

MISSOURI  
**S&T**

**MECHANICAL AND  
AEROSPACE ENGINEERING**  
INVENT THE FUTURE

MISSOURI S&T STUDENT-DESIGNED  
SATELLITE TO LAUNCH IN EARLY 2024

PAGE 12

# MESSAGE FROM THE CHAIR



Dear Friends:

2023 was a great year for Mechanical and Aerospace Engineering at Missouri S&T. From record research awards, to record first time enrollment (in both Aerospace and Mechanical programs), to record starting salaries, to five faculty searches

underway, there is an abundance of pride in our accomplishments and optimism for the future. It is a great time to be an S&T Miner.

Let's start with a calendar year record for new research awards - \$14.0 million. That is more than \$600,000 for each of our tenure and tenure track faculty, thanks to a significant growth in advanced manufacturing research. We also reached a five year high in expenditures per faculty, increased our annual citations per faculty to a new department record, and eight (8) of our faculty were named as being in the 2% of researchers in their field as reported by Stanford University.

The success of our faculty is catching the attention of potential students and our stakeholders. Both our mechanical and aerospace programs had record new student enrollments in Fall 2023, with our aerospace program increasing its new student enrollment by nearly 40% over the last record class. While there is great excitement for new students, our graduates are also setting records, with both programs having average starting salaries for B.S. holders exceeding \$77,000.

Our students are also winning national and international recognition for their individual and team successes. We had our second student team in three years win a NASA Big Idea award for lunar mining. Waleed Addas was awarded as the top young inventor at the 34th International Invention, Innovation and Technology Exhibition (ITEX) held in Kuala Lumpur, Malaysia. And our Satellite Team is preparing for their first ever deployment on a SpaceX rocket this Spring.

As we look to the future, with five new faculty hires this year and anticipation of the opening of the advanced manufacturing research and development facility (the 'Protoplex') to become the heart of the Missouri Manufacturing Ecosystem initiative, we continue to focus on making lives better through research in improved infrastructure, resource sustainability, energy conversions, AI and autonomous systems, and advanced manufacturing, including biomanufacturing.

I invite you to explore these and many other highlights from this year and learn how the people of MAE are developing knowledge and innovations to tackle some of our world's most pressing problems with amazing drive and creativity.

Respectfully,

*David J. Bayless*

Dr. Dave Bayless, P.E., F-ASME and NAI  
Chair and Professor, MAE at Missouri S&T



Mechanical and  
Aerospace Engineering  
Department

# MECHANICAL AND AEROSPACE ENGINEERING BY THE NUMBERS

mae.mst.edu

## RANKED NEAR THE TOP

MECHANICAL ENGINEERING #61

AEROSPACE ENGINEERING #50

*U.S. News & World Report (2023-24)*

**34** Full-time  
faculty  
members

**1,500+**

MAE student enrollment

**7** DEGREE  
PROGRAMS

### MECHANICAL ENGINEERING

Bachelor of Science (B.S.)  
Master of Science (M.S.)  
Doctor of Philosophy (Ph.D.)

### AEROSPACE ENGINEERING

Bachelor of Science (B.S.)  
Master of Science (M.S.)  
Doctor of Philosophy (Ph.D.)

### MANUFACTURING ENGINEERING

Master of Science (M.S.)

**7** GRADUATE CERTIFICATES

Start earning college credit  
toward your master's degree.

(Learn more: [distance.mst.edu](https://distance.mst.edu))

**131,000** ft<sup>2</sup>  
LAB SPACE  
PROTOPLEX

A hub for manufacturing research and  
development (Opens 2025)

**19%**

MAE department  
undergraduate  
female engineers

**8**

WORLD'S TOP 2%  
SCIENTISTS  
*Stanford University  
(2023)*

**\$14M**

Research  
Awards  
(CY 2023)

**\$77,000+**

MAE B.S. holders average starting salaries

# COLLEGE OF ENGINEERING AND COMPUTING

cec.mst.edu

**16** ABET-accredited  
engineering  
programs

**TOP 40**

**\$52.2M**

CEC total  
engineering  
enrollment **5,400+**

U.S. PUBLIC ENGINEERING  
PROGRAMS

New research awards

## NEWEST FACULTY



### Mohammad Abbas

Assistant Teaching Professor

**PhD:** Missouri S&T, 2022

**Research Focus:** Thermodynamics, fluid mechanics, aerospace propulsion, vehicle performance, and general mechanics



### Donna Jennings

Assistant Teaching Professor

**PhD:** Missouri S&T, 2023

**Research Focus:** Educational research, small satellites, astrodynamics, orbital mechanics, spacecraft mission design



### Abdulaziz Abutunis

Assistant Professor

**PhD:** Missouri S&T, 2020

**Research Focus:** Hydrokinetic and Wind energy; composites; additive manufacturing; injection molding; system design



### Zhi Liang

Associate Professor

**PhD:** Missouri S&T, 2010

**Research Focus:** Micro/nanoscale thermodynamics and heat transfer, dynamics of nanodroplets, nanobubbles, and nanoparticles, structure-property relationship for materials and interfaces, and computational modeling



