



# MAE

MECHANICAL AND AEROSPACE ENGINEERING



CELEBRATING  
100 YEARS!

2017 NEWSLETTER

MISSOURI  
**S&T**



# MESSAGE FROM THE CHAIR

Dear Friends,

I am excited to share with you a few of the many highlights from another busy year for the students, faculty and staff of the Department of Mechanical and Aerospace Engineering at Missouri S&T. Inside this edition of our newsletter, you will find that our students have had a successful year with significant accolades for our design teams, including a second place finish for our rocket team at the Spaceport America Cup as well as a second place finish for our Formula SAE team at the Lincoln competition. Our faculty are also reaching new heights with Prof. Gao and Prof. Kinzel being awarded National Science Foundation CAREER Awards. Together our faculty research activity exhibited a 30% increase in research expenditures in 2016 while advising a record number of doctoral students. Several other faculty and student achievements and awards are also highlighted in the newsletter along with honors of our alumni.

I am pleased to introduce to you a new faculty member who joined the department this year. Dr. Yun Seong Song joined us in January 2017 as an assistant professor after completing his PhD at Massachusetts Institute of Technology and postdoctoral studies through a joint program in biomedical engineering at Georgia Tech and Emory University. His research interests include physical human-robot interaction and rehabilitation robotics. He makes a significant addition to our world-class faculty

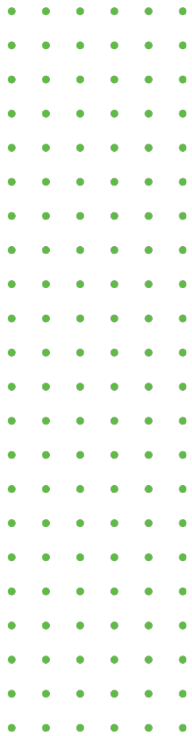
and will be joined by three new faculty in the 2017-2018 academic year.

This past year, we celebrated the 100th year of our department in a year-long celebration. From our small beginnings of a department of one full-time and two part-time faculty and three students to a department of 40 faculty, 920 undergraduate and 250 graduate students, we are very proud of who we have become. In this newsletter, we reflect on several of the Centennial activities including student events, a special centennial seminar series featuring accomplished alumni, and the MAE Centennial Banquet. Thank you to all who traveled back to campus to celebrate with us.

In closing, please take a look through our newsletter to learn more about the great accomplishments and activities in the department. I would also like to extend my thanks to the many alumni and friends who have made varied contributions to enhance the department and contribute to the education of our students. Please consider contributing to the efforts of your department that will enable us to continue to grow through the next century and provide the best education to our future Miner engineers.

Warm Regards,

**Jim Drallmeier**  
Chair, Mechanical and Aerospace  
Engineering



## PRODUCED BY

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MECHANICAL AND AEROSPACE ENGINEERING





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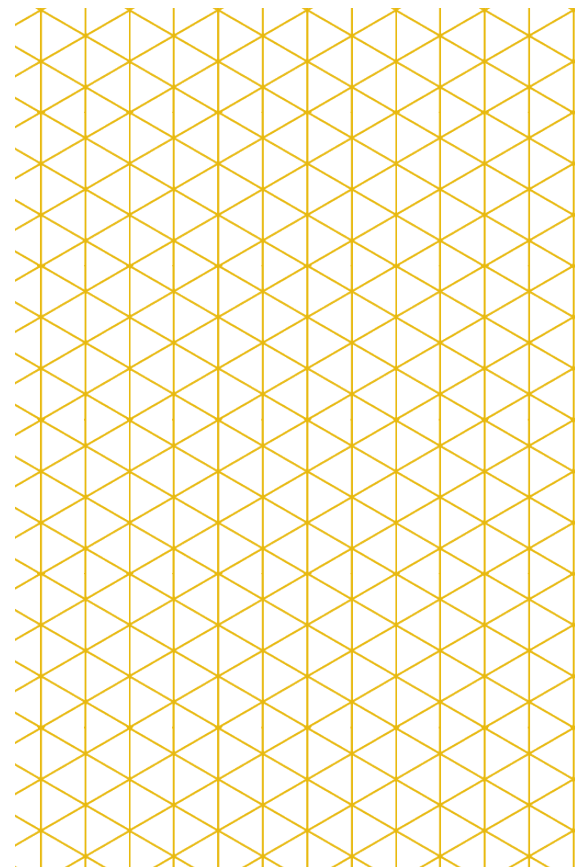
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# MAE CENTENNIAL: A YEAR OF CELEBRATION

2016-2017 was a year full of celebration. Celebration of the past, celebration of the present and celebration of the future of the department.

Starting with only three faculty members and a similar amount of students, the mechanical and aerospace engineering department has grown to more than 1,100 undergraduate and graduate students and 40 full-time faculty making us the largest academic unit at Missouri S&T. With this great milestone, the department held a year long celebration with students, faculty, staff and alumni.

Throughout the 2016-2017 school year, the 100th anniversary was celebrated by many events. On September 14, the department held the MAE Centennial Kick-off in the Toomey Hall Atrium. Decorated with balloons and plenty of seating for attendees from all over campus, there were new banners

hung in commemoration of the 100 years. Dr. Drallmeier spoke of the history of the department, the growth and the changes over the decades. The event was wrapped up with a social of networking and cupcakes decorated with the MAE centennial mark.

The MAE student organizations also hosted many events to celebrate the milestone with their peers, faculty and staff. Sigma Gamma Tau held their annual Fall picnic on September 16 with a focus on the centennial. ASME hosted a Pumpkin Chunkin' Competition where teams of five designed and built a launcher to see how far it could throw a pumpkin. The winning designs were placed into competition. The first place prize

was scholarships for the team. Pi Tau Sigma held a trivia night where winners could win a variety of prizes including a smart watch and a small drone. Finally, AIAA hosted a build your own rocket/model plane workshop which was very well attended.

During the centennial year celebration, the department hosted a special seminar series that featured speakers who were accomplished alumni in their fields. The speakers were as follows:

- September 1, 2016 - Dr. Robert Wagner (BSME '93, MSME '95, PhDME '99), Director of Fuels, Engines and Emissions Research Center, Oak Ridge National Laboratory
- October 12, 2016 - Mr. Wayne Garrett (BSME '72), Managing Director, IW Capital Partners
- October 17, 2016 - Dr. James Friend (BSAE '92, MSME '94, PhDME '98), Professor of Mechanical and Aerospace Engineering, University of California San Diego
- December 8, 2016 - Dr. Scott White (BSME '85), Professor of Aerospace Engineering, University of Illinois

- February 2, 2017 - Tim Barefield (BSME '83), Chief Operating Officer, Pershing Square Capital Management
- February 23, 2017 – Dr. Ronald Dougherty (PhDME '78), Professor and Executive Associate Chair of Mechanical Engineering, Kansas University
- April 27, 2017 - Jeff Thornburg (BSAE '96), President, Interstellar Technologies LLC, Madison, AL

The year-long celebration was then concluded with a banquet for students, alumni, faculty and staff. The banquet was held at the new Hasselmann Alumni House beginning with a social where friends, old and new, celebrated the department's milestone. Dr. Drallmeier welcomed over 100 attendees and spoke of the future of MAE. Jorge Ochoa, a 1985 mechanical engineering graduate from Missouri S&T and a principal engineer at Exponent Inc., served as the keynote speaker. Ochoa is also a member of the S&T Academy of Mechanical and Aerospace Engineers and a past Miner Alumni Association board member and section officer.

