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Fall 2019 • Alumni Newsletter

MECHANICAL, AEROSPACE & BIOMEDICAL ENGINEERING

Bone Fracturing Device is Integral Part of Research Being Done at UT's Body Farm

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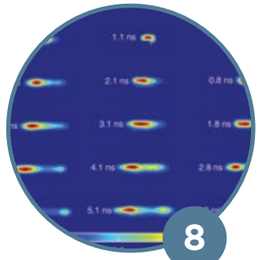

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Departments

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Mechanical, Aerospace &
Biomedical Engineering

On the cover: A team of senior design students designed and developed the Bonecrusher to assist the world-famous Body Farm in more accurately determining cause of death.

From the **Department Head**

Thanks for reading the fall 2019 issue of our alumni magazine. I hope you enjoy it!

The Tickle College of Engineering and MABE have continued to expand our global impact and reputation. We had another record-breaking year in MABE, with research expenditures between UT and UTSI's MABE faculty topping $15 million. This achievement is a result of the collective effort of our tremendous faculty, staff, and students, and the successful implementation of strategic thrusts in manufacturing and hypersonics.

One of our newest faculty members, Professor Tony Schmitz, is an example of this effort. Schmitz joins our team from the University of North Carolina at Charlotte as a well-respected national leader in subtractive manufacturing. He also has an interesting history, including recovering an onside kick from Tennessee in Neyland Stadium when he played football for Temple University.

Other incoming faculty include Assistant Professor Damiano Baccarella from the University of Illinois. His industrial experience and PhD were related to hypersonics, and his new high-enthalpy wind tunnel lab will add a major experimental capability of national significance to our AE program. We also welcome Assistant Professor Devina Sanjaya, a computational fluid dynamics grid meshing expert in AE from the University of Michigan to our team.

As our faculty and research programs have grown at the UTSI and UT Knoxville locations, the investments have transformed our undergraduate facilities as well. This fall we will begin work on a new modern manufacturing training facility in the basement of Dougherty, greatly expanding the existing advanced and conventional machine shops. We are also continuing to regularly upgrade our student labs. Thanks to a generous gift from our MABE Board of Advisors member, H. Lee Martin, I am excited to announce a new 3D Prosthetics and Device Printing Laboratory that will be used to develop "life hacks" for disabled people all over the world who need special solutions to unique problems. I am excited to see how our department will positively impact the lives of people everywhere with this special facility.

None of this is possible without your help. The generosity of our alumni and friends have empowered this transformation, and included over $10 million in direct monetary gifts and pledges since 2016 alone. The impact of this generosity will be felt for generations to come, and I want to again thank everyone who has contributed. All gifts, small and large, have made a difference in our ability to shape the education and experiences of our students, and provide our faculty with the facilities and resources they need to be internationally recognized in their fields.

Finally, please keep sending pictures and stories of your time at Big Orange—we love to share your memories with the entire MABE family! I look forward to hearing from you and invite you to get in touch and stay connected.

Best regards,

Matthew Mench

Addition by Subtraction

By David Goddard. Photography by Shawn Poynter.

Like an archeologist seeking out buried relics of the past, Tony Schmitz has a knack for revealing objects hidden underneath layers of resources.

The difference in his case is that the items contained within exist only in thought until he creates them, meticulously removing bits and pieces of existing elements to expertly craft a new item out of the confines of its host material.

Known as machining, or more recently subtractive manufacturing, its name alone tells you about its process in much the same way as additive manufacturing, which adds material layer by layer to make a finished product.

Schmitz's arrival to UT helps strengthen MABE's role as a leader in the advanced manufacturing revolution by fitting neatly with its renowned efforts in additive manufacturing and providing expertise all along the manufacturing spectrum.

"Additive and subtractive manufacturing are extremely complementary to one another," said Schmitz, who comes to UT with a joint appointment at Oak Ridge National Laboratory.

> ***"With additive, you can build an object that is generally what you want, but subtractive manufacturing allows us to create the final geometry with the desired accuracy and surface finish."***

Schmitz described the chance to join UT as the "perfect opportunity," noting that he has already begun to collaborate with other faculty members. Notably, Schmitz, Associate Professor Chad Duty, and others have teamed up to submit a proposal to the US Navy as part of the Department of Defense's Manufacturing Engineering Education Program.

If selected, Duty and Schmitz will be able to create a one-of-a-kind lab focused on machine tool research, additive and subtractive manufacturing, and robotics.

Schmitz won't be waiting for the outcome of that proposal to craft a lab space, however, with some of his research already taking place at ORNL's Manufacturing Demonstration Facility as well as in a new lab in the Dougherty Engineering Building.

"Vibration during subtractive processes continues to be one of the most important areas that needs addressing in our particular field, and it's one we hope to tackle in the lab," Schmitz said. "Another thing we hope to do is to incorporate subtractive ideas into the planning process instead of it being something you do at the end of additive manufacturing. It will take a new approach, new way of thinking, but should allow us to have better, more refined designs and outcomes."

The chance to develop today's students into tomorrow's thought leaders is also an important opportunity in Schmitz's eyes—one that brought him to UT in the first place. ORNL had planned to hire Schmitz and another colleague from the University of North Carolina at Charlotte as full-time researchers, but Schmitz felt it was important to continue his role as an educator.

In fact, far from considering it a requirement, he really enjoys it.

"Growing up in the 1970s and 80s, I always wanted to be the front man for a heavy metal band, like AC/DC," Schmitz said. "For me, standing in front of a class is my stage, my chance to take on that lead singer role. I'm motivated by my research, but teaching is what keeps me going."

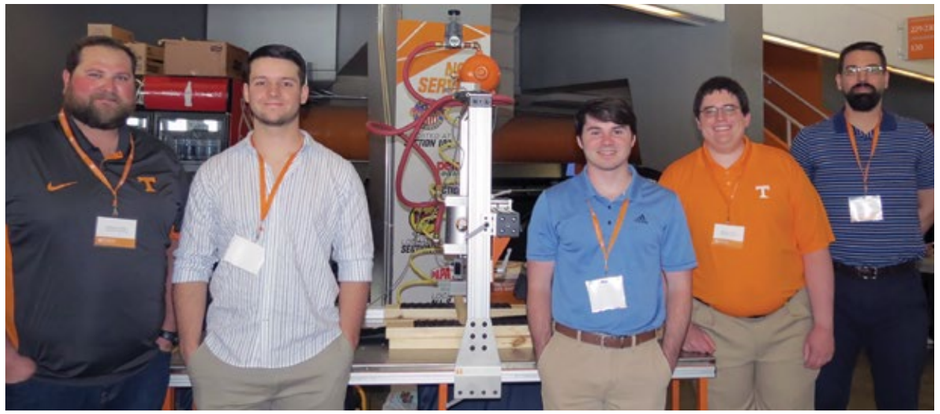
If the five doctoral students who followed him to UT are any example, he must be hitting all the right notes.

STUDENTS BUILD Bone Fracturing Device FOR UT'S BODY FARM

By Kathy Williams. Photography by Shawn Poynter.

A team of MABE students have spent the last two semesters working with UT's Forensic Anthropology Center, better known as the Body Farm, to build a bone fracturing device needed for research.

"The device will be used to help document the survivability of blunt force fracture evidence following a burning event, and will provide tools to successfully differentiate blunt force trauma from thermal trauma," said Research Associate Professor and Assistant Director of the Body Farm Giovanna Vidoli. "This will improve the scientific knowledge of the fracture pattern expected in bone with pre-existing trauma."



The Bone Crusher team (l-r) Zachary Ziegler, Carter Breeding, Ryan Smith, Daelyn Greene, and Nicholas Poker displayed the bone fracturing device at the Tickle College of Engineering Senior Design Showcase in April.