### Richard Billo

Distinguished Professor/Director of Kummer Center for Advanced Manufacturing

**PhD:** Arizona State University, 1989

**Research Focus:** Advanced manufacturing, industrial information systems, metallurgy, and liquid fuels processes



### Smriti Nandan Paul

Assistant Professor

**PhD:** Purdue University, 2020

**Research Focus:** (Astro)dynamics, space domain/situational awareness, space traffic management, space weather, stochastic machine learning techniques, GNC for space sustainability and missions, computer vision, and space autonomy

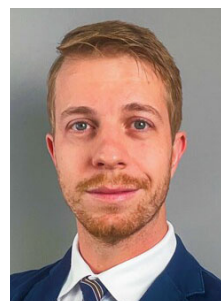


### Xiaosong Du

Assistant Professor

**PhD:** Iowa State University, 2019

**Research Focus:** Machine learning, artificial intelligence, aircraft design optimization, electric drones



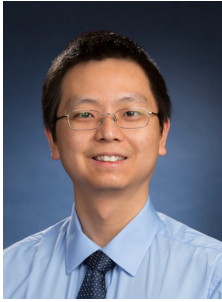
### Davide Viganò

Assistant Professor

**PhD:** University of Texas at Arlington, 2019

**Research Focus:** High-speed experimental aerodynamics, hypersonic and high-enthalpy flows, compressible turbulence, supersonic vortex dynamics, laser-based flow diagnostics, ground facilities development

## TENURE AND PROMOTION



### Daoru (Frank) Han

Associate Professor

**PhD:** University of Southern California, 2015

Promoted to associate professor and granted tenure in 2023

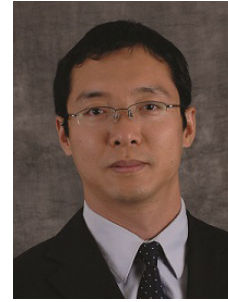


### Yun Seong Song

Associate Professor

**PhD:** Massachusetts Institute of Technology (MIT), 2012

Promoted to associate professor and granted tenure in 2023



### Xiaodong Yang

Professor

**PhD:** Columbia University, 2009

Promoted to professor in 2023

## FACULTY BY RESEARCH AREA

### Thermal-Fluid Sciences

#### Aerodynamics

Daoru (Frank) Han  
Serhat Hosder  
David Riggins  
Davide Viganò

#### Fluid Dynamics

Daoru (Frank) Han  
Serhat Hosder  
Zhi Liang  
Davide Viganò

#### Propulsion

Daoru (Frank) Han  
David Riggins

#### Energy Conversion and Transport

David Bayless, P.E  
Kelly Homan  
Umit Koylu  
Jonghyun Park  
Xiaodong Yang

### Design and Manufacturing

#### Manufacturing

Richard Billo  
Ming Leu  
Frank Liou  
Anthony Okafor  
Jonghyun Park

### Systems Design

#### Mechanical Engineering Focus

Ryan Hutcheson  
Ming Leu  
J. Keith Nisbett  
Yun Seong Song  
Daniel Stutts

#### Aerospace Engineering Focus

Warner Meeks  
Donna Jennings  
Henry Pernicka  
Jillian Schmidt

#### Multidisciplinary analysis/ Optimization

Serhat Hosder  
Yezad Anklesaria

### Materials and Structures

#### Solid Mechanics

K. Chandrashekhara  
Lokeswarappa Dharani  
Daniel Stutts

#### Engineering Materials

K. Chandrashekhara  
Lokeswarappa Dharani  
Jonghyun Park  
Xiaodong Yang

### Dynamic Systems and Control

#### Controls

Douglas Bristow  
Xiaosong Du  
K. Krishnamurthy  
Smriti Nandan Paul  
Yun Seong Song  
Daniel Stutts

