, including the ability to control energy waves on the surface of a solid material. These waves, called mechanical surface waves, are fundamental to how vibrations travel along the surface of solid materials.

While the team's discovery, at this stage, is simply a building block for other scientists to take and adapt as needed, the material also has the potential to be scaled up for larger applications related to civil engineering, micro-electromechanical systems (MEMS) and national defense uses. "Conventional materials are limited to only three dimensions with an X, Y and Z axis," Huang said. "But now we are building materials in the synthetic dimension, or 4D, which allows us to manipulate the energy wave path to go exactly where we want it to go as it travels from one corner of a material to another."

This breakthrough discovery, called topological pumping, could one day lead to advancements in quantum mechanics and quantum computing by allowing for the development of higher dimension quantum-mechanical effects.

Challenging Newton's Second Law

For more than 10 years, Guoliang Huang, the Huber and Helen Croft Chair in Mechanical and Aerospace Engineering, has been investigating the unconventional properties of "metamaterials." His goal is to help control the "elastic" energy waves traveling through larger structures such as an aircraft — without light and small "metastructures."

"For many years I've been working on the challenge of how to use mathematical mechanics to solve engineering problems," Huang said. "Conventional methods have many limitations, including size and weight. So, I've been exploring how we can find an alternative solution using a lightweight material that's small but can still control the low-frequency vibration coming from a larger structure, like an aircraft."

In a recent study published in the Proceedings of the National Academy of Sciences (PNAS), Huang and colleagues have developed a prototype metamaterial that uses electrical signals to control both the direction and intensity of energy waves passing through a solid material.

Potential applications of his innovative design include military and commercial uses, such as controlling radar waves by directing them to scan a specific area for objects or managing vibration created by air turbulence from an aircraft in flight.

"This metamaterial has odd mass density," Huang said. "So, the force and acceleration are not going in the same direction, thereby providing us with an unconventional way to customize the design of an object's structural dynamics, or properties to challenge Newton's second law."



Team Observes Localized Explosion of Aluminum Nanoparticle

A Mizzou Engineering team has provided direct evidence of a localized explosion of an aluminum nanoparticle, a mechanism first theorized in 2006.

"This reaction mechanism has been proposed for over a decade but hasn't been clearly observed experimentally until now," said Associate Professor Matt Maschmann, who is co-director of the MU Materials Science & Engineering Institute.

Maschmann and Shubhra Gangopadhyay, professor emerita of electrical engineering and computer science, outlined their observation of spallation of isolated aluminum nanoparticles by rapid heating in the journal of Applied Materials & Interfaces.

Aluminum nanoparticles are about 120 nanometers in diameter and are encapsulated with an aluminum oxide shell that protects the metallic aluminum core from reacting with the outside environment. When that shell is removed — in this case using lasers — and the core is exposed to oxygen, it releases a significant amount of energy. The key mechanism in this work was rapid (greater than 10,000,000°C per second) thermomechanical expansion and melting of aluminum caused by focused laser heating.

"We're the first to study this under the microscope, to initiate this reaction with fast heating," Gangopadhyay said. "We did this in situ observation in a very controlled setting."

In short, this nanoscopic explosion means researchers can control the release of a large amount of energy in a small, localized area. That energy could be used in applications such as biomedical treatment, material processing and energy storage.

Growing Carbon Nanotubes

Mizzou Engineering researchers are another step closer to controlling the properties of carbon nanotubes growing in mass quantities.

Carbon nanotubes (CNTs) are nanoscale cylindrical carbon molecules that have unique electric, mechanical and thermal properties. CNTs are flexible, lightweight and strong material that could have a variety of realworld applications.

Simultaneously growing CNT populations, known as CNT forests, interact and entangle in ways that are not fully understood with the net effect of modulating their collective properties.