After meeting with Vidoli and her co-researcher, Distinguished Lecturer and Assistant Director Joanne Devlin, and doing some research, seniors Carter Breeding, Daelyn Greene, Nicholas Poker, Ryan Smith, and Zachary Ziegler designed and built a device—which they named the Bone Crusher—that can deliver blunt force impact to bones as well as fracture bones.

"Research into many different kinds and sources of trauma was performed in an attempt to find accurate force values," Greene said. "Data from impact trauma performed in a lab setting, trauma data acquired from car crashes, and trauma data acquired from crime scenes were three of the major sources we used to get an accurate picture of the varying forces we needed to output with the Bone Crusher."

The Bone Crusher, which is six feet long and six-and-a-half feet tall, allows users to control the amount of force, impact duration, and location of impact on the bones, all of which are needed for the research.

"The device is an integral part to produce blunt force fractures," Vidoli said. "This project will be the first research in which complete human bodies will be impacted with blunt force to four areas of the body: the skull, thorax, humerus, and tibia."

The device was built so the output force is easily adjustable and the impact duration can be adjusted in increments of 0.1 seconds. The largest force the students recorded during their testing was 1,900 pounds.

The students built the device for their senior design course, which allows students to apply all their acquired knowledge and skills in engineering and science to solve an actual problem within the community.

"The most enjoyable part of this project was being given free rein to conceptualize, design, and build a prototype using the fundamentals we have been learning in classes leading up to the senior year," Breeding said. "The fabrication stage was by far my favorite, because I enjoy being hands-on and building things."

The final prototype was displayed at the college's inaugural Senior Design Showcase and gained the team the First Place Best Mechanical Engineering Project Award.

Faculty and students at The Body Farm plan to start using the device on human bodies this fall.

Fighting an Epidemic

A new device aims to reduce hospital expenses when caring for patients with a history of IV drug use.

By Kathy Williams. Photography by Shawn Poynter.

As hospitals across the country see an increase in patients addicted to heroin and other injectable opioids, they're also facing new treatment challenges: patients with a history of intravenous drug use who bring illegal drugs into the hospital to inject directly into their vascular access lines, which transport the drugs directly to their heart. Such behavior can cause an infection resulting in prolonged hospital stays, surgery, or even death.

"This leads to high costs for the hospital due to such infection rates counting against the hospital, which can reduce the hospital's medical reimbursement," said Matthew Mench, head of the Department of Mechanical, Aerospace, and Biomedical Engineering in UT's Tickle College of Engineering. "Many in this patient population are uninsured, and the hospitals keep them in the facility for longer periods of time thereby losing a tremendous amount of money."

The University of Tennessee Medical Center (UTMC) was one of the hospitals facing the problem.

"At the quality improvement meetings at UT Medical Center, I heard many times that we were having problems with patients and their families accessing their IV lives with substances brought into the hospital," said Mitch Goldman, assistant dean for research in the Graduate School of Medicine. "So my first thought was 'Why don't we just stop them by putting the access points in a box with a lock?'"

Realizing in 2016 that there was nothing on the market to help, Goldman came to Mench to try to solve the problem.

Mench began devising a concept for a transparent tamper-evident box that closes around the vascular access line interface using a pin connection. With feedback from nurses, he 3D-printed a prototype then spent several months refining the design. Associate Professor Chad Duty and Rosenberg Associate Professor of Practice Matthew Young helped perfect the design by adding a key innovation: an internal chamber to catch the ends of the colored pins, showing clear visual evidence of tampering.

With the help of the UT Research Foundation (UTRF), the device, named the TEL BOXX, went to market in September 2018 and is now used in 11 hospitals across eight states.

"The fact that it has gained acceptance is an example of true teamwork in translational medical research—confronting a problem, looking for solutions, testing the solutions, and bringing them to clinical use," Goldman said.

The invention is the only product available that can be used while the vascular access line is being actively used to administer medication. It covers any interface points that can be tampered with, does not crimp or leave residue on the line, and can deter some patients from tampering with the line.

"A high-risk patient, who we always suspected of tampering with the line, left the facility within a couple of hours," said a nurse in Pennsylvania. "The box sent a clear strong message to him to keep away from the line."

"Evidence of tampering is all the facility needs to document suspected injecting, so medical reimbursement rates may not be affected," said Mench. "It also allows the hospital to free up space by transferring these patients from the hospital to a skilled nursing facility or ambulatory clinic so the patient can get daily medication as an outpatient."

"It is a team effort working towards commercialization of the TEL BOXX from its inception, addressing a current and relevant market need," said UTRF Vice President Maha Krishnamurthy.

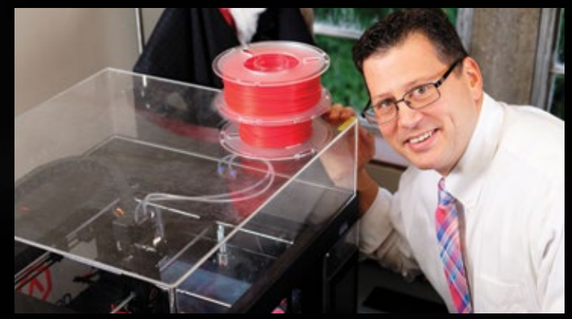
Having the TEL BOXX be successful is a satisfying feeling for Mench and aligns with everything he loves about his job—being creative and helping people.

"The TEL BOXX is a device with real market value and it allowed me to do some inventive engineering, which I love," said Mench.

> "Most importantly, as an engineer, I always want to impact humanity in a positive way."
>
> —Matthew Mench

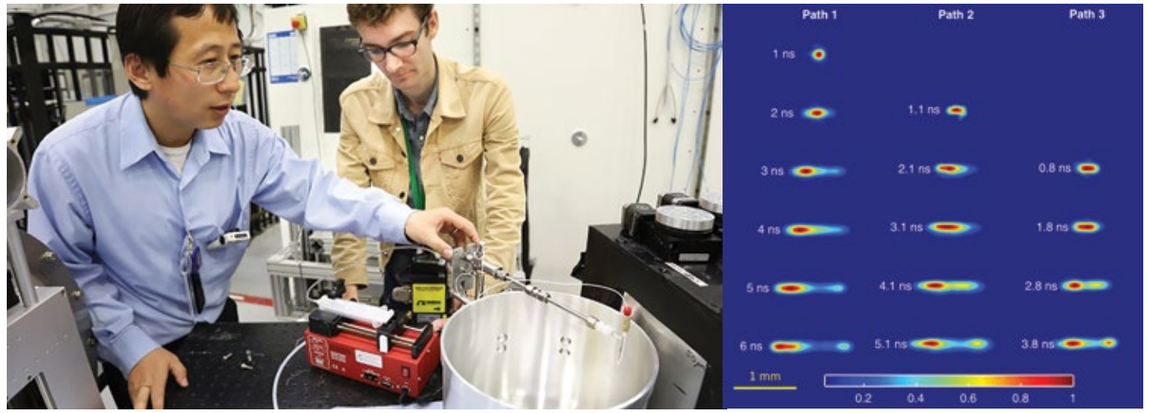
The product portfolio has since been expanded to include several different sized boxes, each one tailored to meet a specific need to provide evidence of tampering at a controlled access point. UTRF already has two issued patents with another four pending, and the next-generation design is in the works. The new design is based on customer feedback and will be much less expensive to produce, more comfortable for the user, and easier for medical staff to use.

In the meantime, Krishnamurthy and Mench are looking to partner with a medical supplier to manufacture and sell the TEL BOXX in the hopes that the device could soon be helping hospitals refocus on patient care and recovery.



A Need for *Shutter Speed*

By Katie Jones. Photography by ORNL/Genevieve Martin.



Zhili Zhang (left) and Cary Smith, use neutrons at HFIR's CG-1D instrument to investigate fluid flow dynamics for potentially improved fuel systems.