#### Nonlinear Dynamics

Nishant Kumar

#### Astrodynamics

Donna Jennings  
Smriti Nandan Paul  
Henry Pernicka

### Structural Dynamics

#### Aerospace Structures

Henry Pernicka  
Daniel Stutts

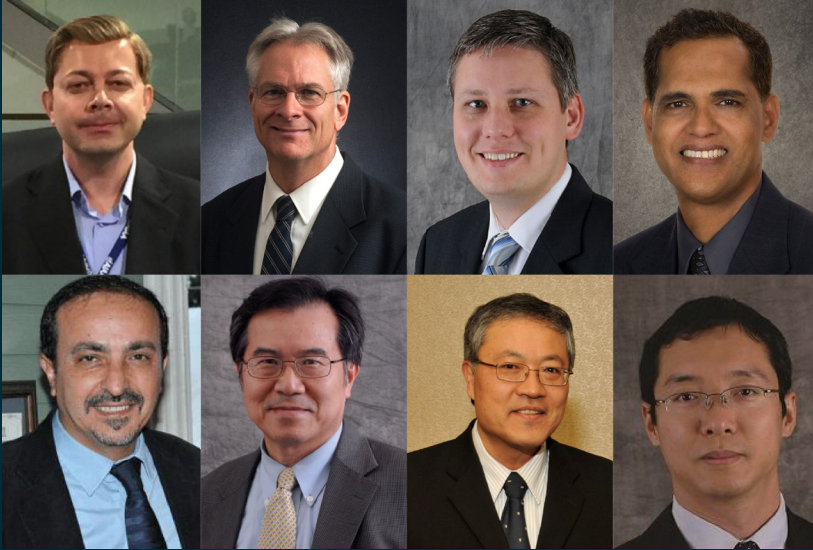
#### Vibrations/Acoustics

Daniel Stutts

#### Machine Learning

Xiaosong Du

## FACULTY ACHIEVEMENTS



### 8 MAE researchers among top 2% in their fields

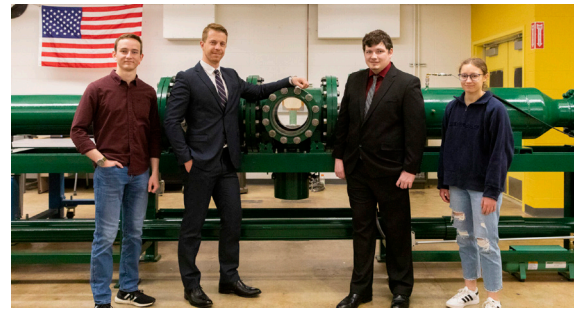
A total of 8 faculty of Missouri S&T Mechanical and Aerospace Engineering Department are among the top researchers in their field as measured by their career research records, and 4 researchers were among the best in their fields in 2022, according to a recent analysis of standardized citation indicators of the Elsevier Data Repository published by Stanford University.

#### Aerospace engineering

- **Dr. Serhat Hosder**, James A. Drallmeier Centennial Professor of mechanical and aerospace engineering (career)
- **Dr. David Riggins**, Chancellor's Professor and Curators' Distinguished Teaching Professor emeritus of aerospace engineering (career)

#### Mechanical engineering

- **Dr. Douglas Bristow**, professor and director of the Center for Aerospace Manufacturing Technologies (career)
- **Dr. K. Chandrashekhara**, Curators' Distinguished Professor of mechanical and aerospace engineering (both)
- **Dr. Umit Koylu**, professor of mechanical engineering (career)
- **Dr. Ming C. Leu**, Keith and Pat Bailey Professor and former director of the Intelligent Systems Center (both)
- **Dr. Frank Liou**, Michael and Joyce Bytnar Professor and interim director of the Intelligent Systems Center (both)
- **Dr. Xiaodong Yang**, professor of mechanical and aerospace engineering (both)



### Researchers revives supersonic wind tunnel

Since its inception in 1968, the supersonic wind tunnel at Missouri S&T has served numerous purposes, though in recent times it has primarily been utilized for educational purposes and demonstrations rather than for research. Dr. Davide Viganò, along with his group of dedicated aerospace engineering students, have undertaken the task of refurbishing the tunnel. Additionally, the facility is set to be upgraded with cutting-edge instrumentation to enhance its diagnostic capabilities.



### 4 MAE faculty honored for outstanding teaching, service, experiential learning

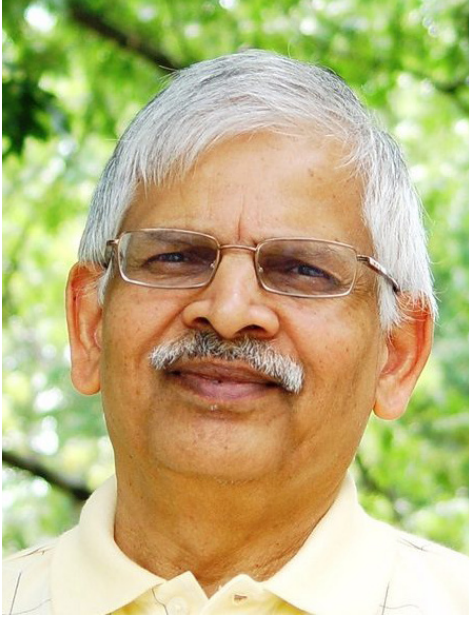
Four esteemed faculty members from the Department of Mechanical and Aerospace Engineering at Missouri S&T were recognized for their exceptional dedication to teaching, service, and experiential learning.

**Dr. Hank Pernicka** - For engaging students beyond the classroom with the Service Learning Award.

**Dr. Jonghyun Park** - For a sustained record of excellence, earning the Faculty Excellence Award.

**Dr. Jill Schmidt** - For her exemplary service to both the university and her professional field with the Faculty Service Award.

**Dr. Nishant Kumar** - For outstanding teaching and related activities, receiving the Faculty Teaching Award.



## DR. LOKESWARAPPA DHARANI APPOINTED AS CHANCELLOR'S PROFESSOR

Missouri S&T is proud to announce the appointment of Dr. Lokeswarappa Dharani as a Chancellor's Professor in recognition of his exceptional contributions to academia, research, and the university community. This prestigious honor comes following his retirement from a distinguished career at Missouri S&T.