As a continued effort in honor of the centennial celebration, the department seeks gifts to create endowments for graduate fellowships and professorships and a distinguished lecture series. These commemorative naming opportunities are an investment in the department as we look to continue our progress and innovation for another 100 years, and longer. Here's how you can help:

## CENTENNIAL PROFESSORSHIP

Endowed professorships allow a university to successfully recruit and retain national and world-caliber faculty by making the necessary resources available to them to support new initiatives in education and research. The Centennial Professorship is vital for the department to keep its place among our peers at the top national research universities. The professor who holds this named professorship will be a distinguished scholar, celebrated for teaching and research and for the caliber of intellectual rigor that inspires both. The funds generated by the Centennial endowment will be available to the Centennial Professor to use at his or her discretion in the pursuit of the institutional and departmental goals of world-class scholarship and research productivity.

The MAE Department is seeking to build two endowments for Centennial Professorships.

**Centennial Professorship Endowment:** Requires \$1M total. Gifts larger than \$1M include naming.

## CENTENNIAL FELLOWSHIP

Supporting students who pursue advanced degrees in mechanical, aerospace and manufacturing engineering remains a top priority of the department. Graduate fellowships provide support vital to recruitment, retention and recognition. Our graduate students inspire the undergraduates they teach and also serve as creative and productive members of research teams.

To attract the best students, it is essential to compete with the very best universities across the nation and around the world. Though our department provides outstanding educational and research opportunities through its excellent faculty, staff and facilities we must also remain competitive in terms of the amount of financial support we can offer. The Centennial Fellowships will allow our department to attract the highest quality graduate students, those who aspire to become the next generation of leading research engineers and faculty members.

The MAE Department is seeking to build four endowments for Centennial Graduate Fellowships and unlimited one-year Graduate Fellowships.

Centennial Graduate Fellowship Endowment: \$50k gift, includes naming.

One-Year Graduate Fellowship: \$5k gift, includes naming.

## CENTENNIAL DISTINGUISHED LECTURE SERIES

The department seeks an endowment to fund the MAE Centennial Distinguished Lecture Series featuring world-renowned leaders in the mechanical, aerospace and related engineering disciplines. Each year, the department will invite and host a Centennial Distinguished Lecturer for a duration long enough to allow sufficient time to interact with S&T students and faculty.

Exposure to world-class practitioners in our fields will provide MAE department students and faculty with a broader perspective and concomitant inspiration to generate world-class ideas of our own.

The MAE Department is seeking to build one endowment for the Centennial Lecture Series.

**Centennial Lecture Series:** \$100k gift, includes naming.



## INAUGURAL CENTENNIAL DISTINGUISHED LECTURER: DR. GALIP ULSOY

One of the objectives of celebrating the centennial year of MAE was to bring world-class practitioners to campus that would provide a broader perspective and concomitant inspiration for our students and faculty. This led to the creation of the Distinguished Centennial Lectureship Series and each year the department will bring in one or two leaders in the mechanical, aerospace and related engineering disciplines.

As the inaugural lecturer, the department invited Dr. Galip Ulsoy, C.D. Mote Jr. Distinguished University Professor Emeritus and William Clay Ford Professor Emeritus of Manufacturing and professor emeritus of mechanical engineering at the University of Michigan. He is also a member of the National Academy of Engineering. Dr. Ulsoy's lecture titled, "Designing Reconfigurable Systems for Manufacturing and Automotive Applications," was held April 11, 2017. He also held a technical talk the following day titled, "Co-Design of a Smart Artifact and Its Controller."

Dr. Ulsoy interacted with various student and faculty groups over two days. The event ended with a reception for Dr. Ulsoy at the home of Dr. Ming Leu.

# DESIGN TEAM UPDATE

AN UPDATE FROM THE TEAMS ON THEIR SEASONS, TRIALS AND TRIBULATIONS, AND LOOKING FORWARD.

## ROCKET DESIGN TEAM

The 2016-2017 year saw enormous R&D, organizational, and technical progress for the Rocket Design Team. After 10 years as a part of the Advanced Aero Vehicle Group, the Rocket Design Team formed its own recognized student organization and set out to compete in the first Inaugural Spaceport America Cup, held in June at Truth or Consequences, New Mexico.

Two key goals were set for the team's 2016-2017 design cycle: to finish the two year development of its first flight certified solid rocket motor and successfully implement a radio telemetry system for tracking flight performance from the ground. The team's propulsion subgroup mixed over fifty pounds of solid composite propellant, conducted

nine static test fires under the supervision of the Experimental Mine and successfully implemented a 3D printed monel nozzle into its design. The final version of the motor produced over 1,000 pounds of thrust and propelled the team's 38 pound rocket to 8,722 feet. Missouri S&T took second place in a division of 26 teams at the Spaceport America Cup. The rocket's onboard telemetry system, which was designed and tested in house, provided the team's desert recovery crew with GPS coordinates that proved vital in finding the rocket after its flight. At the conclusion of the Spaceport America Cup, the team was also awarded the James Barrowman award for the most accurate altitude prediction out of 96 university teams spread out over six divisions. The Rocket Design Team looks forward to higher altitude flights, engaging more students and faculty, and bigger rockets as it sets its sights on the 2018 Spaceport America Cup.

## M-SAT

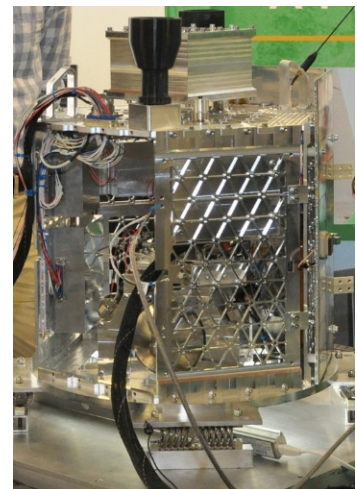
The Missouri S&T Satellite Research Team (M-SAT) reaches for new heights in 2017 by innovating in the small satellite field. The team is actively conducting three spacecraft programs, all with their own unique mission and characteristics.

During 2017, a key focus of M-SAT has been completing final tests for the Nanosat-8 mission, which involves a pair of small satellites: the Missouri-Rolla Satellite (MR SAT) and Missouri-Rolla Second Satellite (MRS SAT). This mission is in conjunction with the University Nanosat Program conducted by the U.S. Air Force Research Laboratory. The team won a down-select competition in January of 2015 and is currently in the process of completing final testing required before the final flight

spacecraft versions will be built, integrated, and shipped to AFRL to be prepped for launch to the International Space Station. This is a significant accomplishment for the team, and everyone is working hard to ensure that the satellite duo will fly, helping to establish S&T's legacy with spaceflight.

Members of the M-SAT team working on the APEX (Advanced Propulsion Experiment) satellite as part of the Air Force Research Lab's University Nanosat 9 Program successfully completed the Preliminary Design Review in January. APEX team members are working towards Program Management Review 2 in August at the Small Satellite Conference in Logan, Utah. The team plans to bring a completed satellite structure and fully-functioning "flat-sat" satellite to the review.

In 2016, the M-SAT Team was accepted into the NASA USIP, Undergraduate Student Instrument Project, program. M-SAT is developing a CubeSat named M<sup>3</sup>, Multi-Mode Mission, that will be deployed in low Earth orbit and integrate an experimental thruster, being developed by S&T's Dr. Joshua Rovey and postdoctoral researcher Dr. Steven Berg,



into a “3U” structure (a rectangular prism of dimension 30 x 10 x 10 cm). During this past academic year the team completed the component selection and conceptual design for the subsystems, and is now working on software and hardware development including structural CAD models, power and flight computer board design, component testing, and flight code that will comprise a fully autonomous mission.

