mabe

Spring 2018 • Alumni Newsletter

MECHANICAL, AEROSPACE & BIOMEDICAL ENGINEERING

Riley Toll and the Makers

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On the cover: Riley Toll, freshman in biomedical engineering, wearing the prosthetic arm she helped create with fellow students in the Maker's Club.

From the Department Head

Thanks for reading the spring 2018 issue of our alumni magazine. I hope you enjoy it!

Our progress continues on Rocky Top toward our goal of becoming a top public program in engineering. Over the past 5 years, MABE enrollment has gone up 35 percent, including a 35 percent increase in PhD enrollment. Since 2013, we've hired 20 new faculty, including two Governor's Chairs, an H.H. Arnold Chair at UTSI, and the Eastman Professor of Practice. In the process, undergraduate labs in all programs have been completely upgraded; A unique MABE Maker Space has been created to enable students to submit their work directly online to a suite of advanced 3D printers and other industrial-quality equipment.

Our research expenditures are up 58 percent at Knoxville and 68 percent at UTSI, and we continue to ensure the engineers we graduate are creative, skilled, ambitious, and ready to contribute from day one.

Our alumni response to this progress has also been tremendous, with over a dozen major gifts and pledges in the past five years and an increase in total yearly donors to MABE of over 230 percent. All of this support is providing a better environment and experience for our students, faculty, and staff. Thank you to those who have joined in and helped push the department and college forward; it absolutely has made a difference in every corner of the department.

In this issue, you'll read great stories about how MABE is impacting humanity. We are proud that the 10th UT Knoxville alumnus, Randy Bresnik, has reached orbit (and safely returned). Assistant Professor Eric Wade's work on rehabilitative engineering to help patients recover from stroke and other illness is profiled. Graduate student Lia Winter describes the tool she is developing to improve certain surgical procedures, and Tech CarniVOL provides a high-energy series of robotics and mechanical-themed competitions for pre-college students during Engineers Day.

We are also honored to profile new MABE Hall of Fame inductees Bennett Croswell and Katherine Van Hooser. Their pathways and commitment to their profession and university are truly inspiring. Sadly, the entire Vol family is still mourning the sudden loss of AE student Joseph "Tanner" Wray, who passed away unexpectedly on February 23 while competing in an amateur charity boxing match. I was lucky to get to know Tanner, and he will be greatly missed.

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

The Makers Club

Chase Cumbelich, Riley Toll, Chad Duty and Alex Weber

> "Things like this are one of the reasons I was interested in engineering to begin with..."
> –Riley Toll

By David Goddard. Photography by Randall Brown.

A recently formed club at UT is providing students an outlet to bring their ideas to life via a mix of traditional and cutting-edge manufacturing methods.

The Maker's Club began last semester with the goal of bringing together students and faculty interested in the makers movement, a group united by the idea of people learning and maintaining practical skills that were once common but are now in danger of being lost and to developing skills in cutting-edge techniques such as 3D printing.

The Maker's Club focus on turning ideas into reality is attracting students from various majors across campus.

"It started because of an idea we had in class," said **Chase Cumbelich**, a junior from Ooltewah, Tennessee, majoring in electrical engineering, who helped found the club. "We kept hitting a wall while we were trying to develop something, and we realized our lack of contact and knowledge with other majors was really hampering us.

"We reached out across the college and got about 30 people interested, and the club just kind of snowballed from there."

Now that club is changing the life of a classmate.

One of the first things the group was able to produce was a 3D-printed hand, developed with other engineering students.

At a group meeting, the question was raised whether anyone knew of someone who might be in need of such a hand.

Riley Toll, a freshman from Memphis majoring in biomedical engineering, stood up and said, "Yeah . . . me."

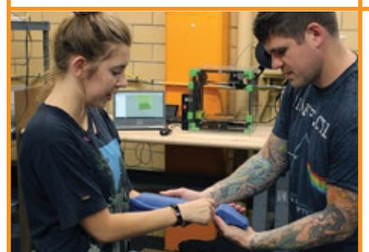
"I'd heard about the group and had a lot of interest," said Toll. "Things like this are one of the reasons I was interested in engineering to begin with—to be able to help people and give back. Hopefully this brings some awareness to what can be accomplished through engineering."

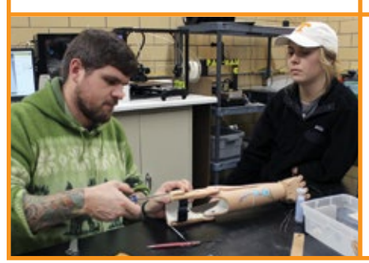
Chad Duty, associate professor of mechanical, aerospace, and biomedical engineering, introduced the idea of 3D-printed prosthetics to the club, stemming from an ongoing effort of a group called the Enable Community Foundation. Enable connects patients across the world who are in need of prosthetic appendages with groups like the Makers Club that have access to 3D printers.

The two parties work together to get the prosthetic limb fitted to the specific size and needs of the patient, and it is delivered free of charge.

Duty pointed out that groups like Enable that bring people together for a common cause underscore the role of having a network of makers and the promise that such innovators hold.

"There are a lot of good things that can be accomplished when groups of people work together," said Duty. "The sky is the limit."





Maker's Club members Alex Weber and Riley Toll work on the design and fit of her 3D-printed prosthetic.

Watch a short video documenting Riley's prosthetic coming together at ***tiny.utk.edu/Riley***.

UT, Harvard, Penn Team Up on Major Materials Breakthrough

By David Goddard.

A team including researchers from UT, Harvard University, and the University of Pennsylvania has opened up new pathways to 3D print short-fiber-reinforced materials with precisely controlled fiber arrangements.

Currently, 3D printing methods for polymer composites build parts by extruding materials through a nozzle that simply moves back and forth in a series of lines to define the desired shape. The team's advance adds precisely controlled rotation of the nozzle to allow variation of the fiber arrangement throughout the printing process.

The new process, called rotational 3D printing, results in unique helical fiber arrangements that provide superior damage resistance to printed materials. In simple terms, carbon fibers adopt spiral patterns as they are printed within an epoxy resin, much as steel wires are bundled and twisted together into larger, stronger cables.

"Having the ability to change fiber orientation without changing the tool path used to deposit the material means that optimal or near-optimal fiber arrangements can be achieved at every location in the printed part, resulting in higher strength and stiffness with less material," said **Brett Compton**, a co-author of the study and assistant professor of mechanical engineering at UT.

"The rotational print head is unique because it utilizes the viscosity of the ink itself to reorient fibers in a desirable way," Compton said.

Compton said the idea for such a design came from nature. Helical arrangements of natural fibers are found in wood, antler, and bone, which are some of the strongest and toughest natural materials known.