Dr. Dharani has been an esteemed member of the Missouri S&T faculty for 41 years, during which he has made significant contributions to Mechanical and Aerospace Engineering. With a distinguished career spanning academia, research, and professional service, Dr. Lokeswarappa Dharani continues to inspire and contribute to the fields of Aerospace Engineering, Materials Science, and Mechanical Engineering at Missouri University of Science and Technology and beyond.

As a Chancellor's Professor, Dr. Dharani's legacy will continue to inspire future generations of scholars. The Chancellor's Professor designation reflects Missouri S&T's appreciation for Dr. Dharani's enduring impact on the university and his ongoing commitment to the pursuit of knowledge and academic excellence.

## DR. SERHAT HOSDER RECEIVED INAUGURAL JAMES A. DRALLMEIER CENTENNIAL PROFESSORSHIP



Dr. Serhat Hosder (left) being conferred the professorship by Ed Gerding (right), President of AMAE 2022-2023, at the 28th AMAE Induction Ceremony on October 26, 2023

Dr. Serhat Hosder, an esteemed professor at the Department of Mechanical and Aerospace Engineering, has been named as the inaugural holder of the James A. Drallmeier Centennial Professorship, an accolade celebrating Dr. Drallmeier's excellence in leadership.

The campaign to endow this professorship has been a testament to perseverance and vision. It saw considerable acceleration with Dr. Drallmeier at the helm as Chair, who strategically capitalized on the Centennial celebrations of 2016 to enhance the department's development drives. In a pivotal move in 2021, Dr. David Bayless reached out to the Academy of Mechanical and Aerospace Engineers, advocating for the vital support needed to bring this vision to fruition—a move instrumental in equipping the department with a means to honor and retain distinguished faculty.

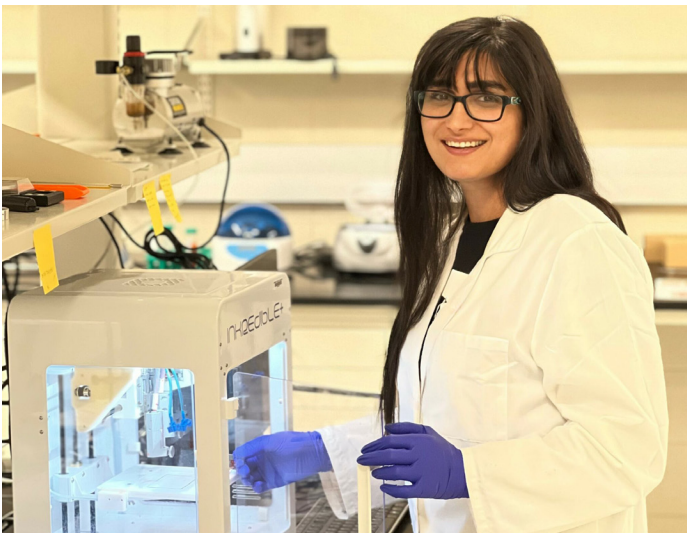
The recipient of the inaugural James A. Drallmeier Centennial Professorship was selected by a committee of named professors in and outside the department, with confirmation of the Dean and approval of the Provost. Dr. Hosder was formally bestowed with the professorship during the 28th Missouri S&T Academy of Mechanical and Aerospace Engineers Induction Ceremony held on October 25, 2023, in Missouri S&T.

Dr. Hosder expressed his gratitude, saying, "It is a great honor for me to receive the James A. Drallmeier Centennial Professorship. With this prestigious recognition, I am excited to further promote excellence in research, graduate student mentorship, teaching, and professional service; and contribute to the visibility and reputation of our department."

An internationally renowned figure in hypersonics and presiding Chair of the Aerospace Technical Committee in the department, Dr. Hosder's selection reflects the high caliber of our faculty. Dr. David Bayless encapsulated the sentiment: "I am thrilled that this professorship could be awarded. It reflects not only the outstanding work of Dr. Hosder, but the overall quality of the faculty in Mechanical and Aerospace Engineering and the commitment the Academy and alumni of the department have to its future."

# S&T RESEARCHERS DEVELOPING NEW DRESSINGS FOR BETTER WOUND CARE

Missouri S&T researchers are developing new 3D-printed hydrogel dressings to speed up and improve the healing process for patients with second-degree burns.



“We have developed dressings with bioactive formulations to better address issues that patients with burn injuries regularly face,” says Dr. Fateme Fayyazbakhsh, an assistant research professor of mechanical engineering at S&T and the project’s lead researcher. “The continuous hydration provided by these dressings, along with their non-adhesive and porous texture, show great promise in promoting moist wound healing, reducing pain caused by atraumatic dressing removal, and minimizing scar tissue formation.”

Each year, approximately 1.1 million Americans suffer from burn injuries that require acute medical attention and can experience several issues throughout the healing process, according to American Burn Association.

The research team published an article covering their latest findings in the *International Journal of Bioprinting* in July.

Hydrogels are typically part of the care regimen for patients with severe burns, but what separates S&T’s research from standard hydrogels is that the team is

focusing on precisely 3D printing dressings that also include bioactive borate glass.