## FORMULA SAE

S&T Racing had very large shoes to fill this year after coming off of the team’s most successful season ever. The team once again participated in three competitions: Michigan, Canada, and Lincoln. They competed in Formula SAE Michigan in May where the competition was strong, but they held their own. Their best event was Skidpad, where they took 2nd place, defeating the large field of formidable European teams. When it came to the Endurance, they started off strong and recorded some impressive lap times. Unfortunately, there was a mechanical failure two laps from the checkered flag. Suffering an oil leak from a bearing failure, they were pulled off of the track. The team finished the competition in 29th place overall. They were happy with how they performed and it gave them some direction for improvement.

The team was excited to return to Formula North, in Canada, to defend their title. Thanks to multiple significant test days after Michigan, the car performed beautifully! Nearly sweeping the dynamics events, the team placed 1st in Skidpad, 1st in Autocross (by nearly two seconds according to several hand timers from other teams, which is a wide margin in racing), 2nd in Acceleration (missing first by only 0.024 seconds), and 2nd in Endurance. Going into the awards ceremony, the team expected to receive an overall podium finish, if not a repeat 1st place. Unfortunately, due to an error in the electronic lap timing system and no official backup hand times, all Autocross times were declared invalid and the event was thrown out. Autocross was the best event at this competition, and dropping it affected the overall placement significantly. The team lost out on the overall dynamic event award by less than a point and ended with 5th place overall. Disappointed by these circumstances out of their control, the team kept their focus and prepared for Formula SAE Lincoln.

A gathering of 80 (mostly) American teams from the best engineering schools in the country, Lincoln is always a good challenge. The team placed 2nd in Endurance despite some cooling issues that required them to hold back. They placed 2nd in Acceleration,



their best-ever Lincoln result. The Skidpad driver, James Ward, placed first. Finally, in Autocross, David Piel went first and put down a lap time of 53.38 seconds, the fastest time at that point in the day by about 0.3 seconds. Before long, two teams beat that time: Texas A&M with a 52.48 and San Jose with a 52.41. The pressure was on the second driver, Caleb Alne, to improve the time. His first lap was a 52.1, which was good enough to put the team comfortably in first place, but he wasn’t done there. His second lap was a 51.51, which gave a 0.9 second split on second place, the biggest Autocross win at Lincoln since 2012. Overall, it was very close between the top teams, but S&T Racing was confident they were going to end up on the podium, something they just missed out on in 2016. In the end, the team placed 2nd overall, their best ever finish at Lincoln. The team is very proud of the success this season, ending with a podium finish in 9 out of the 12 dynamic events they competed in and a first place in 4 of them. The team is currently working hard on the design of the 2018 competition car and they are excited to come out with even more “best ever” finishes in the future. The team also wants to extend its thanks to all the support from AMAE, the MAE department, and SDELCL.

## BAJA

The focus of the 2016-2017 competition year for the Miner Baja SAE team was to use the same basic car from the 2015-2016 season and for the team to focus on team building instead of car building. The team building aspects were recruitment, public relations, and knowledge transfer. Some changes to the car to improve its performance were a redesigned rear suspension, a new drivetrain using a continuously variable transmission (CVT) and a custom forward-reverse gearbox instead of a manual transmission. A data acquisition system was purchased and implemented to aid in suspension design validation, a

key part of what the team needed for its design presentations.

The team attended two competitions this year in Pittsburg, KS and Peoria, IL. In Pittsburg, the team ran into difficulties getting through technical inspection which caused the team to miss the dynamic events for that competition. Team members were inexperienced with the static events so they learned what to do better for the Peoria competition. The team started the endurance race on Sunday and immediately encountered problems. The result was a place of 86 out of 110.

The team regrouped after Pittsburg to prepare for Peoria. New rear knuckles were designed and machined with help from Randall Lewis, and both the sales and the design presentations were improved. This resulted in the best scores in team history for the presentations. The team passed technical inspection after only a few minor changes and was able to compete in the dynamic events. The team placed in the top third in both the rock crawl and the hill climb. During the endurance race the team broke a rear knuckle twice but, because of its new modular design, was able to repair it both times. These breakages kept the team out of the endurance race for some time, but overall Miner Baja doubled the amount of laps completed in the endurance race from



Pittsburg to Peoria. These improvements resulted in a finish of 71st out of 100 teams.

## HPV

Missouri S&T's Human Powered Vehicle Design team endured many changes through the 2016-2017 competition season. After the team reorganized their leadership and analyzed the fabrication schedule, they recognized the time crunch due to the competition being a month earlier than anticipated. This year's design, a leaning trike named M-24 Chaffee, was designed with three things in mind: reliability, performance, and manufacturability. The team quickly began laying up the carbon fiber fairing while also preparing the material that was welded to make up the frame. Next, the drivetrain and steering were fabricated and installed to make the trike operational. Some of the setbacks included the lack of spare parts, lean-lock resistance, and humid conditions causing the clearcoat to be not so clear. With little time to train the pilots on the final vehicle, the team arrived at competition for a rainy weekend with work still to be done. After installing the frame into the fairing on the morning of competition, the team was unable to adjust all necessary engineering controls before the conclusion of safety inspections. Despite this, the team passed safety and continued working to prepare the trike for the endurance race. Each rider completed the required number of laps around the 1.3 mile track which included sharp turns, a rumble strip, speed bump, hill climbs, agility test, abrupt stop and slalom.

Out of 46 teams competing at the ASME HPVC hosted by Tennessee Tech, Missouri S&T placed 8th in Design, 2nd in Innovation, 26th in Endurance, and 25th overall.

In the upcoming year, the team has small projects planned in addition to the main vehicle design. There is plenty of room for team expansion and several introductory projects for new members. In Fall 2017, the HPV team has planned a Rolla Bike Tour to kick-off their rider training regime and more fun activities with other teams throughout the year!

## FORMULA ELECTRIC

The 2016-2017 season was Formula Electric's best season to date. The team has recently returned from their competition in Lincoln, NE, where they received 4th place out of a field of 29 vehicles. This is the team's best result in their three years of competing. The team is especially proud of their placements in the efficiency event (1st place) and the cost event (2nd place).



Formula Electric's season started with a redesign of the previous year's car. The 2016 car was a strong performer in dynamic events and was the first car in the team's history to have passed technical inspection. However, there were some design issues with the car, primarily that it weighed 519 lbs. The team decided their design goal for the 2017 car was to weigh in at less than 500 lbs. while not losing the reliability or rules compliance that had been achieved in the prior year. The team looked through the car's systems and decided that a significant amount of weight could be taken out of the battery box and the space frame. Thanks to the hard work of several senior team members, the team was able to lighten the frame by 15 lbs. and the battery box by 36 lbs. bringing the vehicle weight down to 468 lbs.

The team learned a lot in 2016-2017 and is excited for the next season. Formula Electric has developed a reliable electrical control

system that can be used for the next several seasons without needing significant change. Along with a well sorted electrical system, the team is confident that they are moving in the right direction with the mechanical systems and will continue to iterate on them this season. Despite just returning from competition, the team already has discussed their goals for the upcoming year. The team wants to add an aero package in order to increase the vehicles cornering capabilities, continue to lighten the vehicle, and complete the car by February so that a large amount of testing can be done.

Formula Electric would like to thank all of their sponsors, but especially Umicore, who has been sponsoring them since 2014.