A critical aspect of their work—the ability to control where the strongest and weakest points are located—was inspired by one of nature's recent viral video stars, the mantis shrimp. Known as stomatopods, the shrimp have a pair of clubbed "fingers" they accelerate so quickly that the bubbles they produce are powerful enough to crack crab, clam, and other shells.

While they must be strong enough to crack shells and provide the shrimp's meals, the fingers must survive repeated use with minimal damage. Extreme impact resistance is achieved through variations in helical fiber arrangements that guide energy from impacts onto stronger regions of the club.

"Using that idea allows us to control how and where strain is distributed in printed components," said Compton. "We can design fiber arrangements to protect certain regions or ensure that failure occurs only at desired locations."

Compton said the concept of rotational 3D printing could be applied to any material system and any extrusion-based additive manufacturing technology, from the small-scale direct ink writing used in this study up to the large-scale BAAM 3D printers developed at Oak Ridge National Laboratory.

The team was led by Professor Jennifer Lewis at Harvard University and includes researchers from the University of Pennsylvania and ETH Zurich, a top research university in Switzerland. Compton initiated this work while he was a postdoctoral research fellow at Harvard's Wyss Institute for Biologically Inspired Engineering. Their work was published in the prestigious *Proceedings of the National Academy of Science.*

Peacock Mantis Shrimp

CELL RECEPTION

By David Goddard.

Understanding and controlling which materials gain entry into living cells holds great promise in a number of fields, from biomedicine to agriculture.

MABE assistant professor **Andy Sarles** will soon begin new research aimed at allowing such a breakthrough, which has earned him a prestigious National Science Foundation CAREER award of $540,000 over five years.

That project aims to understand how amphiphilic monolayer-protected nanoparticles, or AmNPs, interact with model cell membranes. Amphiphilic materials have both hydrophilic and hydrophobic characteristics, meaning they are both attracted to and yet repulsed by water.

"AmNPs have shown the ability to harmlessly pass through the outer membrane of a cell, yet how they do this is not well understood," said Sarles. "If we can reveal these details, then there is great potential to use AmNPs as carriers for drugs or other materials that can be used to control cellular function."

The team will apply and further develop this model system to study a specific type of striped AmNP produced by Swiss professor Francesco Stellacci at École Polytechnique Fédérale de Lausanne. By alternating back and forth between water-loving to water-hating sections of nanoparticles, Stellacci's team discovered that AmNPs could pass through cellular membranes easily and without causing damage.

Sarles's team will employ state-of-the-art methods to assemble and characterize realistic, yet simplified, model cell membranes that form at the interface between lipid-coated water droplets in oil.

This multi-phase system leverages the amphiphilic properties of lipids to spontaneously assemble at the water-oil interface and allows for creating a synthetic barrier between droplets that has the same structure and composition of cellular membranes.

Sarles said that while his team's primary focus is to understand how these nanoparticles behave at a membrane surface and then improve methods to probe these intricate events, a longer-term goal is to focus on the best way of using them.

"If you can unlock details of how cellular membranes interact with synthetic nanoscale materials, you can engineer a variety of outcomes around those mechanisms," said Sarles. "For example, you could engineer particles to deliver specifically targeted medicines for gene therapy or even to increase crop yield."

Additionally, once you understand how to improve entry into cells, you can also engineer how to keep species out; something that could improve water and soil quality, or even prevent the absorption of cholesterol.

In addition to the research, Sarles has also made a point of integrating a set of education and outreach activities to disseminate to a broader community at UT and in Knoxville concepts related to the research.

Called INTERFACE, this outreach program will include both UT undergraduate researchers and journalism students as well as high-school students from the nearby L&N STEM Academy.

Photo by Jack Parker

Big Orange in Orbit

Over the past 35 years, 10 UT graduates have advanced the American space program as NASA astronauts. The graduates include MABE alumnus **Randy Bresnik**, who commanded the International Space Station (ISS) during a 2017 mission. In addition to extending UT's time in space by another three months, Bresnik's mission adds to a collection of research aimed to better humankind.

His team performed research related to drugs that only target cancer cells. They also used microgravity for a new lung tissue study to advance the understanding of how stem cells work and the pathology of Parkinson's disease with the goal of helping develop new patient therapies—a project funded by the Michael J. Fox Foundation.

Another MABE alumnus, **Scott Kelly**, advanced preparations for deep space exploration, particularly America's plans to visit Mars, by participating in NASA's One-Year Mission.

Kelly lived aboard the ISS from March 2015 to February 2016, taking part in research about how the human body adjusts to weightlessness, isolation, radiation, and the stress of long-duration spaceflight. Researchers continue to compare the differences between Kelly's physiology and that of his twin brother, Mark Kelly, a retired astronaut who remained earthbound during the mission. The Twins Study has revealed that Scott Kelly's time in space even impacted him at the genetic level.

Studying those remarkable findings, along with changes in Kelly's musculature and bone density, will help NASA prepare countermeasures for missions to Mars and beyond. The One-Year Mission was Kelly's fourth and his last before retiring.

Another MABE alumnus, **Barry Wilmore**, has also helped NASA prepare for visits to Mars. While Wilmore was ISS commander in 2014, his team used the first design emailed from Earth to make a tool in space. They made a ratchet wrench with a 3-D printer. NASA was testing the ability to supply missing equipment on demand during a space exploration mission, along with the possible benefits of microgravity when creating objects in space.

To watch a video and read more about all our UT astronauts, visit ***tiny.utk.edu/bresnik***.

Other Volunteer Astronauts

Hank Hartsfield
1982 First of three flights
UT's first astronaut, Hartsfield piloted Columbia's last test flight, Discovery's first flight, and a Challenger flight that included 75 experiments related to biology and materials science.

Rhea Seddon
1985 First of three flights
A medical doctor and the fifth American woman in space, Seddon researched how weightlessness and cosmic radiation impact animal cardiovascular and skeletal systems.

Chris Hadfield
1995 First of three flights
Hadfield was the sole Canadian to spend time aboard the space station Mir, as well as the first Canadian to spacewalk and use the shuttle's robotic arm—which was designed and built by Canadians.

Joe Edwards Jr.
1998 flight
Edwards piloted Endeavour on a mission to Mir for research related to space travel and growing plants in space.

Dominic Gorie
1998 First of four flights
Gorie's first flight was the final Mir mission, which helped pave the way for the ISS. His second flight included the first highly-detailed mapping of Earth.

Jeffrey Ashby
1999 First of three flights
Ashby's missions include advances in X-ray and ultraviolet imagery of the atmosphere and observations on tissue loss in space.

William Oefelein
2006 Sole flight
Oefelein's mission on Discovery included the deployment of a new solar array for the ISS.