Before engineers can solve that problem, they must first be able to measure and characterize how individual CNTs are assembled within forests. In their latest paper, Associate Professor Matt Maschmann and co-authors have outlined a deep learning technique to segment carbon nanotube forests in scanning electron microscopy (SEM) images. This technique allows them to detect individual CNTs within a forest which can help eventually characterize their properties.

"This technique allows us to quantifiably interpret SEM images of complex and interacting CNT forest structures," Maschmann said. "My dream for this would be to have an app or plug-in where anyone looking at an SEM image of carbon nanotubes could see histograms representing the distributions of CNT diameters, growth rates and even estimated properties. There's a lot of work to do to make that happen, but it would be phenomenal. And I think it's realistic."

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Mizzou Awarded \$3 Million NSF Research Traineeships Grant

A five-year, \$3 million grant from the National Science Foundation (NSF) is establishing a doctoral training program at the University of Missouri to help prepare the next generation of scientists and engineers to work in the emerging fields of materials science and data science and analytics. The aim of the NSF Research Traineeship program is to empower future workers to be proficient in both subjects — a skillset that is highly desirable in today's global marketplace.

"We're excited to train a new generation of materials scientists and engineers to be proficient with data science techniques, including machine learning and artificial intelligence, whether it's to discover better materials for building batteries and computer chips, reconstructing technology from ancient civilizations, or harnessing the untapped potential of carbon nanotubes," said Matt Maschmann, co-principal investigator on the project and an associate professor. "Students will have the necessary skills to tackle some of the world's most significant challenges in a wide variety of fields ranging from health care and medicine to energy."

The data science components of the program — including artificial intelligence and machine learning — will help guide students in conducting and analyzing experiments associated with this research.

"Data science and analytics can accelerate materials research in various ways," Maschmann said. "But these tools haven't been taught to students who are primarily focused on materialsbased programs. What we want to do is integrate emerging tools in data science like artificial intelligence and machine learning into a more traditional materials program. At the end of the program, we'll have students who have a deep understanding of materials, and who are also fluent in data science and analytics — a skillset I think the marketplace is looking for right now."

In addition to placing an emphasis on integrating materials-based research with data science and analytics, the program also has a formal creativity training component to help students conceptualize new materials technologies.

"With machine learning and artificial intelligence taking over a larger role in research, it means that many tasks aren't being performed by humans as much anymore," Maschmann said. "So, we see creativity training almost like a counterbalance to machine learning and artificial intelligence to engage students in the processes that cannot be outsourced to digital tools. Because as these tools become more pervasive, the role of human beings is going to shift more toward the creative and cognitive processes. The parameter space for materials is basically inexhaustible, and by utilizing the available digital tools in a more efficient way, a researcher can arrive at a desired outcome for material properties much quicker. Human creativity is imperative to guide research in innovative and meaningful application domains."

FACULTY ACCOLADES



Tzou Receives Heat Transfer Memorial Award

D.Y. "Robert" Tzou, a professor emeritus of mechanical and aerospace engineering, was selected to receive the 2023 Heat Transfer Memorial Award from the American Society of Mechanical Engineers (ASME). He received the award during the Heat Transfer Luncheon during the 2023 ASME International Mechanical Engineering Congress and Exposition (IMECE) this fall.

Tzou was recognized for his international leadership and seminal contributions to microscale heat transfer by establishing the dual-phase-lag model for ultrafast phenomena, publishing the first book in this area, and founding a major international conference on microscale and nanoscale heat and mass transfer.



Curators' Distinguished Professor and Chair Bill Ma was recognized with the Donald Q. Kern Award from the American Society of Mechanical Engineers (ASME) and American Institute of Chemical Engineers (AIChE) for his pioneering work around heat transfer processes and oscillating heat pipes.

Ma received the award and delivered a plenary keynote at the society's Summer Heat Transfer Conference in Washington on July 12. Ma is co-founder and president of ThermAvant Technologies, the sole company to manufacture and sell oscillating heat pipe cooling devices to the top defense companies in the U.S.