# TWO MAE DOCTORAL STUDENTS NAMED DEAN'S PH.D. SCHOLARS



Recipients of the Dean's Ph.D. Scholars are pictured above. Pictured with associate chair of graduate affairs Dr. Josh Rovey (left) and interim vice provost and dean Dr. Richard K. Brow (right), are Amir Ghazanfari (middle of left photo) and Ran Zhou (middle of right photo).

## TWO DOCTORAL STUDENTS IN THE MAE DEPARTMENT AT MISSOURI S&T HAVE BEEN NAMED DEAN'S PH.D. SCHOLARS IN RECOGNITION OF THEIR SCHOLARLY EXCELLENCE AND RESEARCH PRODUCTIVITY.

A total of ten award winners were nominated by professors in their home departments and honored at an end-of-semester campus reception earlier this month. The recognition follows the launch of similar College of Engineering and Computing awards in the 2016-17 academic year for top faculty researchers and those who excel in the classroom.

As a group, the 10 winners have produced a total of 152 technical publications and reports with another 26 publications under review. The cohort has collectively accrued 35 external awards and served on 30 different technical society committees.

The awardees from MAE were Amir Ghazanfari and Ran Zhou. Amir Ghazanfari, advised by Dr. Ming Leu, was awarded for his research on "Additive manufacturing of ceramics and functionally graded ceramic composites."

Ran Zhou, advised by Dr. Cheng Wang, was awarded for her research on "Microparticle manipulation with acoustic and magnetic fields in microscale flow systems."



## JAMES MCCABE EARNS PRESTIGIOUS NASA SPACE TECHNOLOGY RESEARCH FELLOWSHIP

James McCabe, an aerospace engineering Ph.D. student, has received the NASA Space Technology Research Fellowship. This fellowship is awarded to outstanding graduate students who receive funding for developmental research in areas critical to NASA's long term goals of space exploration and the understanding of space. James' research for this fellowship is to develop advanced navigation schemes for planetary landers, such as the vehicles that would put humans on Mars or rendezvous with an asteroid. James has been able to draw from the vast knowledge of the navigation experts at NASA Johnson Space Center. This research can be applied to many real-life problems, whether it be space-based, such as planetary landers, rovers, docking with International Space Station, or formation flight of small satellites, as well as problems entirely unrelated to aerospace applications, such as manufacturing, medicine, and vehicle traffic.

James is from Arnold, Missouri with a very supportive family back home. He graduated Summa Cum Laude with his B.S. in Aerospace Engineering from Missouri S&T. As he is pursuing his Ph.D. under mechanical and aerospace engineering faculty, Dr. Kyle DeMars, he feels lucky to have this opportunity to contribute to the future of spaceflight, both manned and unmanned.

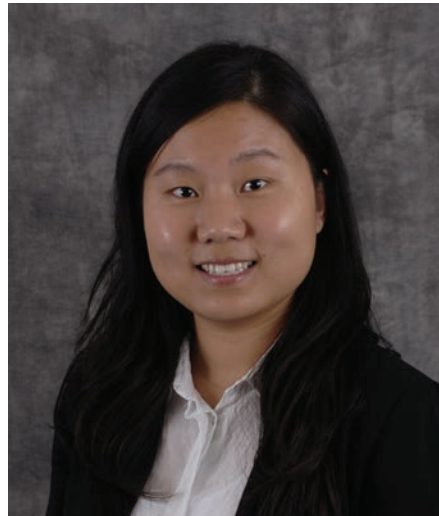


## INTRODUCING NEW FACULTY: DR. YUN SEONG SONG

Dr. Yun Seong Song is an assistant professor in the mechanical and aerospace engineering department at Missouri S&T. His work and research interest include physical human-robot interaction and rehabilitation robotics, particularly in their applications to understanding and assisting human movement. He conducted his postdoctoral research in the Department of Mechanical Engineering at École Polytechnique Fédérale de Lausanne in 2012-13, as well as in the Department of Biomedical Engineering at Georgia Institute of Technology and Emory University in 2014-16. While at Georgia Institute of Technology, Dr. Song was also a lecturer in the Department of Mechanical Engineering.

He graduated with a Ph.D. degree in mechanical engineering from Massachusetts Institute of Technology in 2012. He received his B.S. degree in mechanical engineering and B.S.E degree in computer science and engineering from Seoul National University in 2004. He also holds a M.S. degree in mechanical engineering from Carnegie Mellon University. Among his honors, is the Bennett Award for Outstanding Thesis from Carnegie Mellon University, as well as being a two-time recipient of the Samsung Scholarship for graduate studies.

# TWO FACULTY RECEIVED NSF CAREER AWARDS



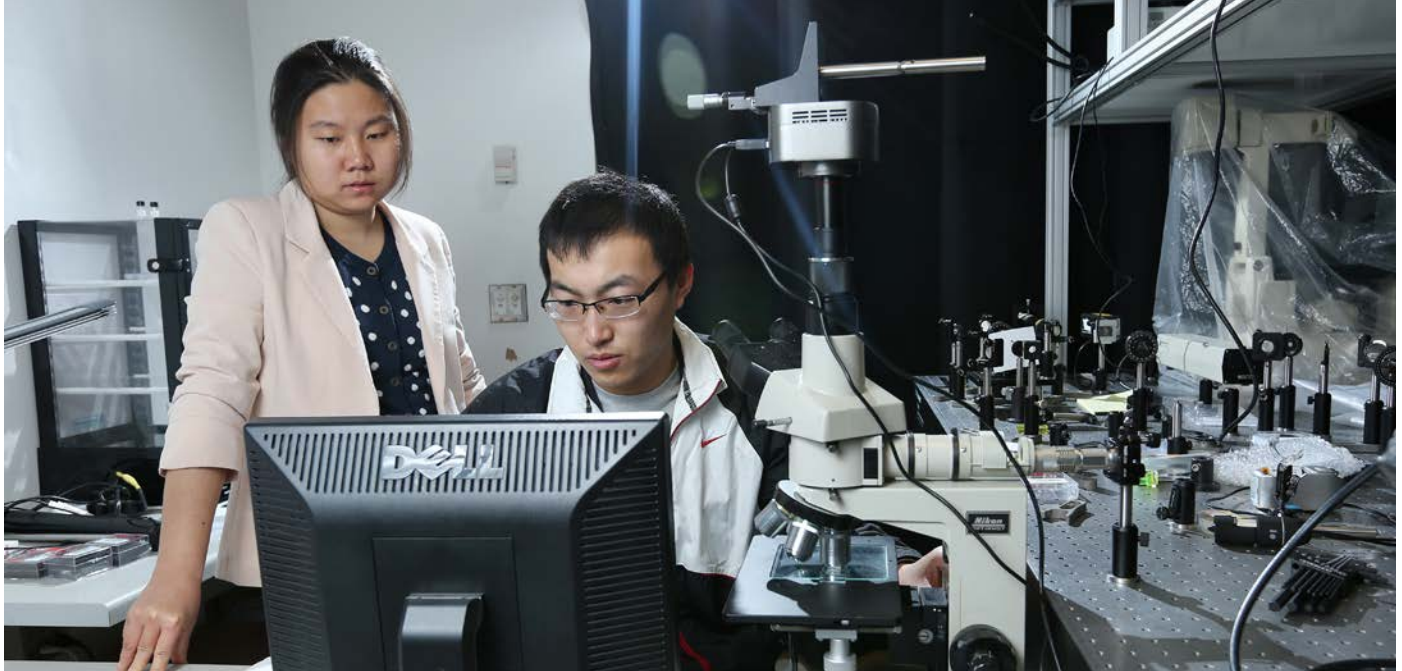
## Drs. Gao and Kinzel, assistant professors of mechanical engineering, received the National Science Foundation's most prestigious award for young faculty members.