The innovative use of glass for health care procedures was pioneered at S&T in the 1980s by Dr. Delbert Day, Curators Professor Emeritus in materials science and engineering and a fellow of the National Academy of Inventors. Day is also on the research team for this project.

By 3D printing the dressings and including the glass, the researchers can better control the release of water from the dressing. Instead of coming in bursts, the water is paced out continuously over the course of 10 days, which means the dressing should stay effective on the wound for a longer time.

In a study using a murine model, researchers observed that the 3D-printed dressings led to faster wound closures, less scarring, non-adhesive contact of the dressing and easier dressing removal.

Fayyazbakhsh says the next steps for this research are to continue refining and improving the dressing, while also demonstrating its viability as a treatment option and considering its long-term efficacy. She says the eventual goal is to hold clinical trials with patients and then commercialize the treatment.

“We are making great strides toward one day having the dressings commercialized and providing better treatment for burn patients,” Fayyazbakhsh says.

Dr. Ming Leu, the Keith and Pat Bailey Distinguished Professor of mechanical engineering at Missouri S&T, is the principal investigator of this project.

Other researchers for the project include Michael J. Khayat, who earned a bachelor’s degree in ceramic engineering from S&T in 2021 and is now a Ph.D. student at McGill University; Candy Sadler, an adult geriatric nurse practitioner at the Phelps Health Wound Ostomy Center; and Dr. Yue-Wern Huang, professor of biological sciences and associate dean for research and external relations in the College of Arts, Sciences, and Education at S&T.



# HOSDER RECEIVES \$1.5 MILLION DEPARTMENT OF DEFENSE GRANT TO INCREASE ROBUSTNESS OF HYPERSONIC VEHICLES

**T**he development of hypersonic weapons and advancement of hypersonic technologies has become a critical research focus for the national defense of the United States, and researchers from Missouri S&T are directly involved in these efforts working with a \$1.5 million grant from the U.S. Department of Defense.

Dr. Serhat Hosder, a professor of aerospace engineering and director of the Aerospace Simulations Laboratory at Missouri S&T, and his team will lead a study to quantify uncertainties in the computational modeling of hypersonic systems and reduce their impact on the performance of hypersonic vehicles.

Hosder is the principal investigator on this 3-year project, which was funded in November 2022 by the DOD's Joint Hypersonics Transition Office (JHTO) through the University Consortium for Applied Hypersonics (UCAH).

"With hypersonic vehicles, which fly faster than five times the speed of sound, we are dealing with extreme environments with high temperatures and complex physics," Hosder says. "Due to the extreme operating conditions, there are several uncertainties that affect the performance and reliability of hypersonic vehicles."

Physical areas studied will include aerodynamics, propulsion and thermal protection systems subject to operational and modeling uncertainties, with the primary objective being to improve the performance and



survivability of the hypersonic vehicles.

Dr. Kamal Khayat, S&T's interim vice chancellor for research and innovation, says this is a significant research endeavor that is of national importance.

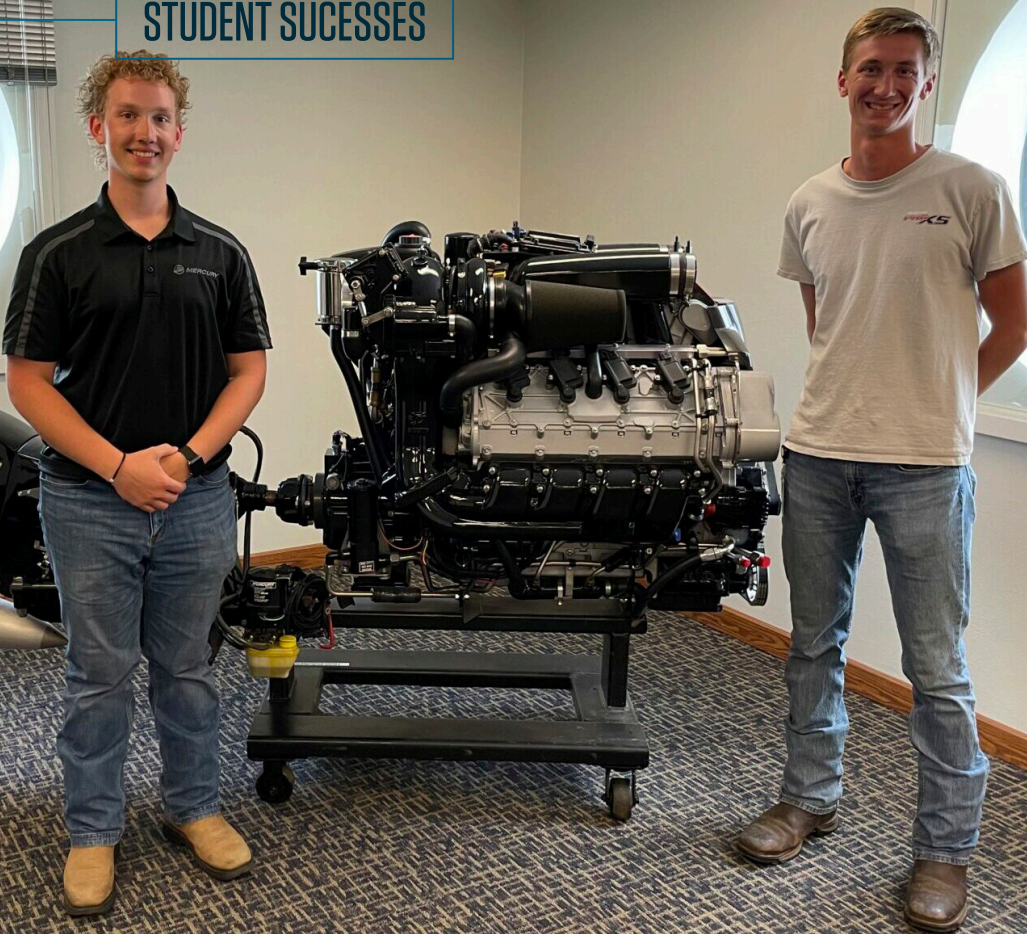
"Dr. Hosder has already made some excellent contributions to the field of hypersonics, and I am excited to see his team conduct this research," Khayat says. "The work he is doing here in Rolla, Missouri, will benefit the entire nation."