Huang Named Fellow of SPIE

Guoliang Huang has been named a Fellow of SPIE, the international society for optics and photonics.

SPIE Fellows are members of the Society who have made significant scientific and technical contributions in the multidisciplinary fields of optics, photonics and imaging.

Huang is Huber and Helen Croft Chair. His research focuses on addressing challenges in development of passive and active metamaterials for wave propagation and noise control, mechanical topological insulator, vibration and sound mitigation, energy harvesting, bio-sensing and more.





Welcome New Faculty

The Department of Mechanical and Aerospace Engineering welcomed several new faculty members in 2023.

Associate Professor Travis Sippel's research is in the area of energetic materials, which involves the study of synthesis, fabrication and combustion of propellants, explosives and pyrotechnics. His work has been funded by the Department of Defense and Department of Energy.

Associate Professor Scott Thompson conducts research on metals additive manufacturing methods, including laser powder bed fusion and directed energy deposition. He also investigates the effects of harsh environments such as nuclear radiation and high temperature on emerging materials.

Associate Professor Yingchao Yang's interests span in the loop of nanomaterial fabrication, property evaluation and advanced applications. He is the recipient of a National Science Foundation Early CAREER Award and faculty awards from the University of Maine.

Roseanna N. Zia is associate dean for research and Wollersheim Professor. She studies structure-property relationships of flowing suspensions, elucidating the mechanistic origins of the colloidal glass transition and multi-scale computational modeling of reversibly bonded colloidal gels.



Travis Sippel Associate Professor Mechanical and Aerospace Engineering



Scott Thompson Associate Professor Mechanical and Aerospace Engineering



Yingchao Yang Associate Professor Mechanical and Aerospace Engineering



Roseanna N. Zia Associate Dean for Research & Wollersheim Professor Mechanical and Aerospace Engineering

Mizzou Racing Speeds Past Competition

Mizzou Racing, which builds a quarter-scale formula car, competed in May and Mizzou Electric Racing, which builds a quarter-scale electric formula car, competed in the Formula SAE event at Michigan International Speedway in June.

"Student organizations like Mizzou Racing are what make college fun," said Gillian Dorman, team manager of Mizzou Racing. "Classes are tough and having an outlet like this team is how to become a successful student."

The teams spend all year preparing for competition, which includes static events such as design and cost presentations and numerous technical inspections in addition to driving events. Mizzou Racing's car, #18, placed 17 out of 120 teams. They also earned second place in the Skidpad event. Mizzou Electric Racing passed all except the brakes safety test, and were unable to compete in the driving events.

"Competing with the electric car was an amazing experience that we couldn't have done without the help of Mizzou Racing," said Brooke Becker, vice president of Mizzou Electric Racing and a senior in mechanical engineering. "My favorite moment from the week was seeing the racecar drive for the first time at competition. We had a few setbacks leading up competition, but seeing the car drive was such an amazing thing to witness."

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Mizzou Space Program Reaches New Heights

Mizzou Space Program (MSP) made history this year at the Spaceport America Cup when it launched Mizzou's first rocket flown with a student researched and developed (SRAD) motor.

"We earned fourth place in the 10,000 feet SRAD category and 22nd overall," said Abigail Penfield, 2022-23 Mizzou Space Program President. "We also reached an apogee of 10,058 feet, had the 5th highest flight performance score overall and improved from last year in all major score categories."

Competing in the 10,000 feet SRAD category meant the team targeted an altitude of 10,000 feet above ground level for their rocket's flight, which they nearly precisely hit.

"We are very happy with our results, especially considering that it was our first year in this category," said Ryan Milewski, 2023-24 Mizzou Space Program President.





Mizzou Tigers Take to the Sky

The Mizzou AeroTigers took flight for the first time as an organization this spring at the American Institute of Aeronautics and Astronautics (AIAA) "Design, Build, Fly" competition.