The Faculty Early Career Development (CAREER) Award is National Science Foundation's "most prestigious award in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations." These faculty will be receiving approximate \$500,000 over the next five years in support of their research.

Dr. Jie Gao's award is in support of her research "Flat Singular Optics: Generation and Detection of Optical Vortex Beams with Plasmonic Metasurfaces in Linear and Nonlinear Regimes." The current open research challenges in singular optics are how to generate pure vortices with broad bandwidth and polarization singular beams on chip, how to realize compact linear and

nonlinear vortex beam converters, and what kind of device enables direct identification of vortex topological charges. Supported by this award, Dr. Gao will conduct research work to explore flat singular optics, generate singular optical beams in both linear and nonlinear regimes, as well as detect vortex beam orbital angular momentum with optoelectronic integration. This research paves the way for advancing many applications in optical communications, beam shaping and conversion, optoelectronic devices, and optical sensing images.

"The idea is to manipulate beam polarization and phase with optical metasurfaces, for example, the generation of singular optical beams in both linear and nonlinear regimes, as well as the detection of vortex beam orbital angular momentum with optoelectronic integration," she says.



“This could have a significant impact in the field of functional, metasurface-based optoelectronics.”

Dr. Gao joined the Missouri S&T faculty in 2012 from Columbia University, where she earned a Ph.D. in applied physics. At S&T, she oversees the Nanophotonics Laboratory, a multi-disciplinary effort that bridges disciplines of engineering, optics, physics and material science by studying light-matter interactions at the nanoscale.

Dr. Edward Kinzel’s award is in support of his research on “Large Scale Manufacturing of Metasurfaces Using Microsphere Photolithography.” Dr. Kinzel and his team are using self-assembled microsphere arrays as an optical element for low-cost large-area fabrication of infrared and visible metasurfaces to control thermal transport, sensing, energy harvesting, and planar

optics. This includes both far-field and near-field applications and involves hierarchical patterning sub-micrometer structures over  $m^2$  areas. These are widely made with much more expensive direct-write tools such as e-beam lithography or focused ion beam with costs exceeding  $\$1M/m^2$ . They are making functional devices at less than  $\$500/m^2$  and the grant will allow them to reduce this to less than  $\$10/m^2$ . This is key to the practical implementation of these devices and also enables engagement because of the dramatically reduced cost.

“Practical applications require the precise patterning of sub-micron features over large areas, which is currently cost-prohibitive using traditional integrated circuit (IC) manufacturing tools,” Kinzel says. His work focuses on creating scalable metasurface manufacturing techniques.

“Our goal is to generate the manufacturing science necessary to create infrared and optical metasurfaces at large enough areas and low enough costs that they can benefit people’s lives,” Kinzel says. “IC prototyping tools such as electron beam lithography or focused ion beam milling are sufficient for creating prototypes but result in devices that would cost millions of dollars per square meter.”

Kinzel joined the Missouri S&T faculty in 2012 following a postdoc in the Infrared Systems Laboratory (UCF:CREOL/UNCC: Physics and Optical Science). He earned a Ph.D. in Mechanical Engineering from Purdue University in 2010. Dr. Kinzel has developed a Thermal Radiation Laboratory at Missouri S&T.





## DR. PERNICKA NAMED DEAN'S EDUCATOR SCHOLAR

To celebrate excellence in the classroom and contributions toward student service, four Missouri S&T faculty members are being honored by the College of Engineering and Computing with the title of Dean's Educator Scholar. They were surprised while teaching classes. Dr. Hank Pernicka, associate professor of mechanical and aerospace engineering was one of the four recipients of this honor.

The new award honors tenure-track and non-tenure-track faculty nominated by their department chairs and selected by a five-person CEC committee of senior professors from the college's nine departments. It follows the fall designation of six CEC dean's scholars, who were cited for their research accomplishments, teaching excellence and campus service.

The two-year title includes a \$5,000 stipend. In addition to receiving the news in surprise classroom visits in March, the winners were later recognized at a ceremony at Hasselmann Alumni House.

# DR. MING LEU RECEIVED PRESIDENT'S AWARD FOR LEADERSHIP



Provost Robert J. Marley, left, with Dr. Ming Leu and mechanical and aerospace engineering chair Dr. Jim Drallmeier

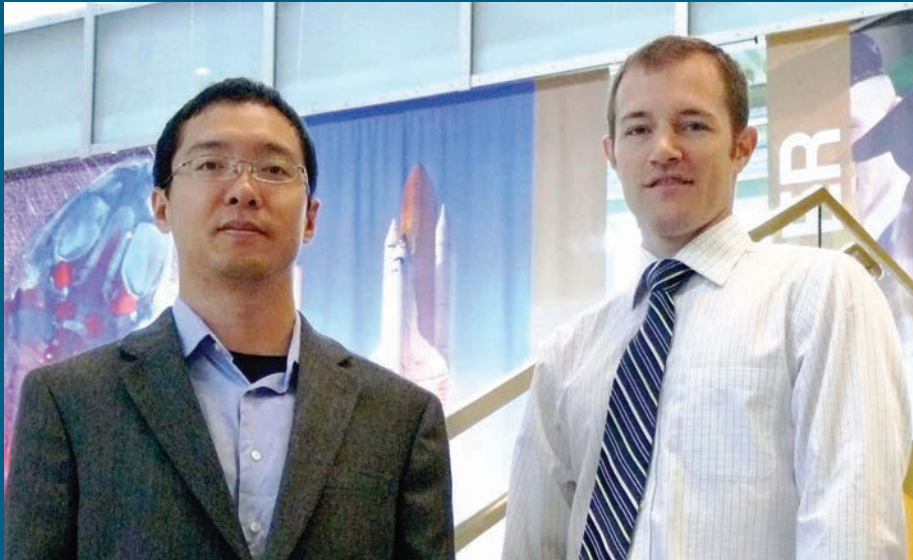
**D**r. Ming Leu, the Keith and Pat Bailey Missouri Professor of Integrated Product Manufacturing, received the President's Award for Leadership, the highest honor bestowed by the University of Missouri System. The award, which includes a \$5,000 prize, recognizes faculty who have provided exemplary leadership to one of the four UM System campuses through commitment to excellence and integrity in their leadership roles. The award was presented by Missouri S&T Provost Robert J. Marley.

Leu also serves as director of the Intelligent Systems Center (ISC). The Intelligent Systems Center (ISC) performs basic and applied research to develop generic methodologies and tools (both software and hardware) that can be applied to a wide variety of real-world problems, and to address technology and related issues in developing intelligent systems for manufacturing and energy applications. Under Leu's leadership, the ISC has one of the highest returns-on-investment of any center at S&T averaging approximately 12 externally sponsored grant dollars for every internally invested dollar.

"I believe the hallmark of Ming's career has not only been consistent funding, scholarly production and graduate student mentoring but his desire to include others in his success," wrote Dr. James Drallmeier, Curators' Distinguished Teaching Professor of mechanical and aerospace engineering. "The leadership he has shown in his research centers has created a cooperative and productive environment among faculty across the campus and encouraged several industries to come partners in growth."

Leu has published 410 referred publications in technical journals and conference proceedings, one e-book, nine book chapters, five U.S. patents and eight edited volumes of conference proceedings and delivered more than 300 technical presentations. Since joining Missouri S&T, he has obtained more than \$28 million in external grants that enabled research for the Department of Energy, the Department of Defense, Ford Motor Co., Lockheed Martin Co. and many others.