Hosder's project will also include collaboration with Ohio State University (OSU), NASA Langley Research Center and Boeing and Lockheed Martin, who will serve as the industry transition partners in the project.

Multiple graduate and undergraduate students from Missouri S&T and OSU will be involved in the research. These students will work on the development of advanced uncertainty quantification tools and perform high-fidelity computational fluid dynamics simulations over hypersonic vehicles while using high-performance computers from the university and the DOD.

Hosder and his students are also working on another JHTO/UCAH project led by the University of Texas at Arlington to study how lasers could be used to destroy hypersonic threats to the U.S.

## STUDENT SUCCESSES



Brennen David, left, and Luke Mirly stand with a Mercury Marine engine in the company's headquarters in Fond du Lac, Wisconsin.

# CHARTING NEW WATERS

## S&T STUDENTS' CO-OP EXPERIENCE LEADS TO POTENTIAL PATENTS

Luke Mirly and Brennen David may both currently be mechanical engineering students at Missouri S&T, but they are already making a difference in the boat motor industry – and may eventually have multiple patents to prove it.

Mirly and David, both juniors at S&T, completed a cooperative education program (co-op) with Mercury Marine in Fond du Lac, Wisconsin, from January to July of this year. They are collaborating with the company to develop patents related to their work.

Although Mirly and David were new to their engineering positions at Mercury Marine, neither of them felt like fish out of water when beginning their positions.

David has worked with boats for years and has been part of his family's boat dealership. Mirly has been on the water for most of his life and has been successful buying, fixing and restoring jon boats for a profit.

These experiences led to the students' already having several ideas and opinions about Mercury's products before they arrived in Wisconsin, Mirly says.

Both students, who are Kummer Vanguard Scholars, say the co-op experience benefited their knowledge and abilities as engineers. David has taken more engineering courses than Mirly, and he says the co-op solidified many of the principles he has learned about in the classroom and S&T laboratories.

## IN BRIEF

### National Space Club and Foundation Keynote Scholarship

- Coleman Goulding

### Dean's Graduate Educator Award

- Donna Jennings
- Dylan Clay

### Dean's Ph.D. Scholar Award

- M. Hossein Sehhath

### Miner Creativity Challenge

- 1st Place – The Foam Warriors

### Undergraduate Research Conference Poster

- 1st Place – Brendan Crotty
- 2nd Place – Joseph Nguyen

### Research Proposal

- 1st Place – Allie Dingfield

### Future Research Pioneers Program

- 1st Place – Joshua Gary
- 2nd Place – Samuel Patterson
- 3rd Place – Coleman Goulding

### MAE Academy Awards

#### Past Presidents' Scholarship

- Grant Edwards
- Matthew Traum

### McGovern Scholarship Award

- Carter Allen

### AMAE Scholarships

- Elizabeth Kittinger
- Brody Lehenbauer
- Lillianna Matthews
- Kyle Renkoski
- Kaylee Schafer
- Reese Sherman
- Austin Spyrna
- Patrick Steinkamp
- Anthony Zuber

### Graduate Teaching Awards

- Zachary Boeringa
- Dane Huck
- Jeremiah Rittenhouse

### Senior Design Leadership Award

- Hunter Boswell

### Senior Design Mentorship Award

- Mina Khalizadeh Fathi
- Hollis Waites



Waleed Addas, right, with faculty advisor Dr. Phillip Mulligan at ITEX in Malaysia.

# MANUFACTURING MOON METAL

Missouri S&T aerospace engineering Ph.D. student Jacob Ortega is leading a team of students to develop a method for producing metal on the moon. The group received funding through NASA's 2023 Breakthrough, Innovative, and Game-Changing Idea (BIG Idea) Challenge: Lunar Forge.

The S&T moon metal work began in fall 2022, when the team submitted a proposal to NASA for the contest. In spring 2023, NASA announced S&T as a finalist and provided funding for the team's research efforts to continue.