The **VolShop** is selling special edition T-shirts to commemorate UT's 35 years in space. The shirts may be purchased at ***tiny.utk.edu/spaceshirt***.

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Astronaut Randy Bresnik aboard the International Space Station in 2017. Courtesy NASA.

SENSING a problem

By David Goddard.

Photo by Shawn Poynter

One of the biggest stumbling blocks for medical practitioners is something that is inherent to patients themselves: human nature.

"People have a tendency to relate back to their doctors only the good news, unless something really bad happened," says assistant professor of biomedical engineering **Eric Wade**. "It's like how everyone tells their dentist that they floss regularly, when maybe they only remember once a week.

"You have the same thing with patients undergoing rehab or treatment who only relate back the progress they are making, but not the times that they took shortcuts."

That's where biomedical sensors come into play. Such sensors, capable of registering a wide array of data, could help patients, doctors, and facilities alike gain a better picture of two key populations: patients recovering from strokes, and those dealing with the mobility-impairing effects of Parkinson's disease.

For stroke rehabilitation, incorporating prescribed exercises into daily living is vital for patients to rebuild muscle strength.

The problem is what is known as the "vicious cycle:" Patients find the exercise hard, so they don't do them fully or correctly. In turn, patients experience even more loss of function, making the exercises even harder to accomplish.

By monitoring these activities through wearable sensors, patients and doctors would know if they were doing the required amount of work, and doing it correctly.

"A lot of quality of life is related to being able to use your upper extremities," said Wade. "What happens a lot of times is that patients might lean in with their torso to help lift an object or complete an exercise, but that limits the redevelopment of the motor function in their hands and arms. Sensors would help them distinguish between good and bad movement strategies."

Wade's research is being completed through a partnership with Columbia University and Chapman University. His team receives ongoing data from 20 stroke patients to help decide what information is most useful in developing the sensors, which resemble Fitbits that people use to track their steps.

Since what works best or is more important for one patient might not be true of another, Aaron Miller, a graduate research assistant on the team, is using an algorithm to figure out the best overall methodology for the devices to capture patient behavior.

The biggest hurdle is that most people do even the simplest tasks differently, so finding a "best fit" for overall use will prove critical. Eventually, the goal is to have the monitoring data available in real time via cell phone apps.

Improved mobility, awareness

Unlike stroke patients who can choose to stop their rehab exercises, patients with Parkinson's may suffer from freezing of gait, an attribute that can lead to uncontrollable falling or instability. Wade is tackling the problem with backing from the National Science Foundation.

Parkinson's patients have reduced levels of dopamine, a compound in the brain that helps transmit signals to the body that coordinate motion, among other things. As a result, neurological resources can rapidly become swamped when presented with too many decisions, leading to a freeze in motion. It can be as simple as just stopping in place or as dangerous as falling to the ground.

Wade partnered with neurologist Michelle Brewer—who sees roughly half of all Parkinson's patients in East Tennessee—to develop a way to identify what might trigger such freezes.

"Our plan is to use advanced sensors to observe what happens in the body when patients come to a normal stop versus when they have a freezing gait episode," said Wade. "If we can figure out the differences, we might be able to identify what causes such episodes and develop a way to prevent them."

Past research has shown patients are less likely to fall when walking over tiled floors or carpets with patterns as opposed to walking on uniformly toned surfaces, for example.

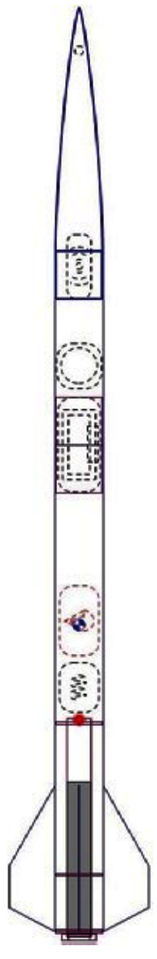
In a separate project, Wade is using virtual reality to help train the Parkinson's-afflicted brain for particular environments.

Patients are able to "walk" through virtual recreations of environments they frequently encounter, helping pre-wire their brains to the layout. Ideally, once they are comfortable functioning in the virtual realm, their brains will have less to process in the real world.

Less processing equals more stability, helping ensure the safety and well-being of patients, one step at a time.

Rocketry Team Goes Mile High for NASA Competition

By David Goddard.



A team of engineering students has been selected to participate in NASA's Student Launch project, which pits 45 teams from across the country against one another in an attempt to overcome a specific challenge.

This year's competition, held during rocket trials April 4–8 at NASA's Marshall Space Flight Center in Huntsville, Alabama, requires teams to build a reusable rocket capable of carrying a payload at least one mile high and successfully landing back on Earth.

Teams have a choice of one of three payloads:

- a camera that can identify and discern between targets in flight
- a rover that deploys upon landing, moves at least five feet, and extends solar panels
- an onboard system that can triangulate a landing within a specified zone

"We made a unanimous decision to go with the rover option," said **Grayson Hawkins**, a senior in mechanical engineering who co-leads the team with **Theresa Palandro**, a senior in aerospace engineering. "We must consider problems such as 'can the main axle handle 20 Gs of acceleration?' and 'what is the most efficient way to stow the rover during flight?'"

Their selection marks the first time UT is taking part in the 18-year-old competition. Other Southeastern Conference schools participating include Auburn University, the University of Florida, and Vanderbilt University.

More than 30 UT students have shown interest in the project, with about a dozen in the core UT Rocketry Team.

While they are allowed to have faculty supervision, the students must do all of the work themselves.

"It is our hope that we are creating permanent roots so that future students will have these and more opportunities," said Hawkins.

The group is working under UT's Student Space Technology Association—founded by Hawkins three years ago and part of the Center for Student Engagement—and is supported by the Tickle College of Engineering.

Drawings of the rocket, details about their plans, and timelines are included in the team's preliminary design review at ***utkrocketryteam.com/launch***.

Winter Wins Boyd Venture Challenge

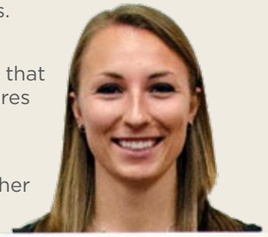
When she started graduate school at UT, she decided she wanted to get involved in entrepreneurship and innovation.

By Kathy Williams.

"Amazing" was how first-year graduate student **Lia Winter** felt when she won the Boyd Venture Challenge last fall. Winter, who's pursuing a dual MBA and master's in biomedical engineering, was awarded $12,500 in seed money for her EasyWhip business.

EasyWhip is a surgical tool Winter created to improve the current graft preparation station and whip stitching needle that are used during certain orthopedic reconstruction procedures such as ACL surgery.

Winter used the knowledge she gained during a summer internship at an orthopedics medical device company and her background in biomedical engineering to develop the tool.