Throughout his career, Leu has supported 40 junior faculty members and post-docs through collaborative projects and team proposals and has mentored 26 Ph.D. students and more than 90 master's students through to graduation.



## DU RECEIVES GOVERNOR'S AWARD FOR EXCELLENCE IN TEACHING

Dr. Xiaoping Du, Curators' Distinguished Teaching Professor of mechanical and aerospace engineering earned the 2017 Governor's Award for Excellence in Teaching. Each year, the Governor's Award is presented to one faculty member at each public institution of higher education in Missouri.

The award is based on effective teaching, innovating course design and delivery, effective advising, service to the university community, commitment to high standards of excellence and success in nurturing student achievement.

Du teaches introduction to engineering design, dynamics and probabilistic engineering design. In December of 2016, Du was named Curators' Distinguished Teaching Professor. During his tenure at Missouri S&T, he has received numerous awards for excellence in teaching.

Du is a Fellow of the American Society of Mechanical Engineers and a member of the International Society of Structural and Multidisciplinary Optimization and the American Society of Engineering Education. He serves as associate editor for the Journal of Mechanical Design and for IISE Transactions, as review editor of Structural and Multidisciplinary Optimization, and as a member of the editorial boards of three other professional journals.

## DRS. ROVEY AND YANG NAMED INAUGURAL DEAN'S SCHOLARS

Six top young researchers at Missouri University of Science and Technology have been named Dean's Scholars, a new award that recognizes prodigious research, teaching excellence and campus service in the College of Engineering and Computing. Of the six awardees, MAE's own Drs. Joshua Rovey and Xiaodong Yang were recipients.

The award honors assistant and associate professors who were nominated by their department chairs and selected by a five-person CEC committee made up of senior professors from the college's nine departments. This award is the first step to recognizing outstanding scholars among junior faculty. The two-year title includes a \$10,000 research stipend for recipients. The winners received the news in surprise classroom visits and later recognized at an Oct. 21 ceremony at the Hasselmann Alumni House.

Dr. Josh Rovey is an associate professor of mechanical and aerospace engineering. Since arriving on campus in 2008, Rovey has carved a national and global reputation in the fields of plasmadynamics and space propulsion. He founded the Aerospace Plasma Laboratory and has shepherded sizable research grants from NASA and others and is also his department's associate chair for graduate affairs.

Dr. Xiaodong Yang is an assistant professor of mechanical and aerospace engineering. Yang has received the National Science Foundation's CAREER award as well as the 2016 Office of Naval Research Young Investigator Award. He is the principal investigator in the Nanoscale Optics Laboratory, where he and his research team study the design, fabrication and characterization of engineered photonic, plasmonic and metamaterial nano structures – work that lies at the interface of engineering, physics, applied physics, and material science.



## FACULTY RECEIVE NSF AWARD SUPPORTING ADVANCED MATERIALS ADDITIVE MANUFACTURING RESEARCH

Dr. Frank Liou, Michael and Joyce Bytnar Professor of mechanical engineering at Missouri S&T, was awarded a research grant through the National Science Foundation along with Joseph Newkirk, professor of metallurgical engineering, and Jagannathan Sarangapani, Rutledge-Emerson Professor of electrical engineering.

The award, \$881,018, is to be used on their research titled, "MRI: Development of an Advanced Materials Additive Manufacturing (AM2) System for Research and Education."

Here is a short description of the research that will be performed:

"Additive manufacturing (AM) is often called 3D printing. Although AM technologies have been developed since early 1980s, the exciting applications have just begun. The point-by-point material placement operation offers a lot of opportunities for material innovation, such as digital materials, in which a structure can be designed and specific materials can be digitally placed in the desirable locations.

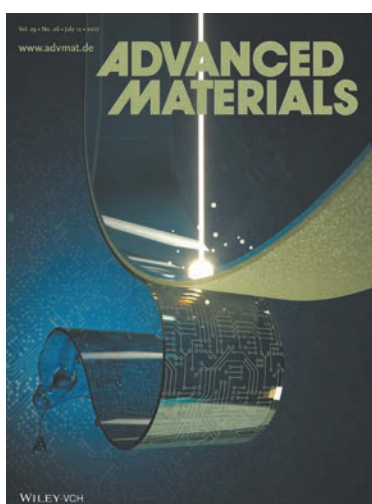
This major research instrumentation development project, sponsored by National

Science Foundation Major Research Instrumentation (MRI) program is to build a unique AM system to fabricate freeform parts with advanced materials. AM, the process of directly depositing a 3D solid object from a digital model, makes it possible to produce virtually any geometric complexity with very little impact on cost. However, most of the current AM technologies have not yet begun to achieve their tremendous potential. The objective of this project will develop the research infrastructure to advance AM technologies, with the focus on capacities that differ from conventional manufacturing processes, such as the ability to create materials with properties not generally observed in nature and structures with multiple materials. These capabilities will lead to breakthrough manufacturing technologies, such as producing much stronger and lighter products that cannot be currently made, and repairing parts stronger than their original condition.

This project will establish the critical research infrastructure to effectively fabricate novel materials through a high performance

deposition system, real-time monitoring and control, and the knowledge required to control the process. The developed system will enable us to 1) investigate freeform fabrication of materials that are several times harder and stronger than stainless steels; 2) investigate freeform fabrication of materials that can potentially integrate multiple materials with traditionally incompatible properties into one unified part; and to repair structures to be stronger than their original condition which will revolutionize remanufacturing products; 3) fabricate parts using elemental powders so that real-time material customizability can be achieved; 4) enhance and validate critical multi-scale and multi-physics modeling and analysis for AM processes; 5) develop novel advanced manufacturing applications; and 6) greatly enhance several existing research and education AM projects."

# MAE FACULTY PUBLISHED RESEARCH ARTICLES FEATURED IN TOP SCIENTIFIC JOURNALS



Our faculty's ground breaking research is continually catching the eye of world renowned scientific journals. During 2016, our faculty published 78 journal articles. Here are just a few featured in top journals:

MAE professors, Drs. Jie Gao and Xiaodong Yang published a new approach for making ultrathin holograms for producing full-color holographic images in their article "Full-Color Plasmonic Metasurface Holograms," in the journal of ACS Nano, one top journal in nanoscience and nanotechnology research. Their findings hold promise for future technologies such as 3D floating displays for cell phones, security marking on credit cards, and biomedical imaging.

Read more details here: <http://pubs.acs.org/doi/abs/10.1021/acsnano.6b05453>

Dr. Heng Pan, assistant professor of mechanical and aerospace engineering, and his team of researchers published a low-cost manufacturing method for bioresorbable conductors in an article, "Low-Cost Manufacturing of Bioresorbable Conductors by Evaporation-Condensation-Mediated Laser Printing and Sintering of Zn Nanoparticles," published in Advanced Materials. "The new method can direct print patterned Zn conductors on bioresorbable polymers with conductivity close to bulk values," Prof. Pan states. Dr. Pan collaborated with Prof. Xian Huang of Department of Biomedical Engineering at Tianjin University, and co-workers, to discover that the sintering of Zn nanoparticles can be greatly facilitated by evaporation and condensation.

Read more details here: <http://dx.doi.org/10.1002/adma.201700172>

## MAE FACULTY AWARDS

MAE has many faculty who are honored for their outstanding research, service and teaching. Here are some campus honors awarded in 2016-2017.