Don't blink, or you'll miss it—unless you're Professor Zhili Zhang. He's built a research career around laser diagnostics and optical imaging to better enable the visualization and study of ultrafast processes.

With an increasing demand for high-speed imaging across science, physics, and engineering, Zhang's work has gained importance, culminating in the development of a novel high-speed imaging method with higher resolution at faster speeds than current technologies.

Zhang's technology arose from a practical problem: cost efficiency.

"It's extremely difficult to keep pace with evolving camera technology," Zhang explained. "The big question is, "how can any academic keep up with this expensive technology in their research?""

He recalled attending a federal government convention in Arlington, Virginia, where government scientists showed off an imaging lab stocked with eight high-speed cameras, each costing more than $200,000. The top-of-the-line cameras grow obsolete in only a handful of years, resulting in potentially millions of dollars to keep pace with changes every few years.

Determined to help minimize this obstacle, he partnered with Mark Gragston, research professor at the UT Space Institute, to find an alternative. They drew inspiration from a slow-moving technology developed in the early 2000s that modulates light over space to illuminate a target. By applying this approach to high-speed cameras, the MUltiplexed Structured Image Capture (MUSIC) was born.

With laser-induced plasma as an imaging target, Zhang and his fellow researchers used modulation to split incoming light into multiple arms with distinct coding over given spaces. Light is captured in snapshots at distinct moments in time, resulting in a single shot comprised of multiple images reconstructed together through computer processing. The multiple images reveal high-speed dynamics that enable the imaging target's evolution to be seen on a nanosecond scale.

Thanks to an encoding method that bypasses the speed limits of the fastest commercially available camera shutters, MUSIC can capture up to one billion frames per second (FPS) compared to just one million in other models. It also captures around 300 pixels per image, compared to around 10 pixels in standard high-speed cameras.

The UT Research Foundation (UTRF) immediately saw MUSIC's possibilities.

"This is a very universal innovation that can be used with any camera and it paves the way for cost-efficient, real-time imaging and characterization of ultrafast processes and tracking of fast objects," said UTRF Licensing Associate Andreana Leskovjan.

Feedback from companies during marketing outreach was so positive that UTRF filed a patent application for the technology. In addition to MUSIC, Zhang is also hard at work researching the use of laser optics to study hypersonic combustion and fuel options in vehicles.

From Mercury to Artemis

By Laura Tenpenny.

In July 2019, Dougherty spoke at UTSI's Apollo 11 anniversary celebration by giving an insider's view of the Apollo space program research and testing performed at Arnold Engineering Development Complex in the 1960s.

Nathan Sam Dougherty Jr. (BS/ME '62, MS/AE '70) has contributed to every US Human Spaceflight Program over his career. He is currently employed by Engineering Research and Consulting (ERC) in the Jacobs Space Exploration Group at NASA's Marshall Space Flight Center.

"I see the same feeling I had at their age in the eyes of new hires and interns. That feeling has continued with me," Dougherty said.

Nathan W. Dougherty, alumnus and former dean of the college, subtly influenced his grandson's career with the high school graduation gift of a slide rule. That slide rule motivated two engineering degrees and a co-op experience, giving Dougherty his first taste of space.

"I was lucky enough to get my first choice: the Air Force's Arnold Engineering Development Center (AEDC) with Sverdrup/ARO," Dougherty remembered.

Beginning his co-op in 1958, the year NASA was established, Dougherty worked on the Mercury, Gemini, and Apollo missions, remaining at AEDC after graduating.

"As part of Apollo's Ground Test Team, I worked on essential portions of the rocket propulsion components, particularly for the Trans Lunar Injection Burn, which moved the spacecraft from Earth's orbit toward the Moon, and the in-space operations at the Moon down to landing," Dougherty said. "We supported a series of Apollo flights, all of them major firsts and all precursors to Apollo 11."

When Armstrong made that "one small step for man," Dougherty was with his team at AEDC.

"We gathered at our facility conference room—all of us watching the television together," Dougherty recalled. "Our feelings at the time were mixed. It went great! But they didn't need us anymore. Our work was done."

Dougherty has made many other contributions to NASA, in particular to the Space Shuttle—all 135 flights—and testing a supersonic jet, the F-15, as well as helping build the International Space Station.

Among his honors, Dougherty holds two Silver Snoopy awards, based on a unique drawing by Schultz. Given to individuals who ensured mission success and safety, the Snoopy pin adorns less than one percent of those involved with NASA.

"An astronaut comes to your workplace, pins the Silver Snoopy on you, and thanks you personally," Dougherty said. "I received mine after the first and eighth Space Shuttle flights."

As a recognized national expert on propulsion, Dougherty serves as part of the propulsion team for the Artemis missions. The objective: to return to the Moon, this time with a woman, and conduct extensive Deep Space exploration and testing in preparation to journey to Mars.

As it has been for all missions previous, his contributions will help us make it safely there and back again.

Dougherty (R) speaks with Capt. Jerry Worden, brother of Astronaut Al Worden. Al was the Command Module Pilot on Apollo 15 and went to the moon.

Students, Faculty, and Staff Honored at Banquet

MABE recognized students, faculty, staff, and newest Hall of Fame member at the department's annual Honors Award Banquet at The Foundry on April 4.

Guest speaker Thomas Noyes, founder and CEO of Commerce Signals, shared the history of his successful career and how his degree in aerospace engineering was the foundation that led to his career in the finance sector. He encouraged the students in attendance to build relationships, stay in touch with fellow classmates, and work with passionate people. He also stressed how important it is to love what you do. Noyes was inducted in the department's Hall of Fame during the banquet, increasing the hall's membership to twelve.

The student, faculty, and staff award winners included:

Jonathan Dixon and **Spencer McDonald**
Outstanding Junior in Aerospace Engineering Award

Benjamin Savitz, **Bradley Moore**, and **Lauren Jennings**
Outstanding Junior in Biomedical Engineering Award

Parker Trulove, **Zane Chapman**,
Alexander Arbogast, and **Alexandra Defilippis**
Outstanding Junior in Mechanical Engineering Award

Stewart Whaley and **Camille Bergin**
Outstanding Senior in Aerospace Engineering Award

Katherine Stiles and **Simran Dayal**
Outstanding Senior in Biomedical Engineering Award

Landen McDonald, **Adam Daniel**, and **Justin Harmon**
Outstanding Senior in Mechanical Engineering Award

Camille Bergin
MABE Student Leadership Award

Associate Professor **Chad Duty**
Thomas Stewart McCorkle Family Endowed Faculty Award

Assistant Professor **Brett Compton**
Louis and Ann Hoffman Endowed Excellence in Research Award

UT-ORNL Governor's Chair **Suresh Babu**
B. Ray Thompson Endowed Excellence in Research Award

Lecturer **Sara Hanrahan**
MABE Outstanding Faculty Initiative and Leadership Award

Associate Professor **Andy Sarles**
MABE Translational Research and Innovation Award

Communications Coordinator **Kathy Williams**
J.A.M. Boulet Outstanding Staff Service Award

Senior Lecturer **Rob Bond**
Pi Tau Sigma Excellence in Teaching Award

Associate Professor Andy Sarles presented Sara Hanrahan with the MABE Outstanding Faculty Initiative and Leadership Award.

Simran Dayal (middle) and Katherine Stiles were named Outstanding Seniors in Biomedical Engineering at the banquet.

Senior Lecturer Rob Bond was presented the Pi Tau Sigma Excellence in Teaching Award by Savannah David.

Faculty News

Kihm Receives Open Education Award

Professor **Ken Kihm** is one of three faculty members to receive an Open Education Award from UT's Student Government Association (SGA) due to his use of Open Educational Resources (OERs) in the classroom.