ANDERSON CENTER

When she started graduate school at UT, she decided she wanted to get involved in entrepreneurship and innovation. She first pitched her EasyWhip idea at VolCourt, a competition where she had to present her business idea to a panel of successful business owners, and she won first place. She was awarded $1,500 which she used to start her business and file a provisional patent application to protect her idea.

"The mentors from the Anderson Center for Entrepreneurship and Innovation encouraged me to compete in the Boyd Venture Challenge—the bigger pitch competition for student-owned businesses," Winter said.

She spent two weeks preparing for the challenge and was ecstatic when she won. The seed money will help Winter fully patent EasyWhip and optimize the design. She hopes to one day license EasyWhip to a medical device company.

"I'm so grateful to all of the mentors and professors who helped me accomplish my goals, especially those at the Anderson Center who challenged and encouraged me," Winter said. "Four months ago, I never would have expected that I'd start a business, but I've learned so much throughout the process."

Winter encourages any student who has a business idea to take advantage of the resources provided by the Anderson Center.

Mia Becker Tackles Male-Dominated Sport

By Kathy Williams.

MABE senior and Ice Vol goalie **Mia Becker** has never let her gender stop her from playing a sport she loves. Since age 9, Becker has been playing ice hockey—a sport most females don't play. Becker has played on teams of boys, girls, women, and men. To her, the teams are all the same.

"On the ice, I'm a hockey player who happens to be a female, and my male teammates treat me like any other hockey player," Becker said. "They want me to score and I want to stop the puck. That's the same with male and female hockey players."

Becker transferred to UT in 2015 from Boston University where she played goalie on their NCAA division one women's ice hockey team. She came to UT to focus more on her studies in engineering and play for the Ice Vols—a less time-demanding and male-dominated team.

"The only real difference when I am on a male-dominated team is I put my equipment on in a different locker room," Becker said. "Once on the ice, it's just hockey, no matter who is on the team."

Becker is a tough player. Once she's on the ice, her goal is to play the best she can and help her team win.

She is grateful for the opportunity to play for the Ice Vols and said the best part of being on the team is the people she has met through it. "I've made friendships with my teammates that I will have for the rest of my life," Becker said.

Becker will graduate in May with a degree in mechanical engineering. After graduation, she plans to play adult league hockey as well as in the Ice Vols' alumni games.

Tech CarniVOL 2017

Each October, Engineers Day on the UT campus brings together high school students from across the state and surrounding region for a day of engineering exploration and friendly competitions. In association with the event, Tech CarniVol, a UT-student-designed festival, provides a series of robotics and mechanical-themed competitions.

This year, contests included RoboRage, a tournament-style head-to-head conflict among competing robots. Dubbed the "Harvest" competition, teams had to collect pumpkin-shaped game pieces for as long as possible while also sabotaging and defending against their opponent's harvesting efforts.

The "Houston, We Have a Problem" competition was inspired by the famous Apollo 13 space mission in which astronauts had to recover from an equipment failure using only the tools they had on hand. For this test of planning and execution, students collaborated to solve a situational problem using a collection of seemingly unrelated parts.

View a photo gallery of these and other Tech CarniVol and Engineers Day contests at ***tiny.utk.edu/ED***.

RoboRage robots are designed to be small but mighty to accomplish their goal and fend off opponents.

A team inventories the supplies available to create a working solution in "Houston, We Have a Problem."

Planning and implementation: Team members exchange ideas and test their equipment.

A team of visiting students prepare their robots for the Roborage competition. Their devices "harvested" various sized "pump-kins" from the Big Orange Octagon while also trying to oust opponents.

Teammates share ideas for solving the Tech Carnivol "Houston" challenge.

The "Houston" competition inspires a fun interaction among student engineers.

A team puts its plan into action. Will their design successfully do the deed?

Success! We love it when a plan comes together.

Student Notes

Graduate student **Mark Gragston** won Best Student Paper in the Aerodynamic Measurement Technology—Spectroscopic Technologies Session at the 2018 AIAA Science and Technology Forum held earlier this year in Orlando, Florida. The winning paper, entitled "Acoustic measurements of molecular oxygen REMPI", focuses on Gragston's work to extract gas phase temperature by listening to the effects of selective multiphoton ionization of molecular oxygen. Gragston's advisor, Associate Professor **Zhili Zhang**, and former Postdoc **Yue Wu** are co-authors on the paper, which has been published in *Optics Letters*, a peer-reviewed scientific journal published by the Optical Society of America.

Graduate student **Yasser Ashraf Gandomi** is the 2018 winner of the Electrochemical Society (ECS) Industrial Electrochemistry and Electrochemical Engineering Division Student Achievement award. ECS established the award in 1989 to recognize promising young engineers and scientists in the field of electrochemical engineering. The award and a $1,000 prize, will be presented to Gandomi at the 233rd ECS meeting in Seattle in May. Gandomi works in the Electrochemical Energy Storage and Conversion Lab under the direction of his advisor **Matthew Mench**.

(L–R) Theron Price, Adam Harris, and Brian Kocher

Three UTSI students received awards at the Second Annual AIAA Young Professionals Symposium last October. **Adam Harris** won the Best Presentation award in the Aerodynamics I Technical Session; **Brian Kocher** won the Top Presenter award in the Aerodynamics II Technical Session; and **Theron Price** won the Top Presenter award in the Propulsion Technical Session. All three students are pursuing their master's in aerospace engineering. Harris and Kocher work under the direction of **John Schmisseur** and Price works under the direction of **Trevor Moeller**. The symposium gives young professionals in the aerospace community the opportunity to present their technical work while gaining invaluable mentoring and connections with industry leaders.

Twice as Ice

For a second year in a row, a team of UT students will be competing in NASA's Revolutionary Aerospace Systems Concepts-Academic Linkage (RASC-AL) Mars Ice Challenge. UT's team is one of ten university teams competing in the finals this summer at NASA Langley Research Center with their project plan titled, "This is Not a Drill."

As with last year's competition, the team is required to build a robot capable of extracting water from simulated Martian subsurface ice and will receive $10,000 from RASC-AL to fund the construction of their prototype.

The 35 student team members have been working hard to refine last year's robot by designing and building a completely different digging system and improving the efficiency and filtration of the ice mining device. MABE Assistant Professor **Jim Coder** is the faculty advisor for the team this year, with students **Skylar Jordan**, **Aaron Crigger**, and **Gabriel Hatcher** serving as team leaders.

AE student **Joseph "Tanner" Wray** passed away unexpectedly on February 23 while competing for his fraternity in the Ace Miller Boxing Charity Tournament. Tanner was a junior and was described as an exceptional student who was always happy. He will be greatly missed by his fellow classmates and professors.

