

TENNESSEE

SPRING 2019

# ENGINEER

THE UNIVERSITY OF TENNESSEE, KNOXVILLE • TICKLE COLLEGE OF ENGINEERING



**PARTNERS  
TO THE CORE**  
PAGE 22

**T** ENGINEERING

Plus: A Change for the Better / Time to Move On / Female Engineers Take the Lead





## Dean's Message



### Features

- |  |   |
|--|---|
| <b>2 A Change for the Better</b>                               | <b>22</b> Partners to the Core                    |
| <b>6</b> TCE Spring Banquet Awards                             | <b>36</b> Female Engineers Take the Lead          |
| <b>8 Time to Move On</b>                                       | <b>41</b> <b>Print a Plane (and fly it, too)</b>  |
| <b>12</b> Rhodes Less Traveled                                 | <b>42</b> <b>EDP 45th Anniversary Celebration</b> |
| <b>14</b> Engineering Vols Share their Nuclear Co-op Rotations | <b>44</b> Join the Journey Campaign Continues     |
| <b>16</b> Research Tidbits                                     |   |

### Departments

- |                         |
|-------------------------|
| <b>1</b> Dean's Message |
| <b>38</b> Student Notes |
| <b>39</b> Faculty Notes |
| <b>40</b> Alumni Notes  |
| <b>45</b> In Memoriam   |

**Vol. 20 Issue 1**  
Tennessee Engineer is published in the spring and fall by the University of Tennessee, Knoxville, Tickle College of Engineering

**Misty Mayes**  
Chair, Board of Advisors

**Mark Dean**  
Interim Dean

**Brian Shupe**  
Executive Director,  
Engineering Development

**Christie Kennedy**  
Editor and Director of  
Communications

**Melissa Callahan**  
Project Manager

**Mitchell Williamson**  
Designer

**Randall Brown**  
**David Goddard**  
Writers

**Steven Bridges**  
**Randall Brown**  
**Shawn Poynter**  
Photography

**University Print and Mail**  
Printer

On the cover: Eric O'Quinn, nuclear engineering doctoral student, stands inside a section of the Spallation Neutron Source at Oak Ridge National Laboratory.

**T TICKLE**  
COLLEGE OF ENGINEERING  
THE UNIVERSITY OF TENNESSEE, KNOXVILLE

As I reflect on the past year's activities of our college, I am struck by the curiosity, determination, and Volunteer spirit of our students and faculty. The work they are doing to make a difference in the lives of those in our communities is humbling. No matter how small or large that difference, our Engineering Vols are welcoming the challenges presented to them and are delivering results.

Grant Rigney, our college's first Rhodes Scholar—the university's eighth—is heading to the University of Oxford to further his studies to becoming a surgeon to help society's most vulnerable patients (p. 12). A senior design team of civil and environmental engineering students answered the call of a grieving mother to create a revised barrier design for the scenic Natchez Trace Bridge to help prevent the bridge's growing number of suicides (p. 2). I'm also incredibly proud of our female engineering students who now represent around two thirds of our student organizations' leadership and will no doubt go on to make an impact in their chosen future careers. Read about four of these women on page 36.

Central to this edition of *Tennessee Engineer* is our ever-growing, dynamic partnership with Oak Ridge National Laboratory (p. 22). The collaborative work of researchers at both institutions is creating new technologies across multiple interconnected disciplines, including advanced manufacturing and high performance computing; researching pathways to green energy solutions; and helping clean up

water runoff from toxic waste sites. Truly, no other institutions have been able to replicate the special partnership UT and ORNL share.

Earlier this year, the college surpassed its Join the Journey campaign goal of \$200 million thanks to the incredible support of our alumni, friends, and industry partners (p. 44). This achievement has already impacted the college's ability to provide much needed scholarships and fellowships to our students and faculty as well as build infrastructure to continue our mission of educational and research excellence.

As we prepare to welcome incoming Dean Janis Terpenny later this summer, I couldn't be more proud of the efforts of our student, faculty, and staff. I have thoroughly enjoyed serving as interim dean and wish Dr. Terpenny and our entire Engineering Vols community the very best for 2019 and beyond.

As always, thank you for your support, and Go Vols!

*Mark Dean*

Mark Dean  
Interim Dean of Engineering





# *A Change for the Better*

*By David Goddard. Photography by Trish Merelo.*

The Natchez Trace Bridge is famous for its architecture and its views, but a darker reputation has begun to surround it in recent years due to its increasing use in suicides.



The National Park Service (NPS), which has jurisdiction over the bridge and park, doesn't keep official records of the number of suicides, but the Williamson County Sheriff's Office, which serves as de-facto law enforcement for the bridge, says that at least 32 people have died after jumping from the bridge, most recently on New Year's Eve in 2018.

Trish Merelo's son John was one of those, dying in January, 2016. Like most cases, the people he left behind had been given few warning signs; he was a solid student, didn't miss school, and had a scholarship to the University of Alabama awaiting him.

"He had told me he had symptoms of depression, but he'd told me he'd let me know when he was feeling down," Merelo said during a visit to UT. "When I woke up that morning and he wasn't at the house, I knew. I just knew."

Following that turn of events, Merelo learned about the other instances at the bridge, figuring out that the bridge's design played a major role in its grim status.

Since it wasn't intended to carry foot traffic, the sides of the bridge were built only 32 inches high so as to not impede the view from cars traversing it. Although ideal for sightseeing, it has proven far too easy for people to surmount.