SGA partnered with the University Libraries to establish the annual award to recognize faculty and lecturers who use OERs—teaching and learning materials that are free of cost and access barriers—in the classroom to promote and contribute to a culture of openness and knowledge sharing. Using OERs not only increases student access to course materials, but also lessens the financial burden on students and their families.

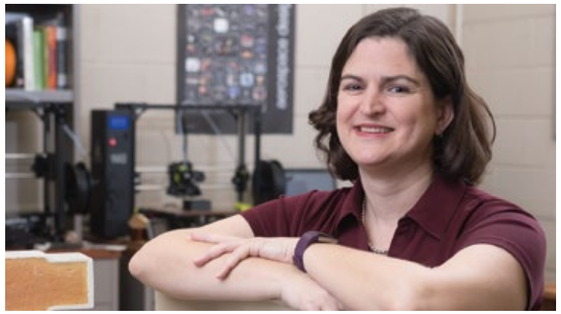
"Receiving the Open Education Award is an honor," said Kihm. "I enjoy teaching my class with the open book resources, and I am happy my students are benefiting from this new way of learning."

Judging for the award is based on the impact of learning, innovation in teaching, and economic impact on students.

Kihm was nominated by students in his AE 351 class. Some of the comments from the students included, "...it simplified the learning experience. Dr. Kihm is an excellent professor and true to provide as many resources as he can to maximize success," and "having an open textbook was very effective and saved me a lot of money."

Kihm received his award at a campus reception on April 25.

TerMaath Receives AWP Giving Circle Grant for After School STEM Program



Jessie Rogers Zeanah Faculty Fellow **Stephanie TerMaath** received a Giving Circle Grant from UT'S Alliance of Women Philanthropists to fund SuSTEMability, an after-school STEM program for elementary school girls at socio-economically disadvantaged schools.

The ten-week program will be piloted this fall with twenty fourth- and fifth-grade girls at Bowers Elementary School in Harriman, Tennessee. The students will complete an engineering project and participate in stand-alone sessions about college preparation and STEM fields.

For the project, students will team up to extrude filament from water bottles, which they will then use to design and 3D print an airplane. The teams will test their airplanes in a portable wind tunnel to evaluate flight characteristics before presenting a poster and modeling their airplanes.

"This project will not only teach them technical skills in a wide variety of STEM fields, but also teach them leadership, how to work in teams, and how to present and evaluate their work," said TerMaath.

Female graduate students from UT's WiSTAR3 (Women in STEM Advancing Readiness, Retention, and Research) organization will lead the program and serve as role models and mentors who will ideally inspire the girls to pursue STEM fields.

TerMaath hopes to expand the program to other schools in the future.

The Giving Circle Grants are awarded annually to fund innovative projects and programs throughout the UT System that are in alignment with their mission to educate, empower, and inspire women to be philanthropic leaders.

New Faculty

Damiano Baccarella joined MABE this fall as an assistant professor of aerospace engineering. Baccarella was previously a postdoctoral research associate at the Center for Exascale Simulation of Plasma-Coupled Combustion at the University of Illinois. His research focuses on hypersonic aerothermodynamics and high-speed propulsion systems.

Devina Sanjaya joined the department this fall as an assistant professor of aerospace engineering. She received her PhD in aerospace engineering and scientific computing from the University of Michigan: Ann Arbor in May. Her research interest is in the development of algorithms to improve the robustness and accuracy of computational fluid dynamics simulations.

Tony Schmitz joined the department this fall as a professor of mechanical engineering. Schmitz was previously a professor and assistant director of the Energy Production and Infrastructure Center at the University of North Carolina at Charlotte. His research interests include machining dynamics, manufacturing process modeling, uncertainty evaluation, and displacement measuring interferometry.

Faculty Recognized at College and University Award Banquets

Four MABE faculty members were recognized for their outstanding teaching and research at the college's Awards Banquet and Chancellor's Honors Banquet this spring.

TCE award recipients:

Professor **Jackie Johnson**
2019 TCE Teaching Fellows Award

Rosenberg Associate Professor of Practice **Matthew Young**
2019 TCE Teaching Fellows Award

Assistant Professor **Jim Coder**
Dean's Junior Faculty Research Excellence Award

Jessie Rogers Zeanah Faculty Fellow **Stephanie TerMaath**
TCE Professional Promise in Research Award

Chancellor's Honors Banquet award recipients

Jessie Rogers Zeanah Faculty Fellow **Stephanie TerMaath**
2019 Research and Creative Achievement—Professional Practice Award

Jackie Johnson

Matthew Young

Jim Coder

Stephanie TerMaath

Promotion & Tenure

Kivanc Ekici has been promoted to full professor. Ekici is an associate department head and director of MABE's graduate programs. He joined MABE as an assistant professor in 2008. Ekici's research interests include unsteady aerodynamics and aeroelasticity, computational fluid dynamics, wind turbine aeroelasticity, turbomachinery, and aerodynamic design.

Caleb Rucker has been promoted to associate professor with tenure. Rucker joined MABE as an assistant professor in 2013, and is director of the Robotics, Engineering, Applied Continuum Mechanics, and Healthcare (REACH) Laboratory. His research interests include the intersection of robotics, solid mechanics, and medical applications.

Andy Sarles has been promoted to associate professor with tenure. Sarles joined MABE as an assistant professor in 2011 and is director of the Bioinspired Materials and Transduction Laboratory. His research interests revolve around the assembly, characterization, and application of biologically inspired and biomolecular material systems for engineered devices.

Matthew Young has been promoted to associate professor of practice. Young joined MABE as an assistant professor of practice in 2014 after receiving his PhD in mechanical engineering from UT. His research interests include additive manufacturing, machine design, and CAD. Young runs the MABE Maker Lab, which provides undergraduate and graduate students hands-on experience with industrial technologies including 3D printers, water jet cutters, and CNC machines.

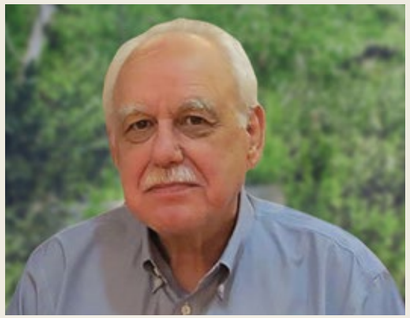
Feng-Yuan Zhang has been promoted to full professor. Zhang joined MABE as an associate professor in 2012 and was granted tenure in 2018. He is located at UTSI and is director of the Nanodynamics and High-Efficiency Lab for Propulsion and Power. Zhang is currently leading a $2 million project in fuel cell and hydrogen technology for the US Department of Energy. His research interests include development of high-efficiency, low-cost, and sustainable materials, sensors, and devices with nanotechnology and advanced manufacturing.

Zhili Zhang has been promoted to full professor. Zhang joined MABE as an assistant professor in 2008 and is director of the Laser Diagnostics, Computational Imaging, and Combustion Research Group. His research interests include trace species, flow velocity and flame temperature measurement, optical diagnostics of fluid flow and validation of computational fluid dynamics and laser-induced plasma spectroscopy.