Komisteks Bring Together Biomedical Engineering and Baseball

Paul Komistek will begin his UT career in 2018, coming to Rocky Top to study biomedical engineering and play baseball for the Vols. Academically, he will be following in his father's footsteps. Dad **Richard Komistek** is the Fred M. Roddy Professor in MABE and co-director of UT's Center for Musculoskeletal Research.

Komistek says his decision to join the Volunteer family was an easy one. "I have grown up around the campus and have fallen in love with it. When I had the opportunity to play here, it was an easy decision."

Komistek credits his father for playing a large role in his choice of major. He says his dad has always challenged him to push himself in the classroom. With knowledge of what an engineering career looks like, Komistek decided it was the best fit. Richard Komistek shared that the connection between biomedical engineering and sports injury made it even more of a fit for his son, given his passion for baseball.

Juggling sports and academics can be hard, but Komistek was able to get a little advice from one engineering alumni who succeeded at both. Last year, he sat down with **Josh Dobbs**, former UT quarterback and aerospace engineering graduate, and got some tips on how to do his very best on the field and in the classroom. He knows it will be a challenge, but he is extremely excited to pursue his lifelong goal of playing baseball in the SEC.

Plus, he knows, "There's no better color than orange!"

Richard Komistek says that he is proud of his son for pursuing engineering and is excited to see him develop both playing in Lindsey Nelson Stadium and walking the same halls that he does.

"Paul's dream has always been to be a professional baseball player," says the elder Komistek. "As much as I would love to see him follow my path in engineering, this would mean he missed out on his real dream."

Jasmine Worlds Earns Student Leadership Award

The Women of Color STEM Conference has named UT's **Jasmine Worlds** the 2017 recipient of the Student Leadership Award from the Career Communication Group.

Worlds, a senior in mechanical engineering, was honored for her work in engineering and her commitment to volunteer outside the classroom. She received the award October 7 at the group's conference in Detroit, Michigan.

"UT provides many opportunities for its students to lead," said Worlds. "Having the opportunity to create or influence change is important, and UT has provided a space where it is possible to do so."

A native of Arlington, Tennessee, Worlds participated in the 2013 Tennessee Louis Stokes Alliance in Minority Participation Summer Bridge program and was later appointed the academic excellence chair for the National Society of Black Engineers (NSBE) chapter at UT.

With NSBE, Worlds was able to implement study halls and several academic incentives and was instrumental in providing chapter members with scholarship information and encouragement to compete in regional and national competitions. She also helped coordinate the group's "Mini-Seek" event, which brings 100 elementary students on UT's campus for a day each year.

Worlds has served as a precollege counselor during several summer camps, in the Office of Engineering Diversity programs, and as a student chair for the WomEngineers Leadership Council. In that role, she worked with faculty, staff, alumni, and senior-level industry representatives to plan the first annual WomEngineers Welcome Dinner for incoming female freshmen and WomEngineers Day, a one-day conference for nearly 400 attendees.

"I've surrounded myself with others who are just as goal-driven and hard working as I am, and those relationships have shaped me into a motivated, career-driven individual," said Worlds. "I am extremely passionate about the diversity and inclusion efforts within the college, and receiving this award confirms that I have been able to make an impactful difference."

Her time at UT has opened up several opportunities for her, including a co-op experience with Fiat Chrysler, a study abroad experience in London, England, and time spent working with PepsiCo/Frito Lay in Dallas, Texas. She plans to return to the company as a project engineer after graduating this May.

Dean's List Fall 2017

Summa Cum Laude

Aerospace Engineering

Teague A. Aarant
Emily A. Beckman
Camille E. Bergin
Christopher J. Busic
Jeffrey S. Cargile
Jared A. Carnes
Ryan M. Carter
Ethan M. Cerrito
Zane Chapman
Brian G. Coulter
Zackery C. Crum
Jonathan A. Dixon
Jordan K. Dobbins
Emma K. Farrar
Grayson T. Foster
Mattheus E. Fry
Timothy L. Grizzel
Andrew E. Healan
Peyton B. Jenkins
Ryan E. Kelly
William J. Kobler
Ethan Long
Kevin J. Mathew
Jacob A. McCoy
Spencer T. McDonald
Caleb M. Morgan
Steven D. Patrick
Tessa M. Patton
Soham Paul
Margie M. Peeler
Chapel R. Rice
Daniel A. Rudolph
Colter W. Russell
Makaela Sides
Ethan A. Vogel
Jody A. Walker
Samuel B. Walters
Caleb E. Weatherly
Stewart R. Whaley
Andrew T. Wilcox
Jeongmin A. You

Biomedical Engineering

Sara B. Aboeleneen
Ifedayo A. Akinduro
Robert L. Borkoski
Samantha Z. Bratcher
Kailee J. Buttice
Adam M. Cable
William Z. Clayton
Bryn R. Cowart
James B. Cox
Chance M. Cuthbert
Tristan A. Davenport
Simran Dayal
Alexandra N. Defilippis
Johnathan A. Dunaway
Gehrig Q. Elkins
Sarah Enani
Madeleine M. Fitts
Marie C. Franzen
Samuel F. Gallemore
Bailey M. Giacomini
Katherine E. Glass
Kellen J. Glasscock
Cameron A. Goodman
Shelby M. Goodsell
Luke J. Hamby
Carson D. Helton
Jade N. Hestand
Mackenzie K. Hooker
Lauren T. Jennings
Branndon P. Jones
Kaleb S. King
Jeevan Mani Kanta Reddy Kypa
Nidhi S. Menon
Courtney C. Mobbs
Bradley S. Moore
Anastasia G. Nassios
Paige F. Paulus
John B. Phillips
Megan E. Pitz
Amanda N. Randolph
Matthew M. Rowe
Debra R. Sagmiller
Francisco J. Sanchez
Micah A. Shirran
Connor Sims
Rachel L. Slappy
Elijah D. Smith
Marniecia J. Steele
Katherine E. Stiles
Taggart C. Stork
Joseph Tawfik
Marina I. Vlasyuk
Gavin L. Warrington
Nicholas M. Weiner
Amber C. Williford
Sarah E. Wilson
Hunter M. Woodall
Anna L. Young