S&T's project was titled "Lunar In-Situ Aluminum Production Through Molten Salt Electrolysis" and worked with anorthite, a material in large supply on the moon that contains aluminum.

The group researched methods for using a type of electrolysis to reduce the aluminum oxide in the anorthite into aluminum metal.

Ortega says his work on this issue is not over, as it could one day make a significant difference in future developments on the moon.

## BEST YOUNG INVESTOR PRESENTS "PLANTBOT"

A student from Missouri S&T was recognized on the world stage as a top young inventor at the 34th International Invention, Innovation and Technology Exhibition (ITEX) for his "PlantBot" invention.

"I can't even describe the feelings I had when I was announced as the best young inventor," says Waleed Addas, a first-year aerospace engineering student. "I am so grateful for the support I received from the university, as well as from my home country of Saudi Arabia and the Saudi Arabian Cultural Mission. So many individuals cheered for my success and helped me with the tools and resources I needed for this competition."

Addas received awards for being the best inventor and having the best invention in the Asian Young Inventor Exhibition competition, which is a subsidiary of ITEX. He was also honored with a gold medal in the World Young Inventor Exhibition competition for the second year in a row. These exhibitions were held concurrently with ITEX in Kuala Lumpur, Malaysia.



Jacob Ortega, right, with faculty advisor Daoru Han inside a plasma vacuum chamber.



# MISSOURI S&T STUDENT-DESIGNED SATELLITE TO LAUNCH IN EARLY 2024

Students from Missouri S&T's Satellite Research Team have taken steps for years toward having a satellite orbit the Earth, and their efforts will soon pay off with a giant leap.

On March 1, 2024, the team, advised by Dr. Hank Pernicka, Curators' Distinguished Teaching Professor of aerospace engineering, is set to have a satellite launched into space via SpaceX's Falcon 9 rocket.

"This project has been several years in the making, and the entire team is thrilled to see it finally coming to fruition," Pernicka says. "The team first began working on this in 2016 and made great progress, but this was later slowed due to COVID-19."

The S&T team refers to this initiative, which is part of NASA's Undergraduate Student Instrument Project, as the Multi-Mode Mission, or M<sup>3</sup>.

Drake Beaman, a junior in aerospace engineering from Pleasant Hill, Missouri, who is the project's chief engineer, says the focus of the project will be to test an experimental thruster in space on the team's small, cube-shaped satellite. This thruster was developed in the Missouri S&T Advanced Plasma Lab in partnership with Froberg Aerospace.

Beaman says there will be multiple steps for the satellite's mission. First, the satellite will be launched.

Then, it will spend about a week getting acclimated to zero gravity and the vacuum of space. After that, it will spend the next day or two completing processes already pre-planned and set into motion by the S&T team prior to its rocket ride.

"This will be a technology demonstration in which we use different methods of propulsion for the satellite," he says. "It will have chemical and electric components and will be fed a liquid propellant. The thruster will be fired in the vacuum of space, with zero gravity, for five 30-second bursts."

The satellite's data will then be sent to Iridium Communications, which specializes in satellite communications, and then transferred to the S&T team.

After that, the satellite will continue to stay in low-Earth orbit for the next several years. Beaman says federal regulations currently allow for this type of satellite to remain in space for up to 25 years before its design will eventually lead to it being burned up in the Earth's atmosphere.

Emily Doddmeade, a senior in aerospace engineering from Highlands Ranch, Colorado, who is project manager for M<sup>3</sup>, says this project would not be ready liftoff without the expertise of students from a variety of majors.



Satellite Research Team members Emily Doddemeade, left, and Drake Beaman. Photo by Michael Pierce.

“

It's amazing to consider how many moving parts and disciplines are involved in something like this," she says. "You really have to take a systems engineering perspective for this instead of thinking about just one major. I have learned so much with my experiences on the team."

Some examples of the different areas to consider include the satellite's electrical components, its general design, the necessary coding and the propulsion system, she says.

## ANOTHER UPCOMING LAUNCH

After the M<sup>3</sup> project concludes, the team will have another project in its final stages to complete, which has been in the works for about a decade.

For this project, which is part of the Air Force Research Laboratory's University Nanosatellite Program, the team plans to launch a pair of satellites within the next two years.

The satellites are named the Missouri-Rolla (MR) Satellite and the Missouri-Rolla Second Satellite (MRS), and the project is referred to as MR and MRS SAT.

"These will be larger satellites than for M<sup>3</sup>," says Collin Gentry, a Ph.D. student in aerospace engineering from St. Joseph, Missouri. "The satellites will allow us to collect data related to proximity operations. Both satellites will be in close formation, with one circling the other. MR SAT will take images of MRS SAT, which will serve as a mock target and provide positioning data."

Over time, Gentry says the solar-powered satellite couple will drift apart, and both satellites will eventually be destroyed by the Earth's atmosphere as well. However, until that time, the team will continue to receive the satellites' data.