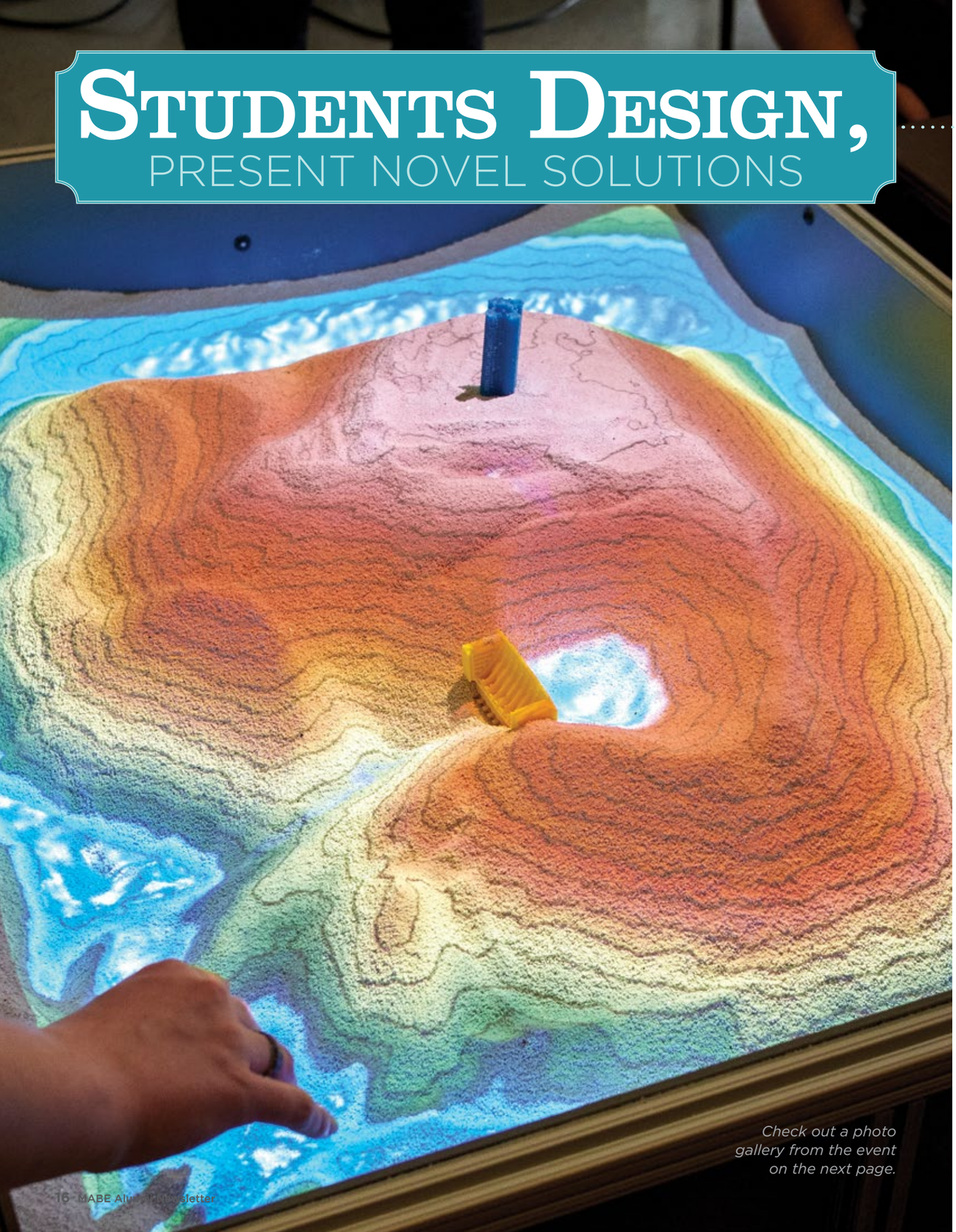
Xiaopeng Zhao has been promoted to full professor. Zhao joined MABE as an assistant professor in 2007 and is director of the Nonlinear BioDynamics Laboratory. His research interests include brain-computer interface, wearable healthcare, computational neuroscience, computational physiology, and biomedical informatics.

In Memoriam: Professor Emeritus Gary Smith

Smith passed away in June at the age of 74. He taught in MABE for 42 years until his retirement in 2017, having spent 15 of those years serving as associate department head. Smith taught almost every course offered in the curriculum and was loved in the classroom. During his tenure, he received four outstanding teacher awards and an outstanding advisor award. Smith was dedicated to the department, college, and university, serving on and chairing numerous committees. He was well-known for his humor and wit and is missed by his friends and colleagues in MABE.



Students Design, Present Novel Solutions



Check out a photo gallery from the event on the next page.

Forty-nine teams of MABE students participated in the Tickle College of Engineering's inaugural Senior Design Showcase at Thompson-Boling Arena on April 24. More than 125 teams representing all eight engineering departments were on display at the event.

The showcase provided an opportunity for students, faculty, sponsors, and guests to come together and celebrate the completion of these open-ended projects that students worked on for two semesters.

The showcase originated with MABE in 2016 with 37 team projects and established an outstanding model for this year's college-wide showcase. At the end of the event an award ceremony was held for all departments to recognize top projects. MABE presented the following awards:

First Place Best Poster Award

Project: Out of Plane Printing for Big Area Additive Manufacturing

Team members: Tyler Smith, Gregory Gorman, Liam Page, Tom Flammang, Dylan Settlemire

Second Place Best Poster Award

Project: AVOLLO: A Reusable Lunar Lander

Team members: Chad Batten, Camille Bergin, Aaron Crigger, Daryl Harris, Gilliam McGlothin

Third Place Best Poster Award

Project: MediVol PPE Accountability System for Securing Patient Rooms and Preventing Hospital-Onset Infections

Team members: Andrew Miller, Andrew Ten Eyck, Kelsie Shea, Peyton Holman

Aerospace Engineering Best Project

Project: Hovercraft team

Team members:: Skylar Jordan, Trenton Bullman, Jorge Navia, Savannah David

Biomedical Engineering Best Project

Project: TraumaTot

Team members: Olivia Lowman, Ryan Ogle, Anneka Granvold, Eddie Orzechowski

First Place Mechanical Engineering Best Project

Project: Bone Crusher

Team members: Carter Breeding, Daelyn Greene, Nick Poker, Ryan Smith, Zack Ziegler

Second Place Mechanical Engineering Best Project

Project: Pratt & Whitney Centering Spring Re-Design

Team members: Nathan Bingham, Marcus Brooks, Allan Coste, Matthew Cum, Grayson Hawkins

Third Place Mechanical Engineering Best Project (Tied)

Project: Accu-Router Pick and Place

Team members: Jordan Cummings, Philip Bailey, Collin Culp, Jacob Maine, William Piwonka

Project: Accu-Router Door Flipper

Team members: Marc Blanshey, Tyler Laughter, Mingsu Lin, Adam Filson

Prototype Excellence Award (5 awards)

Project: Rapid Autonomous Pneumatic Transport System (collaboration between ME and NE)

Team members: (ME) Elijah Davis, Bobby Bohn, Jacob Melton, (NE) Emily Hutchins, Xena McDonald, John Taylor

Project: Wag-In-One

Team members: Evalynn Borrego, Connor Fair, Henry Gertsen, Joseph Golden, Corbin King

Project: Miniature Cooling Tower

Team members: Adam Brooks, Richard Estey, Henry Lee, Sean O'Connor, Jake Treadway

Project: Solar Thermochemical Energy Storage

Team members: Junsung Park, Olivia Pfeifer, Pierce Atkins, Seth Douglas, Tennessee Bryant

Project: Torch-mounted Automated Wire Cutter for Large Scale Metal Additive Manufacturing

Team members: Garrett Foust, Matthew Montgomery, Steven Patrick, Ben Rouse, Erfan Zahraei

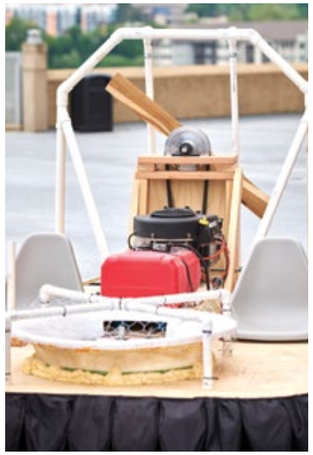
People's Choice Award

Project: Torch-mounted Automated Wire Cutter for Large Scale Metal Additive Manufacturing

Team members: Garrett Foust, Matthew Montgomery, Steven Patrick, Ben Rouse, Erfan Zahraei

Scenes from the Senior Design Showcase

Photography by Shawn Poynter.