Mechanical Engineering

Leyton A. Adams
Kyle S. Andersen
Alexander W. Arbogast
Reid K. Barber
Mia Becker
Dylan W. Beverly
James D. Blanks
Bradley M. Bloedorn
Georgiana S. Blue
William A. Botts
Mallory N. Bowers
James D. Bowman
Nathaniel C. Brandt
Carter W. Breeding
Daniel E. Brimer
Austin M. Bryan
Jesse R. Buckley
Michael J. Buckley
Andre C. Bucks
Michael W. Burnside
Jesse Butler
Rory M. Butler
William C. Buttrey
Austin R. Cain
Joseph A. Camacho
Christopher J. Cannon
Courtney T. Cartwright
Montana B. Cheek
Jake A. Childs
Nicholas R. Collins
Connor J. Cooke
Gregory M. Corson
Adam T. Daniel
Robert K. Davis
William P. Davis
Ryan J. Dunaway
Mikayla M. Ehrsam
Riley A. Farnsworth
James F. Fitzsimmons
Jacob M. Foard
Christopher J. Fowler
Vincent C. Gambuzza
Aaron M. Gerhard
Conner W. Godbold
Gabriel A. Gonzalez
Michael P. Haines
Clark A. Hall
Justin H. Harmon
Nicholas K. Hassler
Jeremy L. Hensley
Sarah R. Higginbotham
Andrew J. Homan
Nicholas C. Howe
Jacob M. Hromi
William A. Hunter
Zaky G. Hussein
Victoria E. Idem
Henry I. Iduoze
Nabeel I. Jaser
Bethany D. Jones
Taylor W. Jordan
Steven K. Jorden
Kelsey N. Klett
Mariah R. Lafond
Stephen C. Lagutchik
Rebecca A. Link
Isaiah G. Linkous
David M. Marsh
Robert W. McDermott
Landen G. McDonald
Iris N. Melara Guzman
Joshua N. Morcos
William J. Morrell
Zachary B. Nolan
John M. Painter
Stephanie K. Paradissis
Junsung Park
Seth T. Parker
James M. Pearce
Celeste A. Pelletier
Abigail C. Pennington
Lizabeth J. Quigley
Abigail E. Roberts
Seth L. Rogers
Mason B. Rucinski
Sebastian Sanchez
Jared S. Shaffer
Shannon R. Sharp
Jeremy A. Siler
Rebecca C. Sphar
John P. Spires
Richard H. Swan
Samuel C. Swayne
Benjamin S. Terry
Benjamin F. Thieme
Michael C. Thomas
William R. Thompson
John F. Thress
William C. Tourville
Dylan C. Townson
Steven C. Trimble
Parker E. Trulove
Ethan C. Vals
Erica L. Waters
Tanner O. White
Justin T. Wilcox
Cole W. Wilder
Jesse M. Wilson
Joseph Wing
Gennick J. Yoshioka
William N. Zabo
Jonah F. Zahn

Magna Cum Laude

Aerospace Engineering

Hayden P. Allen
Aidan L. Baird
Benjamin C. Barnhill
Matthew E. Bolyard
Ryan Cannon S. Buechley
Matthew B. Carter
Sean M. Darling
Nicholas A. Engel
Daniel E. Epperson
Hannah M. Hajdik
Seth R. Holladay
Anthony T. Kennedy
Jacob D. Kloes
Mitul N. Mistry
Caleb H. Peck
Maxwell A. Samlow
Christopher W. Violet
Charles D. Wallen
Joseph T. Wray

Biomedical Engineering

Taylor A. Berger
Seth C. Coomer
Christopher R. Forsyth
Stone E. Isaacs
Richard K. Kuehn
Jenna M. LaColla
Colin M. Mann
Alicia A. Matavosian
Delaina K. McDonald
Lexus D. Morris
Kiara A. Myers
Alexandra E. Natale
Jason Pan
Noah G. Reeder
Jillian M. Schwendeman
Lauren A. Smith
Carli M. Stewart
Mitchell T. Stockinger
Adam S. Throgmorton
Katherine C. Wallace

Mechanical Engineering

Alix J. Ambrose
Chad F. Arnold
Nabeel K. Baaklini
Shems Eddine Belhout
Jacqueline O. Berger
Nathan T. Bingham
Cole A. Brill
Laura M. Burke
Dakota Cauthen
Eric Clark
Davis C. Cole
David H. Crafton
Kathryn H. Culhane
Austin M. Davis
Christopher A. Dias
Kevin Dopatka
Emma A. Drum
Ryan J. Durkee
Andrew N. Elder
Sierra N. Ellis
Cody A. Ferguson
Bryan Z. Fitzsimmons
Elizabeth S. Fowler
Robert S. Garibay
Jacob N. Groothuis
Jackson T. Hardeman
Dalton I. Houser
Luke W. Hudgin
Brett M. Hulett
Christopher R. Kelly
Stephanie R. Long
Benjamin R. Luffman
Katelyn J. Luthi
Kelsey A. McConachie
Thomas B. McDavid
Michelle E. McNamara
Zebulon G. McReynolds
Abad C. Monroy
Graham Y. Montgomery
James T. Morton
Jake L. Murphy
Adam W. Neal
Heather M. Nevills
Isaac R. Nolan
William B. Norris
Grayson T. Northern
Donald J. Partin
Jenny P. Patel
Nisarg B. Patel
Wade H. Price
Matthew T. Puleo
Joshua R. Reed
Joshua H. Richardson
Ryan B. Rife
Kiel T. Russell
Daniel W. Salyer
Austin J. Taylor
Eric J. Vercellone
John A. Ward
Jackson K. Wilt
Trenton B. Yount

Cum Laude

Aerospace Engineering

Engineering
Ian D. Allish
Chad Batten
James G. Farris
Austen J. George
William A. Huffman
Gavin W. Jones
Austin C. Maryanski
Gillian S. McGlothin
Sang Hyeok Park
Jason Patel
Brandon S. Reavis
Anthony M. Roark
Caleb A. Saiyasak
Austin P. Springer
Nathan G. Stover
Matthew R. Trainer
Jordan C. Vallem
William D. Wisdom

Biomedical Engineering

Ahmad Alharithy
Jami E. Anderson
Holly K. Batte
Jackson S. Berryman
Savannah L. Bradburn
Tessa M. Brooks
Dylan J. Carlson
Emily C. Gable
Nathaniel L. Hauser
Trenton J. Hinson
Joshua S. Key
Nicole J. Kowalski
William H. Kuebitz
Jackson M. Mayfield
Claire E. McClain
John C. McDearman
Kimberly N. Noe
David C. Nuthalapaty
Sophia H. Pouya
Nathaniel B. Reinoehl
Andrew C. Richard
Xizhi Xia
Lawand M. Yaseen