### Dean's Scholar Award

Dr. J. Rovey  
Dr. X. Yang

### Class of '42 Distinguished Teaching Award

Dr. J. Schmidt

### 2016 Faculty Teaching Award

Dr. J. Nisbett

### 2016 Research Award

Dr. K. DeMars

### 2015 - 2016 Outstanding Teaching Award

Dr. K. DeMars  
Dr. X. Du  
Dr. H. Pernicka

### Global Learning 2016 Outstanding Teaching Award

Dr. V. Birman



“Education is the No. 1 leveler in the world,” he says. “Engineering education is the No. 1 escalator.”

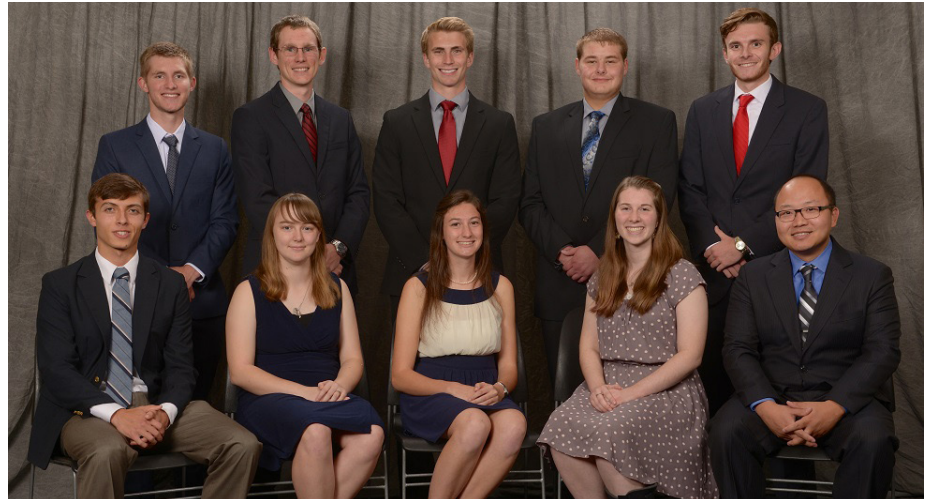
## ROGER DORF: ALUMNI OF INFLUENCE

Celebrated for his contributions to Missouri S&T and the wider world, Roger Dorf (ME'65) was honored as an Alumni of Influence during a special event on November 5, 2016.

In a career filled with executive leadership roles, Dorf served as chief operating officer of AT&T Paradyne, vice president of AT&T Network Systems in the Caribbean and Latin America, vice president and general manager of Nortel Networks Broadband Access, president and CEO of Navini Networks, and general manager and vice president of Cisco Systems Broadband Wireless Group. He retired from Cisco in 2009.

As a former president of the Board of Trustees, former president of the Academy of Mechanical and Aerospace Engineers, and a generous donor to countless Missouri S&T initiatives including scholarships, lab funds, new buildings, student design teams and athletics, Dorf continues to invest in the future — and the lives of those who will lead it.

# ACADEMY OF MECHANICAL AND AEROSPACE ENGINEERS



Scholarships and Graduate Teaching Awardees Front row from left to right: Craig Buschkoetter (Past Presidents Award), Tiffany Newburry, Jill Davis, Shannah Withrow (McGovern Award) and Shixuan Meng (Fall 2015 Graduate Teaching Award). Back row from left to right: Andrew McClard, Aaron Flood (Spring 2016 Graduate Teaching Award), Joshua Giancola, Thomas Ziervogel, and William Loos. Not pictured: Matthew Achelpohl, Joshua Hakanson, Andrew Smith and Zachary Walker.



During the induction dinner on October 13, Paul Niewald (BSAE '85 and Professional Degree '13) was inducted as the new AMAE President for 2016-2017 by John Eash.

Upon graduating from UMR, Paul began his career with McDonnell Douglas. He has held various positions of increasing responsibilities within engineering and supplier management. He was a key contributor to the high-speed aerodynamic testing and database development of F/A-18E/F leading to the success of the aircraft performance test programs and operational evaluations. Currently, Paul is the F/A-18 Program Chief Engineer and Director of the Air Vehicle F/A-18 Program. He is responsible for the program engineering execution from product requirements, product definition, production & test, through post delivery support, ensuring technical performance and mission assurance of all F/A-18 models.





## The Academy of Mechanical and Aerospace Engineers held its 21st Annual Induction Dinner on Thursday, October 13, 2016 in the Missouri S&T Havener Center.

In celebration of the Centennial anniversary of the mechanical and aerospace engineering department, the 2016 AMAE induction event respectively carried on the same theme. The Academy inducted six new members: (left to right) David McMIndes, Michael Ludwig, Wayne Garrett, Andrea Dorr, James Friend, and Jeff Thornburg.

**Andrea C. Dorr** (BSAE 1992): Andrea Dorr is the Senior Vice President of Business Development at Accurus Aerospace Corporation in Irving, TX.

**James Friend** (BSAE 1992, MSME 1994, PhDME 1998): Dr. Friend is a professor for the Center for Medical Devices and Instrumentation in the Department of Mechanical and Aerospace Engineering at University of California, San Diego in La Jolla, CA.

**Wayne Garrett** (BSME 1972): Mr. Garrett is the retired Chief Manufacturing Officer of Harman International Industries, Inc.

**Michael Ludwig** (BSME 1978, MS Engr. Mgt 1988, MS Systems Engr. 2005): Mr. Ludwig is the Sr. Manager of Test Programs Management at The Boeing Company in St. Louis, MO.

**David McMIndes** (BSME 1988): Mr. McMIndes is the Engineering Director and Chief Technology Officer at Honeywell Federal Manufacturing and Technologies in Kansas City, MO.

**Jeff Thornburg** (BSAE 1996): Mr. Thornburg is the President for Interstellar Technologies LLC in Madison, AL.



John Eash accepting the tournament trophy from Greg Slack, president of the Academy of Engineering Management.

## AMAE: ACADEMY OF ENGINEERING MANAGEMENT GOLF TOURNAMENT CHAMPS

For the inaugural Academy of Engineering Management Golf Tournament, the Academy of Mechanical and Aerospace Engineers were the first academy to be challenged. Despite early rain, they had a great day of comradery with students faculty, staff and alumni from both departments. The tournament raised \$3,900 that will be put to good use.

The results of the tournament could not have been a closer match. After regulation play, the score ended up being tied. To break the tie, the course professional conducted a score card playoff where AMAE was declared the tournament champion!

AMAE would like to recognize those who supported this event through sponsorship: Todd Martin, John Eash, Craig Barnes, Ed Gerding, Bill Ricketts, Jorge Ochoa, Breck Washam, Lisa Sombart, Roger Dorf, Brewers Beer and Winemaking at Brewers True Value - St. Peters, MO, Robert Hoffmann, Andy Johnson, Mike Calandro and Steve Moss.

# MEMORIES FROM THE MAE CENTENNIAL BANQUET



## MAE ALUMNI HONORED WITH PROFESSIONAL DISTINCTION

In December 2016, **Thomas A. Selden** was recognized for his professional achievement and awarded an honorary degree by Missouri S&T. Selden of Akron, Ohio, recently retired as president and CEO of Southwest General Health Center in Middleburg Heights, Ohio. He earned a bachelor of science degree in mechanical engineering from Missouri S&T in 1970 and an MBA from the University of Akron in Akron, Ohio, in 1976.

After graduation from Missouri S&T, Selden began work as a plant engineer for the Firestone Tire and Rubber Co. Within three years, he rose to the position of assistant chief engineer of his division with a personal vision of rising to be a top leader of the industrial company. After earning his MBA, he took an opportunity to go a different direction when a local hospital offered him a chance to join its management team. Within five years, Selden had been recruited to even higher levels of a different organization, resulting in his selection as CEO of a large 300-bed hospital in 1991. Ultimately Selden served as CEO over a 25-year period for three different health systems before retiring in 2016.