Drew Cordray, Stefan Dopatka, Cole Weber, Bradley Hills, and Nathaniel Brandt designed and built a hovercraft capable of operating on both land and water.

Jesse McMillan, Mallory Bowers, and James Hillencamp designed a robotic tool head to remove foreign material from the front glass of an automotive dashboard.

The Trauma Tot team Ryan Ogle, Olivia Lowman, Eddie Orzechowski and Anneka Granvold designed and manufactured a trauma model for toddler-aged children that surgeons can practice a variety of procedures on.

Dustin Samples, Trevor Ferguson, and Dax Anderson designed a setup to test the effects of ultrasonics upon resin in a SLA 3D printer.

Brett Evans, Gracie Forbes, Emma Johnson, Hannah Olsen, and Jillian Schwendeman designed the Emergency iTrainer that can be used to simulate select emergency ocular procedures such as foreign body removal, slit-lamp exam, fluorescein staining, and lateral canthotomy.

Mary Daffron, Landen McDonald, Joseph Goble, and Charles Stansbury stand beside the device they made that replicates the flow behavior of a cracked vapor in a high temperature, low pressure furnace.

Michael Keesee, Rabin Gandharva, Xiaoqi Lu, and William Bright designed a magneto alternator with an internal rotating shaft that improves the leak tightness while minimizing frictional resistance.

Michael McClanahan, Corey Crawford, Kea Francis, and Matthew Cummings made an autonomous lawnmower that adjusts its movement based on desired path.

The AIAA design, build, fly team designed and built a remote-controlled aircraft capable of simulating aircraft carrier operations.

Tanner Justice, David Knight, Michelle McNamara, John Thress, and Jeff Zajkowski developed an aerial drone that can create 3D topographic maps of the Martian surface.

Dean's List Spring 2019

Summa Cum Laude

Aerospace Engineering
Teague Aarant
Garett Ball
Camille Bergin
Christopher Busic
Ethan Cerrito
Abigail Chubb
Brian Coulter
Nicholas Crowder
Zackery Crum
Sean Darling
Jonathan Dixon
Iliane Domenech
Mattheus Fry
Kenta Funada
Timothy Grizzel
Jacob Hale
Trenton Henderson
Seth Holladay
Gavin Jones
William Jones
Ryan Kelly
David Kight
William Kobler
Shelby Ledbetter
Jeffrey Martell
Spencer McDonald
Gillian McGlothin
Matthew McVey
Michael Moore
Jamison Murphree
Samuel Pankratz
Sang Park
Akaash Patel
Raj Patel
Samantha Ramsey
Chapel Rice
Caleb Ross
Daniel Rudolph
Colter Russell
Caleb Saiyasak
Killian Samuels
Angus Shaw
Joshua Stephenson
James Strickland
Tyler Sundstrom
Tyler Sussmane
Christopher Violet
Charles Wallen
Samuel Walters
Colby Warden
Caleb Weatherly
Stewart Whaley
Andrew Wilcox
Jeongmin You
Alicja Zeligowska

Biomedical Engineering
Sara Aboeleneen
Ahmad Alharithy
Ryan Babb
Alexander Barrett
Taylor Berger
Samantha Bratcher
Laura Bretscher
James Corbitt
Lainee Darrow
Simran Dayal
Noah Dover
Joshua Duzan
Omar Elkhayyat
Gehrig Elkins
Sarah Enani
Mckenzie England
Madeleine Fitts
Christopher Forsyth
Sydney Garrett
Jordan Grant
Anneka Granvold
Casey Gredzieleski
Nathaniel Hauser
Carson Helton
Megan Hines
Mykenna Horchak
Victoria Howard
Gabriel Isaac
Elizabeth Jelinek
Lauren Jennings
Youngju Jeon
Caitlyn Kicza
Richard Kuehn
Olivia Lowman
Delaina McDonald
Miroslava Migovich
Bryce Miller
Courtney Mobbs
Bradley Moore
Caleb Noe
Jamie Pouncey
Solomon Price
Carl Reeves
Noah Robison
Emily Schulman
Luke Stanley
Carli Stewart
Mitchell Stockinger
Taggart Stork
Reagan Toll
Mckayla Torbett
Carmelo Venero
Katherine Wallace
Gavin Warrington
Virginia Webster
Steven Wilmoth
Lawand Yaseen

Mechanical Engineering
Alexander Arbogast
Griffin Bedell
Jacqueline Berger
Nathan Bingham
Dana Bjorn
Benjamin Black
Bradley Bloedorn
Samuel Botto
William Botts
Leegan Boudreau
Carter Breeding
Donovan Briley
Austin Bryan
Michael Burnside
Rory Butler
Matthew Cagle
Ryan Carter
Courtney Cartwright
Dakota Cauthen
Zane Chapman
Elijah Charles
Ian Collins
Gregory Corson
Corey Crawford
Mary Daffron
Adam Daniel
Austin Davis
Alexandra Defilippis
Connor Defreece
Edward Deiderich
Daniel Dirscherl
Alexandra Dubuc
Ryan Durkee
William Fair
Riley Farnsworth
Christopher Foehringer
Vincent Gambuzza
Robert Garibay
Aaron Gerhard
Corinne Gerhold
Kellen Glasscock
Conner Godbold
Samuel Govan
James Grandin
Isaac Grant
Mitchel Haendel
Clark Hall
Shannon Hall
Tucker Hall
Justin Harmon
Grant Hay
Jeremy Hensley
Jade Hills
Dalton Houser
Zaky Hussein
Joshua Johnson
Taylor Jordan
Fernando Karg
William Kerr
Cheyanne King
Kurtis Kuipers
Isabelle Laffer
Mariah Lafond
Rebecca Laughon
Seunghyun Lee
Brooks Leftwich
Rebecca Link
Isaiah Linkous
Daniel Locke
Ellen Maye
Michael McClanahan
Bradley McClure
Landen McDonald
Michelle McNamara
Zebulon McReynolds
Garrett Mesmer
Kirillos Mikhaiel
Sheridan Monroe
Graham Montgomery
Matthew Montgomery
Clamon Moody
Ian Murray
Tyler Newsom
Jacqueline Noll
William Norris
Grayson Northern
Benjamin Ordway
Liam Page
Junsung Park
Seth Parker
Steven Patrick
Thomas Pinion
Taylor Pruett
Mason Rucinski
Kiel Russell
Sebastian Sanchez
Richard Sarten
Austin Schmidle
Heidi Seuss
Shannon Sharp
Allison Shaver
Connor Shelander
Micah Shirran
Samantha Shoffner
Dustin Shults
Jeremy Siler
Brandon Solsbee
Eilish Stanek
Jenna Stevens
Carter Sutton
Richard Swan
Samuel Swayne
Riley Tavassoli
Mark Terrones
Benjamin Thieme
Michael Thomas
John Thress
Elliott Thurman
Barrett Tillman
Dylan Townson
Mitchell Trotsky
Parker Trulove
Murphy Vidal
John Ward
Jonathan West
Tanner White
Justin Wilcox
Steven Williams
Gennick Yoshioka
Preston Young
Jonah Zahn

Magna Cum Laude

Aerospace Engineering
Aidan Baird
Garrett Bennett
Lucas Berryman
Matthew Bolyard
Noah Compton
James Farris
Samantha Golter
Jesse Groves
Hannah Hajdik
Cooper Jenkins
Luc Lipcius
Ethan Long
Burke Morse
Willie Parker
Benjamin Rubera
Edward Self
Nathan Stover
Matthew Trainer