Mechanical Engineering

Ahmed M. Alhezab
Jacob B. Aljundi
Charles W. Beasley
Zachary R. Beeler
James Best
Daniel A. Blalock
Donovan L. Briley
Jarrett M. Bristol
Robert L. Carlton
Riley A. Chambers
Austin S. Chapel
Katherine L. Clayton
Samuel R. Cook
Zackery R. Crystal
Mary E. Daffron
Edward Deiderich
Daniel R. Dirscherl
Stefan Dopatka
Gregory L. Elder
Ryan J. Glenn
Brandon J. Glover
Austin D. Gomez
Gregory M. Gorman
Brendan D. Goulde
Grayson D. Gregory
Jonathon E. Hicks
Luke M. Howard
Cole J. Huner
Noah Johnson
Brian K. Jones
Nicholas E. Keen
Grant A. Kobes
Albert H. Liu
Jacob T. Maine
Meredith R. Mendoza
Brock J. Miller
Sophia N. Morgan
Seth A. Newport
Tyler J. Newsom
Colin J. O'Brien
Nathan R. Oliver
Patrick Parker
Charles G. Parsons
Bradley T. Peckinpaugh
John A. Perryman
Luke Randall
Matthew J. Rogers
Matthew G. Rumbolt
Ryan C. Savery
Austin M. Schmidle
Dustin V. Shults
Maximilian Smith
Joseph M. Stockli
Kera M. Stoops
Junhyun Sung
Kimon E. Swanson
James Walsh
David M. Werner
Jonathan H. West
Eric S. Wise
Hastin C. Witt
Bryan L. Wixson
Madeline K. Wood
Deshon M. Young

Faculty Notes

faculty spotlight

By David Goddard.

Stephanie TerMaath has made a name for herself during her time with MABE. Now, her position itself has been named, as TerMaath has become the Jessie Rogers Zeanah Faculty Fellow.

"This is a great honor, and I'm very thankful for the unwavering support from Dr. **Matthew Mench** and the MABE department to help junior faculty succeed," said TerMaath. "I would also like to thank Mr. **Eric Zeanah**, an industrial engineering alumnus, for his generous support not only for this endowment but also for his continuous support of the college."

Since coming to UT in 2012, TerMaath has played a role in several notable projects, including leading a key thrust of the nearly $10 million NASA-backed project being helmed by fellow departmental assistant professor **James Coder**, believed to be the largest single NASA project in UT history.

She comes by her love of aviation naturally, having been born on Shepard Air Force Base in Texas, where both parents served in the Air Force.

TerMaath is also heavily involved in the recruitment and retention of underrepresented students in STEM fields.

"I was first exposed to the impact of underrepresentation in engineering when I was the only girl to represent my high school at a math competition," said TerMaath. "One of the boys made a rude joke about what a privilege it was for me to be allowed to hang out with them."

She is actively involved with the Society of Women Engineers (SWE) and Women in STEM Advancing Research, Readiness, and Retention (WiSTAR3) at UT, and works to help build support networks and offer professional development events for such groups of students.

TerMaath is a 2015 participant of the National Academy of Engineering's US Frontiers of Engineering Program, an associate fellow of the American Institute of Aeronautics and Astronautics, and a former faculty advisor for Tau Beta Pi and SWE.

Associate Professor **Chad Duty** is part of the Tru-Design Team that won an R&D 100 award at the 55th Annual R&D 100 Awards Ceremony for their "Large-Format Additive Coating Solutions." These coatings were developed for large-scale printed parts for both high and low temperature applications, and were featured on the Boeing 3D-printed trim tool that set a Guinness World Record in 2017.

Assistant Professor **Dibyendu Mukherjee** is the principle investigator and corresponding author of the featured article on the back cover of the January 2018 issue of the *Journal of Biophotonics*. The article, "In-vitro analysis of early calcification in aortic valvular interstitial cells using Laser-Induced Breakdown Spectroscopy (LIBS)," is co-written with Seyyed Ali Davari, Shirin Masjedi, and Zannatul Ferdous.

The international journal is the first of its kind dedicated to publishing original articles and reviews from the field of biophotonics and has a current impact factor of ~4.33.

Associate Professor **Jeff Reinbolt** was recently elected chair of the Executive Board for the International Society of Biomechanics' Technical Group on Computer Simulation. The society, founded at Penn State in 1973, now has approximately 1,300 members internationally. The group's roughly 200 members share a common interest in biomechanical computer simulations. Reinbolt has also been appointed associate editor for the society's *Journal of Applied Biomechanics*, where he will focus on biomechanical modeling and computer simulation. This journal disseminates studies on musculoskeletal or neuromuscular biomechanics in human movement, sport, and rehabilitation.

Last month, Department Head **Matthew Mench** joined a small group of national leaders in electricity storage at the Union of Concerned Scientists Electricity Storage Strategic Workshop in Washington, DC.

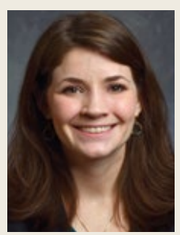
Participants of the invitation-only workshop worked to develop a plan to advocate for more federal funding and produce recommendations to Congress on the needs and opportunities for funding enhanced research, development, and demonstration of electricity storage. Republican and Democrat caucus co-chairs, the Department of Energy's Office of Electricity, the Joint Center for Energy Storage Research, and Advanced Research Projects Agency-Energy all spoke about research and responded to recommendations made during the workshop.

Professor Emeritus **Rao Arimilli** and his wife **Lakshmi** have donated $50,000 to establish the Rao V. and V. Lakshmi Arimilli Endowed Graduate Fellowship in Mechanical Engineering. The endowment earnings will be used for graduate fellowships and undergraduate scholarships. Arimilli, who retired in 2015 after more than 40 years with the department, wanted to give back and help students with financial need majoring in mechanical engineering. Each fellowship and scholarship awarded will be in the amount of $2,000.

New Faculty

Mark Balas joined the department last August as professor and director of the Center for Laser Applications at UTSI. Balas also holds the Jack D. Whitfield Professorship of Dynamic Systems and directs the newly established UTSI Center for Autonomous and Evolving Systems. Balas has been a professor for more than 35 years and is an expert in control theory and aerospace systems applications, adaptive control, infinite dimensional systems theory, control of quantum systems, evolving systems, and modern engineering mathematics.

Elizabeth Barker was hired as an assistant professor of biomedical engineering last August after working as a lecturer in the department since 2014. Barker's research focuses on designing and developing novel polymer materials for implant and drug delivery and intends to commercialize her laboratory findings for use in clinical settings. Barker was instrumental in the department purchasing a synthetic cadaver and opening the SynDaver Laboratory.



Sara Hanrahan joined the department in January as a new lecturer in biomedical engineering. She is teaching two upper-level undergraduate classes this semester—Cell and Tissue Engineering and Cell and Tissue-Biomaterials Interaction. Before joining MABE, Hanrahan co-directed the Neuromodulation Lab at the Colorado Neurological Institute where she worked on developing an improved deep brain stimulation system for the treatment of Parkinson's disease.

Alumni Notes

Croswell, Van Hooser Join Hall of Fame

Bennett Croswell and Katherine Van Hooser are the newest members of the MABE Hall of Fame and will be officially inducted during the department's spring honors banquet this month.