Last year, some of the members competed in the "Design, Build, Fly" competition as part of the Mizzou chapter of the American Society of Mechanical Engineers (ASME). This year as an official team, participants saw much better results.

"We jumped from the bottom five teams [out of 110] last year to being 38th in the world this year [of 135 teams], so it's quite a jump," said senior Landon Toler, president and co-founder. "We're super proud of the work we've put in and are hoping that this year we'll actually be able to fly our plane."



Team Earns Honors at ASABE Competition

The Mizzou Torq'N Tigers Quarter Scale Tractor Pulling Team earned honors at the American Society of Agricultural and Biological Engineers (ASABE) International Quarter Scale Student Design Competition this summer.

The competition is designed for each school to bring a team of experienced members and a team with newer members to compete in separate classes. The experienced members make up an "A-Team," that has to build a completely new tractor each year. The less experienced members comprise the "X-Team," which must redesign at least 30% of the previous year's design. Both Mizzou teams earned spots within the top five overall. "The competition went really well," said Jonathan Ebbesmeyer, team president and mechanical engineering student. "With our members and our knowledge, I believe we have the capabilities to win the entire contest next year."

The A-Team won both heavy pulling events in addition to earning 5th place in the overall competition. The X-Team placed 2nd overall and won the pulling performance competition event.

The teams are judged on design, technical inspections, maneuverability, durability and the tractor pulls. The competition also requires students to create a design report and marketing presentation.



Ph.D. Student Earns DOE Fellowship

A Mizzou Engineer has been selected to participate in a U.S. Department of Energy (DOE) research fellowship program designed to support graduate students working on energy-related research.

As part of IBUILD: Innovation in Buildings Graduate Research Fellowship, Jeremy Spitzenberger will continue to conduct research around thermal management with additional opportunities for mentorship and training.

IBUILD is sponsored by the Building Technologies Office of the DOE, Energy Efficiency and Renewable Energy. It's managed by Oak Ridge National Laboratory and administered by Oak Ridge Institute for Science and Education. In addition to training, the program provides tuition and stipend funding.

Spitzenberger is a third-year Ph.D. student in mechanical engineering. At Mizzou, he's working with Chair and Curators' Distinguished Professor Bill Ma on fluid thermal management applications, specifically looking at ways to improve efficiencies in water heaters.



Nunez Selected for Post-Doctoral Fellowship

Roberto Nunez is using the power of mathematics to ignite advancements in mechanical engineering this year as part of a prestigious post-doctoral fellowship at Mizzou.

Preparing Future Faculty for Inclusive Excellence (PFFIE) is a selective program designed to help recent Ph.D. graduates transition to full-time faculty positions.

Nunez earned his Ph.D. in mathematics from Mizzou in 2021. For the PFFIE

fellowship, he has joint appointments in the Department of Mechanical and Aerospace Engineering and Mathematics Department. As part of the position, he's working in MAE Chair Bill Ma's Multiphysics Energy Research Center, where he's using his mathematical expertise to improve upon algorithms that predict the performance of oscillating heat pipes.

ABSTRACT & INTRODUCTION

This research focuses on leveraging artificial intelligence (AI) techniques to enhance the efficiency and accuracy of decoding data stored in gene materials for use as an alternative to conventional silicon hard drives. DNA, with its high data density,



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NSF REU Focused on Materials, Creativity

Students participating in a materials science-focused summer program spent nine weeks at Mizzou Engineering getting hands-on research experience.

It's part of a Research Experiences for Undergraduates Site funded by the National Science Foundation and coled by Associate Professors Reginald Rogers and Matt Maschmann.

"My hope is to get students to see research as more than just standing in a lab," Rogers said. "It's developing an idea and using creativity to solve problems. I want to sow a seed and

ideally surpassing

introduce them to research and industry opportunities so they can make well-informed decisions to do whatever is right for them after graduation."