Biomedical Engineering
Megan Badorrek
Zachary Barnette
Robert Borkoski
Chance Cuthbert
John Deinhart
Emily Gable
Eleni Golloshi
Gillian Holcomb
Peyton Holman
Emma Johnson
Elizabeth Klavon
Becka Klein
Matthew Kushnir
Mitchell Langley
Brittani Lopez
Alicia Matavosian
Tyler Morris
Shannone Paik
Megan Pitz
Kaitlin Smith
Dan Stedham
Kaitlyn Stephens
Katherine Stiles
Adam Throgmorton
Riley Toll
Guy Waggoner
Christian Waksmunski
Martina Weil
Daniel Woods

Mechanical Engineering
Christopher Allsop
Kyle Andersen
Chad Arnold
Aaron Assefa
William Axon
Demiana Barsoum
Shems Belhout
Connor Bihlmeyer
Chase Blackwell
William Blankenship
Georgiana Blue
Mallory Bowers
William Bright
Daniel Brimer
Andre Bucks
William Buttrey
Steven Campbell
Christopher Cannon
Jacob Cardenas
Kevin Carini
Connor Cooke
Andrew Cordray
Elijah Davis
Abigail Digsby
Stefan Dopatka
Ryan Dunaway
Nicholas Foster
Rabin Gandharva
Joseph Gauspohl
Brandon Glover
Jacob Groothuis
Jackson Hardeman
Carlton Harwood
John Heilig
Natalie Holt
Lee Howell
Lauren Hunter
William Hunter
Camryn Hurley
Stephen Kelley
Austin Kelly
Jacob Kerr
Benjamin Koudelka
Robert Laughter
Jeremiah Littrice
Kyman Matherly
Matthew McAmis
Robert McDermott
Guzman Melara
Jacob Melton
Heather Nevills
Nicholas Pate
James Pearce
Frances Pfeifer
Lizabeth Quigley
Cory Richardson
Jessie Ringley
Jordan Russell
Dustin Self
Rebecca Sphar
Elise Stepp
Zachary Tucker
Dalton West
Wilbert Wheeler
Cole Wilder
Kaifeng Xin
Trenton Yount

Cum Laude

Aerospace Engineering
Chad Batten
Matthew Carter
Kyle Dolwick
Will Dorsey
Daniel Epperson
Samuel Henderson
William Huffman
Benjamin Ingling
Peyton Jenkins
Daniel Johnson
Skylar Jordan
Mary Kemp
Abhi Mistry
Soham Paul
Robert Prater

Biomedical Engineering
Nicole Beautz
Alexandra Byers
Tristan Davenport
Sydney Dobbs
Kayla Franklin
Matthew Jansen
Nicole Kowalski
William Kuebitz
Claire McClain
Andrew Miller
Kiara Myers
Courtney Nakamura
Ryan Ogle
Hannah Olsen
Andrew Richard

Mechanical Engineering
Ifedayo Akinduro
Nabeel Baaklini
Philip Bailey
Kelly Bond
Michael Buckley
Nathan Cooley
Allan Coste
Bryn Cowart
Matthew Cum
Jordan Cummings
Mason Davis
Tanner Davis
Evan Day
Amy Dickey
Zackary Emery
Christopher Fowler
Mac Gasque
Henry Gertsen
Robert Glass
Nicholas Hassler
Cory Hensley
Clifton Herring
Brett Hulett
Noah Johnson
Kelsey Klett
Jace Lyon
Jacob Maine
Case Martin
Joseph Mathes
Christopher Mobley
Joshua Morcos
Connor Morton
Blake Pitman
Andrew Pitsenberger
Wade Price
Matthew Redman
Matthew Rogers
Dustin Samples
Justin Shropshire
Zachary Slessman
Yuvraj Sriram
Noah Stambaugh
Allen Swetman
Jake Treadway
Steven Trimble
Matthew Umsted
Andrew Walters
Erica Waters
William Webb
Andrew Welch
Beverly Wesh
Jackson Wilt
Bryan Wixson
Yaman Zein-Sabatto

Student News

Berger and Kowalski Receive Awards at EUReCA

Taylor Berger

Nicole Kowalski

Taylor Berger (BME) and **Nicole Kowalski** (BME) received college and university awards at the 23rd Exhibition of Undergraduate Research and Creative Achievement (EUReCA) held on campus last April.

EUReCA allows UT's top undergraduate researchers to present their research findings. Participants were required to create and display a poster to summarize their research topic, methods, and conclusions.

Berger received an Office of Research and Engagement (ORE) Silver Award and placed second in research from the college for her project, entitled "Decoding Brainwaves for Visual Attention to Faces and Scenes."

Kowalski also received an ORE Silver Award and an Award of Merit from the college for her project, entitled "Comparing EMG-and Goniometer-Driven NMI Control for a Virtual Target Acquisition Task."

Spaceport America Cup Competition Update

A team of UT students traveled to Las Cruces, New Mexico, in June for the Spaceport America Cup. The team spent months building and testing a rocket for the competition that would carry a payload to study microbes at high altitudes and determine how, if at all, life in the upper atmosphere differs from life on the ground.

The team successfully launched their rocket during the competition, but the larger of its two parachutes deployed early and resulted in the rocket drifting several miles in high winds. The team had to find and recover the rocket, which prevented them from getting the rocket back in time to be scored by the judges. Even though the rocket wasn't judged, the flight was flawless and the rocket was recovered with minor cosmetic damage. The payload was processed by the Center for Environmental Biotechnology to see if any unique microbial life was found in comparison to control samples taken from the soil around the rocket.

The students are already planning for next year's competition.

Students Win at AIAA Region II Student Conference

MABE students **Alicia Sherrod** and **Benjamin Ingling** received awards at the American Institute of Aeronautics and Astronautics (AIAA) Region II Student Conference in Cocoa Beach, Florida, in April.

Over 240 student members from 16 universities attended the conference, presented their research, and were judged on technical content and clarity of communication by professional members from industry.

Sherrod, a graduate student at UTSI, won second place in the master's category for her paper and presentation, entitled "Simulation of Langmuir Probe Response to a Non-Maxwellian Plasma." She is majoring in mechanical engineering under the direction of Associate Professor Trevor Moeller.

Ingling, a senior majoring in aerospace engineering, won third place in the undergraduate paper competition for his paper, entitled "Damage Tolerance Investigation of Hybrid Structure under Low-Velocity Impact." The work was performed as part of the NASA University Leadership Initiative under the direction of Assistant Professor Jim Coder.

Alicia Sherrod, third from left, holds her second place award.

Benjamin Ingling

Haslam Scholars to Join MABE this Fall

Leah Gutzwiller

Sreya Kumpatla

Fifteen outstanding students in the 2019–20 freshmen class were named Haslam Scholar, including two MABE freshmen.

Leah Gutzwiller, of Liberty Township, Ohio, plans to major in biomedical engineering. She attended Mount Notre Dame High School, an all-girls high-school in Reading, Ohio. She is the first female president of the Molecular Modeling Club at Archbishop Moeller, an all-boys school, and has helped prepare presentations on the club's protein research for national conferences. She traveled to Rome, Italy, last winter with her school's Model United Nations Club, where she participated in a debate on nuclear proliferation on the Korean Peninsula. She has also worked with various community groups serving differently abled adults.

Sreya Kumpatla, of Memphis, Tennessee, plans to major in aerospace engineering and aspires to work at NASA or SpaceX. She had a perfect ACT score and won second place in the regional high school chemistry exam. She was active with her high school's Science Olympiad team, was captain of the varsity tennis team, and was a gold medalist in the 2018 State Games of Mississippi.