By Kathy Williams.

Bennett Croswell (*BS ME '79*) is the former president of Pratt & Whitney's Military Engines. He retired in 2017 after a distinguished 38-year career with the company. As president, he oversaw development, production, and support of the company's military offerings. He held other prominent leadership roles at the company, including vice president, F119 and F135 programs; vice president, Military Development programs; and vice president, Advanced Programs & Technology. Croswell was also a member of three Collier Trophy award-winning teams—in 2001 for the development of the Integrated Lift Fan Propulsion System for the JSF program; in 2006 for the successful fielding of the F-22 Raptor; and in 2014 for the X-47B Unmanned Combat Air System demonstration.

"Attending the University of Tennessee was an experience I have always cherished, and I will be forever grateful to UT and the Tickle College of Engineering for providing me a skill set and a foundation that served me so well throughout my career," Croswell said. "To now be inducted in to the MABE Hall of Fame is truly one of the greatest honors of my life."

Croswell currently serves on the college's Board of Advisors and on the Board of Trustees for the Naval Aviation Museum Foundation.

Katherine Van Hooser (*BS AE, '91*) began her career at NASA in 1991 as a turbomachinery engineer and has held several positions during her tenure, including space shuttle main engine chief engineer, space launch system engines chief engineer, and deputy director of the Materials and Processes Laboratory. In 2016, she was promoted to chief engineer of Marshall Space Flight Center, where she provides technical leadership of human exploration, science, and technology programs assigned to the center.

Van Hooser has received several awards, including the 2001 NASA Software of the Year award for her role in developing user-friendly software to model turbomachinery fluid flow; the 2008 NASA Exceptional Engineering Achievement Medal; the 2010 Silver Snoopy award, awarded by the astronaut corps for outstanding achievements contributing to flight safety and mission success; and the 2011 NASA Distinguished Service Medal, NASA's highest form of recognition awarded for contributions to NASA's advancement of interests of the United States.

"The University of Tennessee Department of Mechanical, Aerospace and Biomedical Engineering prepared me well for a career that's been full of challenges, opportunities, and excitement," said Van Hooser. "To have the department that gave so much to me as an undergraduate now reward me for my career achievements is both flattering and a source of great pride."

Alumni Spotlight: David Moseley

By Kathy Williams.

In January 2017, one month after receiving his master's degree in mechanical engineering from UT, **David Moseley** moved to Hartford, Connecticut, and began working at Pratt & Whitney as an F100 Component Improvement Program Manager.

Moseley's responsibilities include leading cross-functional teams to ensure the safety, reliability, and supportability of nearly 4,000 F100-PW-229 and F100-PW-220 engines in services, and leveraging diverse engineering teams to identify, design, and implement new engine improvements for the US Air Force as well as 22 nations worldwide.

A native of Louisville, Tennessee, Moseley is no longer in close proximity to family and has to endure cold New England weather, but is thankful to be working for a great company and doing what he loves—engineering.

"Being an engineer requires a unique mixture of creativity, technical know-how, and determination to solve complex problems," said Moseley. "Working in this type of environment is incredibly satisfying as those efforts yield tangible benefits. This is especially true working within Military Engines at Pratt & Whitney where the results of our efforts directly impact the strength of our nation and the safety of America's military men and women."

> "The engineering/business disconnect, combined with my newly found passion for science, inspired me to become an engineer."
>
> —Moseley

Moseley didn't always have the dream of being an engineer. In fact, it wasn't even on his radar until after he had received a bachelor's degree in business and was working as an entrepreneur.

Moseley started a tech business to improve the efficiency and emissions of internal combustion. After some set-backs and product failure, it became clear he needed to understand the technology before the business could be successful. It was this need that led him to the realization that he was an engineer at heart.

"It became apparent a massive gap existed between the engineered design and the needs of our clients,' said Moseley. "The engineering/business disconnect, combined with my newly found passion for science, inspired me to become an engineer."

Moseley enrolled at UT, starting from scratch with his classes, and spent the next five years working toward his master's in mechanical engineering and simultaneously his MBA from the Haslam College of Business.

On top of a heavy course load, Moseley became very involved in MABE. He worked as a student advisor, performed research in the Electrochemical Energy and Storage and Conversion Laboratory and at ORNL, and served as an EcoCAR 3 project manager.

"Looking back on my journey at UT, the impact the faculty had on my personal and professional success is staggering," said Moseley. "Not only did those relationships lead to unique research opportunities, internships and assistantships, but also the discovery of my current job."

Moseley's advice to current students is to get to know your professors. "Find a mentor and don't underestimate the power of your network. UT'S engineering faculty are a tremendous resource, and opportunities abound for those students willing to go the extra mile."

Photo Gallery

Students Camille Bergin, Gillian McGlothin, and Jake McCoy interned at Pratt & Whitney last summer.

Associate Professor Chad Duty explains what goes on in the MakerLab to incoming students during the Breakfast of Champions event in February.

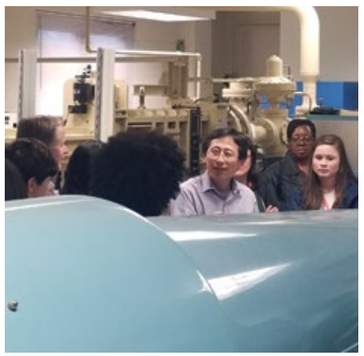
Assistant Professors Dustin Crouch and Andy Sarles and Professor Jindong Tan worked the MABE booth at the BMES Conference last October in Phoenix, Arizona.

Fifth graders from East Lincoln Elementary School in Tullahoma, Tennessee, became the first class to visit UTSI's new solar observatory. *Photo by Laura Horton.*

Cheerleading Squad, 1955. Faculty member Robert Red Matthews of the mechanical engineering department served as the university's first official cheerleader from 1907 to 1916. By 1927, cheerleader attire consisted of a white shirt with orange and white ties and white trousers with an orange stripe. In 1938, the first women appeared as cheerleaders, but by the mid-1950s, the squad was all male.

Chancellor Davenport poses with members of the EcoCAR 3 team, Department Head Matthew Mench, and Dean Wayne Davis.

Bill Hartel, Astronaut Walter Cunningham, and UTSI Executive Director Mark Whorton pose for a photo at Cunningham's 'The Golden Age of Spaceflight' talk.



Associate Professor Zhil Zhang shows the wind tunnels to incoming students during the Breakfast of Champions event in February.

Associate Professor Chad Duty and Riley Toll show Chancellor Davenport the 3D-printed hand they made in the MABE MakerLab.

Grad Student Jenny Patel shows visiting students synthetic body parts during Engineers Day in October.

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COLLEGE OF ENGINEERING

DEPARTMENT OF
MECHANICAL, AEROSPACE &
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