The overall theme of the REU focused on materials with broad-reaching, interdisciplinary applications. Students worked with cell cultures and biomaterials, carbon nanotubes and polymers.

The REU also included weekly seminars focused on creativity, idea generation and collaboration.

and data DNA, encode shown in Figure 1 reashown in Figure 1 reasingle-stranded DNA, cauduring signal reading. The expenencoded information using the molecon-However, this process is time-consuming and particle of noiseinduced errors. Machine learning techniques are employed to address these challenges for signal interpretation and analysis.

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Runge Earns NSF Graduate Research Fellowship

Brooke Runge was selected to receive a 2023 National Science Foundation (NSF) Graduate Research Fellowship.

The highly selective Fellowship recognizes and supports outstanding graduate students and those entering into a graduate program. Runge earned bachelor's degrees in mechanical engineering and math, then a master's in electrical engineering. While Runge accepted a position at Boeing in Los Angeles immediately after graduation, the NSF Graduate Research Fellowship provides three years' worth of funding for a Ph.D. that she can use within the next five years.



Bond Presents Research at State Capitol

Senior Graham Bond this past spring was selected to present his research at the Missouri State Capitol. His project focused on using cutting-edge 4D printing and tissue engineering techniques to kickstart the next generation of personalized and adaptive biomedical devices. He and team members in Associate Professor Jian Lin's lab are developing a novel polymer that can change shape when placed in the warmth of a human body. They mix the polymer with sugar before printing a 3D structure, then dissolve the sugar to leave behind a matrix of pores for tissues to grow upon.



Osaze Wins 3MT® People's Choice Award

A Ph.D. student has discovered a way to turn unrecyclable plastic into building insulation that is 150% more effective than its untampered state on the market.

For his research, Osasu Osaze earned the People's Choice Award at this year's Three-Minute Thesis® competition sponsored by the University of Missouri Graduate School. Osaze devised a way to turn polypropylene into more efficient insulation using 3D printing. He melts the polypropylene down into filaments, then uses that to print insulating materials layer by layer.



IAC Provides Industry Guidance

The MAE Industrial Advisory Council met this fall to discuss priorities and goals for the department. The IAC is comprised of some of the department's most prestigious alumni.

Pictured, front row from left, are David Wollersheim, Charles Svoboda, Lawson Hart, Amber Rowson, Jeff Henderson and Brian Martinek. In back, from left, are Richard Warder, Bill Ma, Steve Pierson, Darius Mehta, Joshua Arnone, Bryan Schache and Aaron Sengstacken. Not pictured are: Phil Bennett, Emily Boyd, Shawn Duryea, Olawale Oladiran, Jeremy Peterson and Christa Weisbrook.



Fitterling Inducted into Mizzou Hall of Fame

Jim Fitterling, B.S. ME '83, was inducted into the Mizzou Hall of Fame. Fitterling is the chair and chief executive officer of Dow a global materials company.

Fitterling has played a key role in the Company's transformation, from lowermargin, commodity businesses to one more deeply focused on higher-growth, consumer demand-driven markets that value innovation with the goal of creating the most innovative, customer-centric, inclusive and sustainable materials science company in the world. He is also a cancer survivor, an experience that has influenced his commitment to transforming health care.

Fitterling is co-chair of the Dean's Advisory Council at Mizzou Engineering.

Watch the Mizzou Hall of Fame video featuring Fitterling here:







416 S 6th Street Columbia, MO 65211

MAE Focus Areas:

- Aerospace Vehicle Flight Mechanics and Control
- Advanced Design and Manufacturing
- Dynamics and Vibrations
- Fluid Power Systems
- Mechanics and Material Science
- Micro/Nano Engineering
- Thermal Sciences, Fluid
 Flow and Energy

Total Mechanical andMechanical and AerospaceInstitutesAerospace StudentsFacultyand Centers

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