In recognition of his significant lifetime contribution to the healthcare field in Ohio, the Ohio Hospital Association honored Selden with its highest award — the Donald Newkirk Award. Selden believes that the learning experience he gained from earning an engineering degree from Missouri S&T was the foundation for his success and proved that an engineer can do anything — even lead major hospitals and health systems.



# MAE WELCOMES NEW STAFF



Over the past year, two new staff members joined the department. A vacancy was created when Jessica Satterfield joined the Engineering Management and Systems Engineering department, opening her previous position as the office support assistant II in the MAE office. With Cathy Williams retirement, her position as graduate support assistant also became available.

**Brenda Parry** joined MAE in 2016 as an office support assistant II. She last worked in the Student Accounts office at University of Central Arkansas in Conway. Brenda received her bachelor's degree from the University of Nebraska at Lincoln in the field of Family and Consumer Science. She has been married for 25 years to her husband, Jim, a Sergeant Major in the US Army. They have lived all over the midwest and even lived on the East coast, spending a year in New York. They have two sons, one in the Air Force and the youngest recently graduated from Rolla High School. In Brenda's spare time she enjoys reading, doing crafts and outdoor activities, especially hiking.



**Michele Warren**, graduate support assistant joins the department in 2016 after working four and a half years with International and Cultural Affairs. In her previous position, she was involved in the intensive english program and the Celebration of Nations. She has served on the Staff Council at Missouri S&T since 2015 and is a member of the Advocacy Committee.

# FAREWELL TO CATHY WILLIAMS



After ten and a half years of service to the MAE department, Cathy Williams retired from her position as graduate support assistant in October of 2016. Cathy joined the department in the Spring of 2016 as the undergraduate senior secretary. For nine and a half years she had been the main support for the Academy of Mechanical and Aerospace Engineers, coordinating all board meetings, the annual induction banquet and the membership meetings. She also handled payroll, undergraduate student appointments and the department scholarship program. In October of 2015, She was promoted to graduate support assistant where she processed all ME and AE graduate paperwork, researched and tracks rubrics and data, assisted with faculty searches and many other responsibilities. She will be missed as she held a vital role supporting faculty, students, and always having a positive attitude.

With retirement, Cathy is looking forward to travelling more, spending more time with family, and playing guitar in her band, Ca'Bootle. She also will be spending her time supporting her husband's commercial roofing business.

# SERTELL PROMOTED TO ADMINISTRATIVE ASSISTANT

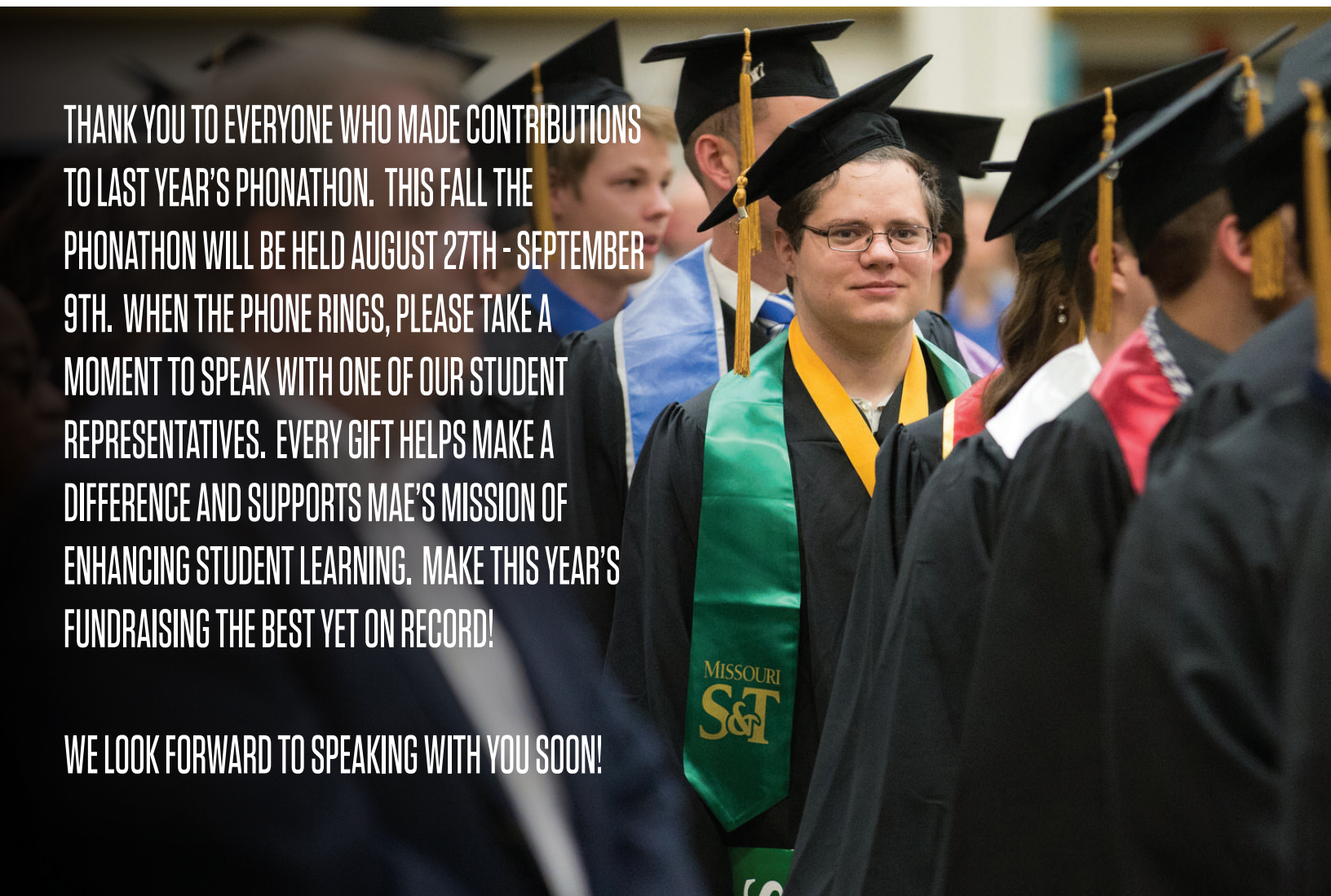


After nearly four years as senior secretary of the manufacturing program, Jill Sertell received a promotion to administrative assistant where she will perform additional departmental responsibilities of assisting with mechanical and aerospace program assessment data, department financials and special projects. She will continue to process manufacturing graduate program forms and admission files as well as coordinate the department scholarly activities report. Jill's work ethics, dedication, and vivacious personality make her a valuable asset to the Department. Congratulations Jill.

## MECHANICAL & AEROSPACE ENGINEERING

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THANK YOU TO EVERYONE WHO MADE CONTRIBUTIONS TO LAST YEAR'S PHONATHON. THIS FALL THE PHONATHON WILL BE HELD AUGUST 27TH - SEPTEMBER 9TH. WHEN THE PHONE RINGS, PLEASE TAKE A MOMENT TO SPEAK WITH ONE OF OUR STUDENT REPRESENTATIVES. EVERY GIFT HELPS MAKE A DIFFERENCE AND SUPPORTS MAE'S MISSION OF ENHANCING STUDENT LEARNING. MAKE THIS YEAR'S FUNDRAISING THE BEST YET ON RECORD!

WE LOOK FORWARD TO SPEAKING WITH YOU SOON!