Gutzwiller and Kumpatla will receive scholarships to cover tuition and fees, campus housing, and funding to support independent research. The program includes an exclusive curriculum, a collaborative study abroad experience, interdisciplinary seminars, community service learning, and unique partnerships with Tennessee institutions. Through personal involvement and mentorship from UT's top faculty, each Haslam Scholar develops the knowledge and skills to pursue and explore an independent research agenda. Additionally, Haslam Scholars serve as high-profile undergraduate leaders on campus and in the community whose lofty academic ambitions match those of the program, the institution, and the State.

Engineering Vol Helps Governor Declare Limb Loss Awareness Month

Last spring, Governor Bill Lee issued a proclamation declaring April as Limb Loss Awareness Month in the state of Tennessee. Engineering Vol **Riley Toll** (junior, BME) helped spark this gubernatorial action.

"At the beginning of February, I received an email from the Amputee Coalition asking for help to proclaim April as Limb Loss Awareness Month in the state of Tennessee," said Toll. "The Amputee Coalition is a great organization that empowers people affected by limb loss and limb difference."

Toll has long contributed to the cause. In 2017, she helped design and create her own 3D-printed prosthetic hand along with fellow students in the UT Makers Club. The club contributes to the Enable Community Foundation, which matches patients who need prosthetic limbs with groups that have access to 3D printers.

"I went online to the Office of the Governor's Proclamation Request page and filled out a form," she said. "Thanks to the Amputee Coalition and others that filled out this form, April is now officially recognized as Limb Loss Awareness Month."

Toll received a copy of the governor's proclamation in the mail.

"This is a great response demonstrating that when you speak up for what you believe in, anything can be accomplished," she said.

Noyes Inducted into MABE's **HALL OF FAME**

By Kathy Williams.

Thomas Noyes (AE, '87) was inducted as the 12th member of MABE's Hall of Fame at the department's annual awards banquet on April 4.

Noyes is the founder and CEO of Commerce Signals and has over 20 years of experience in banking, payments, software development and product innovation. He has worked with leading banks, mobile operators, payment networks, and entrepreneurs globally to bring innovation to consumers. He has built high performance global teams that have created new products to serve both advanced markets and the rural poor.

After obtaining an MBA from the University of Houston, he was hired by First Union Corporation where his team built the world's first online bank.

He has held positions at Oracle Corporation, Wachovia Corporation, and Citigroup. He also worked for Google in 2011, leading strategy and acquisitions for the Google Wallet program.

In 2014, he was named one for the Top 25 Innovators to Watch in Financial Services by Bank Innovation.

After graduating from UT, Noyes worked for McDonnell Douglas Space Systems (NASA Houston) for 8 years where he was responsible for the space shuttle's ascent and descent guidance. In this role he worked directly with astronauts in both evolving and testing flight software. After the Columbia disaster in 2003, he appeared on CNN, ABC, and Fox News as a spokesperson for NASA.

MABE started the Hall of Fame in 2015 as a way to recognize those who hold an engineering degree, have made an impact in their field, and been recognized for their accomplishments and contributions to society.

Board of Advisors Adds Three New Members

The Board of Advisors consists of alumni and friends in leadership positions in national labs, industry, and start-ups. They serve a critical need to help shape the department's vision for the future and help inform the department on needed changes to maintain a cutting-edge education for students, high-impact research, and to enhance our external profile and connection to alumni. Meet our three newest members.

Thomas Noyes is the founder and CEO of Commerce Signals and has an extensive background in business and marketing. He teamed up with some of the top privacy experts in the US to design a data system that enables insight sharing in near-real time between businesses without losing control of the data and sacrificing consumer privacy. The team has three granted patents and numerous patents pending. You can read more about Noyes and his induction into MABE's Hall of Fame on page 24.

Nima Tamaddoni is CEO of T&T Scientific, a company he co-founded in 2015 with colleague Graham Taylor while a graduate student at MABE. He received his BS, MS, and PhD in mechanical engineering from UT in 2011, 2013, and 2015, respectively. His goal is to further develop and improve technologies that increase the efficiency of translating promising medical technology from research and development to scaled up pharmaceutical manufacturing for clinical trials and approved patient use.

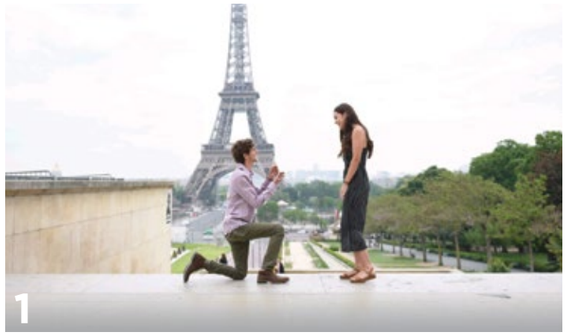
Graham Taylor is president and CTO of T&T Scientific, a company he founded with colleague Nima Tamaddoni. He received his BS, MS, and PhD in biomedical engineering from UT in 2007, 2015, and 2016, respectively. Graham is a strong business development professional who has a demonstrated history working in biotechnology and is skilled in medical device R&D, manufacturing, and sales.

Pratt & Whitney flew selected ME students for a visit on the company Convair ZAO in Hartford, Connecticut in 1956.

Photo from Mancil Milligan

Send Us Your Photos

Do you have any photographs from your time as a student at UT? If so, we'd love for you to share them with us. MABE is collecting old photos of research projects, lab and classroom spaces, students, faculty, staff, and campus. Please send digital copies to **williamk@utk.edu**. We look forward to rediscovering our past with your help!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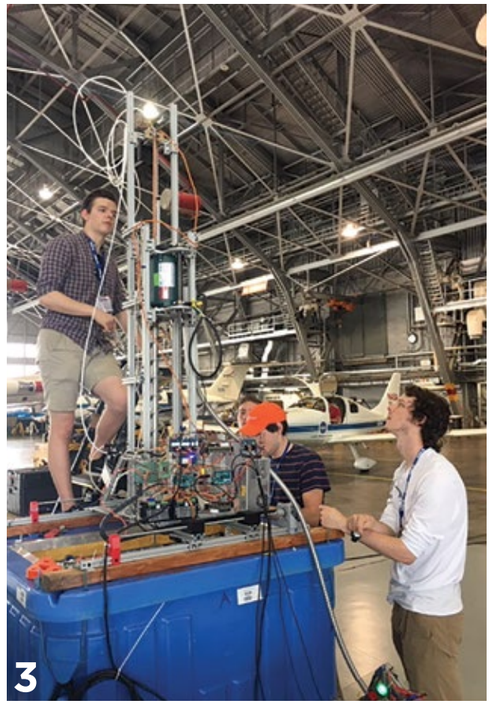
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Around the Department

1: *UT grads Matthew Montgomery (BS/ME, '19) and Alli Reid (BS/Mktg, '17) got engaged in Paris in May, complete with Eiffel Tower backdrop.*

2: *Assistant Professor Jim Coder got a face full of whipped cream from Camille Bergin during the PI(E) Your Professor fundraiser for the Ronald McDonald House. The event was held on National Pi Day, March 14.*

3: *Students checked over their drilling device before it was put to the test in NASA's RASC-AL Competition.*

4: *Construction progress continues on the new Engineering Complex.*

5: *The new Tickle College of Engineering sign adorns the entrance to the engineering side of campus.*

We Need Your Help!

Our Professional Mentoring program is growing and we need more mentors. If you have professional experience as an engineer, want to give back to MABE with your time, and have a desire to connect with our students and help prepare them for professional careers, you can be a mentor.

For consideration, sign up at **tiny.utk.edu/MABEMentor**

TICKLE
COLLEGE OF ENGINEERING

DEPARTMENT OF
MECHANICAL, AEROSPACE &
BIOMEDICAL ENGINEERING

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LIGHTING THE WAY
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YEARS

A new device aims to reduce hospital expenses when caring for patients with a history of IV drug use.

Page 6.