# ACADEMY OF MECHANICAL AND AEROSPACE ENGINEERS WELCOMES FIVE NEW MEMBERS

At its 28th induction ceremony, Missouri S&T Academy of Mechanical and Aerospace Engineers welcomed five professionals with ties to Missouri University of Science and Technology into its ranks.



**DARRYL BRINKMANN**

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**Darryl Brinkmann** of Rolla, Missouri, retiree from Caterpillar Inc., earned a bachelor's degree in mechanical engineering from Missouri S&T in 1978. Starting while he was still a student at UMR, Darryl worked 36 years for Caterpillar Inc. in various Manufacturing, Planning, Purchasing, HR, Engineering, and IT roles. He retired in 2010 and moved to his farm outside of Rolla. In 2011, Darryl went to work for Missouri S&T as an Adjunct Instructor in the Business Department, where he taught various Business and MBA classes for six years. Since retiring to Rolla, Darryl has been the chapter advisor to the Teke fraternity, worked with local organizations, including the Community Partnership and the Phelps County Food Distribution, mentoring students at the Rolla Junior High, and been very active with his church. Besides traveling to visit family and friends, Darryl and Robin have visited all 50 states since his retirement. He loves to work on his farm with a chainsaw or his Cat skid loader.



**TALION EDWARDS**

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**W. Talion Edwards** of Wentzville, Missouri, Senior Technical Fellow for 3D Measurement and Reverse Engineering and Chief Engineer for the Boeing Product Teardown Team in Boeing Research and Technology, earned a bachelor's degree in mechanical engineering from Missouri S&T in 1997. He is a member of the Board of Directors for the Coordinate Metrology Society (CMS), where he founded an effort to establish a central industry certification for measurement practitioners. He holds 25 U.S. patents on topics including 3D imaging, X-ray backscatter, non-destructive evaluation, FOD detection, and feature recognition.



**JACOPO FRIGERIO**

**Jacopo Frigerio** of Littleton, Colorado, retiree from Lockheed Martin Space, earned a bachelor's degree in aerospace engineering in 1993, and a master's degree in mechanical engineering in 1995 from Missouri S&T. After graduating from UMR, Jacopo began his career at Lockheed Martin Space in Denver, CO, where he spent his 25-year career designing, developing, testing, qualifying, and deploying space flight hardware. Some highlights of his career include supporting the Atlas and Titan Centaur upper stage propulsion program specializing in the RL-10 engine, leading the design and development of the Hubble Space Telescope Soft Capture Mechanism (SCM), developing and managing the Common Products Program, and serving as the Orion European Service Module (ESM) Main Engine (OMS-E/AJ10) Certified Principle Engineer (CPE). He is also a graduate of Lockheed Martin's very selective Advanced Technical Leadership Program.

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**JEFFREY SEAMAN**

**Jeffrey Seaman** of Petersburg, Michigan, Chief Program Engineer-P800 of Ford Motor Company, earned a bachelor's degree in mechanical engineering from Missouri S&T in 2000. Jeff grew up passionate about cars and engineering. His father Robert L. Seaman, a fellow mechanical engineering academy member encouraged and supported Jeff as he attended University of Missouri - Rolla and started his professional career at Ford Motor Company in powertrain engineering. He served as the lead calibrator on the Coyote (New 5.0L) engine and Boss 302 Program. During this time, he led the innovation of the industry first TracKey and Aggressive Decel Fuel Shut-Off technologies. In 2017, he moved to Melbourne, Australia, to become the program manager for the Ranger and Everest programs, which launched in 6 plants across the globe, including the return of the Ranger product in the U.S. Market. Upon return to the U.S., Jeff took responsibility for the Ford Bronco and led the development of the "Modularity" functionality - which was industry first and allowed for significant advancements in customization. Jeff has received multiple patents for this concept and the development of accessories built upon this strategy. Building upon the success of the Bronco, Jeff was appointed as the Icons Regional Product Line Manager, leading Mustang, Bronco, Bronco Sport Raptor, and the Ford GT programs as numerous special editions (such as Dark Horse and Bronco Everglades) were designed, developed, and launched. Most recently, Jeff is the Chief Program Engineer for the T3 "Trust The Truck" program, the next generation Ford Electric Truck program to be built in Tennessee.

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**MICHAEL SHIN**

**Michael Shin** of Dallas, Texas, Vice President of Supply Chain in Trinity Rail Industries, earned a bachelor's degree in mechanical engineering from Missouri S&T in 1987. Upon graduating from UMR, Mike began his career with GE, where he progressed from manufacturing engineer to Director of Supply Chain. After GE, from 2001 to the present, Mike served as the VP and Global Head of Supply Chain for iconic American Corporations: Stanley Tools, Remington Firearms & Ammo, Gibson Guitars, FLIR systems, and currently as the VP of Supply Chain for Trinity Rail Industries. Mike's vision is to retire from business and settle on a farm in Phelps County. Mike started a software company where he will serve as Founder and Chairman while contributing to the Rolla community. He plans to support Missouri S&T, RHS Rolla High School, and Newburg School District. His goal is to create manufacturing and technology jobs in Phelps County by leveraging the talent and intellectual strength of Missouri S&T.

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