"Barriers are the only way to prevent people from jumping from bridges," Merelo said. "The national suicide prevention organization has gone so far as to issue a paper saying as such."

Along with other people who have lost family members at the bridge, Merelo formed the Natchez Trace Bridge Barrier Coalition.

Inspired, she sent out feelers to several major public and private universities around Tennessee, but only UT had the right pieces in place to help. That's where Jenny Retherford, senior lecturer in the Department of Civil and Environmental Engineering, entered the picture.

Retherford answered Merelo's request and told her she'd be glad to help, setting up a senior design project aimed at developing barriers for use on the bridge.

"Civil engineering, at its core, is all about serving for the betterment of humanity," Retherford said. "What could be more perfect for that than quite literally preventing suicides?"

Retherford's team of students face a number of challenges due to the bridge's location in a national park. Any change to the bridge must conform with park rules mandating design, materials, changes to aesthetics, and even the "feeling" it evokes when viewed. The students have spent the spring semester tackling the project.

"We are currently performing a lot of research to create a design that will comply with [NPS] guidelines and regulations while also satisfying the coalition's wishes, so we're taking it a little slow right now," said Nancy Abdo, a senior in CEE who has served as liaison for the project's various entities. "Once we settle on a design, we can shift our focus to a more technical engineering scope next semester."

Along those lines, Abdo said the team has decided that any solution will likely be a mix of aluminum and concrete, which would satisfy a key NPS requirement since those materials are already in use on the bridge.

In addition to Abdo, the team includes students with concentrations in structures, construction

management, transportation, and water resources, covering all the bases a project such as this requires.

"The great thing about this team is that they all actively chose this project," Retherford said. "It's inspiring because what they are doing will have a very real influence on society."

The team and their project also recently received help from a powerful source, as Tennessee State Representative Sam Whitson, whose district includes the bridge, introduced legislation aimed at loosening NPS rules so that the bridge could be altered. That bill unanimously passed its first committee, the first step in the legislative process.



(L-R) Barry Boyd, chief of maintenance of the Natchez Trace, and Sarah Davis, chief ranger, pose with UT students Jay Thota, Connor Campbell, and Meet Patel at the site of the Natchez Trace Bridge.

Natchez Trace is one of America's greatest byways, snaking a route of almost 450 miles from Natchez, Mississippi, across the Magnolia State, through the corner of northwest Alabama, finally coming to an end just south of Nashville, Tennessee.

It is a true civil engineering marvel that flows seamlessly through the landscape, showing scenes of natural and historic beauty, a trail used by Native Americans, pioneers, traders, and even as a major thoroughfare for future President and then-General Andrew Jackson as he took the original Tennessee Volunteers into battle.

One of the most well-known current features of the parkway is the double-arch Natchez Trace Parkway Bridge just outside of Franklin, Tennessee.

Heralded as a marvel of engineering, the bridge has been featured in design and architecture magazines and earned the Presidential Award for Design Excellence as well as awards from the Federal Highway Administration and the International Bridge Conference. It was considered such a notable achievement that then-Vice President Al Gore was the keynote speaker at its 1996 dedication.

Since 1999, Tennessee's suicide rate has risen more than 24 percent, with an average of three Tennesseans per day committing suicide in 2018, the highest rate since the early 1980s.

Tennessee had the 20th highest rate of suicide nationally, with rates for males and females both well above the national average.

Signs of suicide include talking about death, a sudden loss of interest in activities or social interaction, increased use of alcohol or drugs, or a sense of hopelessness.

If you or someone you know exhibit these symptoms, the following resources are available:

National Suicide Prevention Hotline: **1-800-273-TALK (8255)**

Crisis Text Line: **Text TN to 741741**

Tennessee Suicide Prevention Network: **[www.tspn.org](http://www.tspn.org)**



# Heath Honored with 2019 Nathan W. Dougherty Award



Interim Dean Mark Dean presents the 2019 Dougherty Award to Ralph Heath

By David Goddard. Photography by Steven Bridges.

**Ralph D. Heath** has a long track record of success, collaboration, and philanthropy, rising to the presidency of Lockheed Martin from 2005-12 before he retired after more than 37 years in engineering and industry.

As a result of his strong record of accomplishment, Heath has been named the Nathan W. Dougherty Award winner for 2019, the highest honor given by the Tickle College of Engineering.

Heath is a firm supporter and alumnus of both the Tickle College of Engineering and Haslam College of Business, having earned his bachelor's in electrical engineering in 1970 and MBA in 1975.

Academic and industry experiences led Heath to contribute to the growth of both colleges by creating the Heath Integrated Business and Engineering program and establishing its initial endowment.

He cited certain areas of overlap between the two colleges as his inspiration to foster collaboration, pointing out that future graduates of the program

will enter the work force with “the necessary technical skills, systems thinking, and business savvy to add real and sustaining value to organizations.”

In addition to serving in various roles at Lockheed Martin, Heath serves on the Boards of Advisors for the Tickle College of Engineering, Haslam College of Business, and the Smithsonian National Air and Space Museum, and is an American Institute of Aeronautics and Astronautics Fellow.

Dougherty, the award’s namesake, served as dean of the college from 1940 to 1956 and was a captain of UT’s football and basketball teams as a student athlete in the early 1900s. He was inducted into the College Football Hall of Fame in 1967.

Recognizing Dougherty’s success in engineering and education, the award singles out those who have “brought honor and distinction to the college through their achievements or who have made significant contributions to the engineering profession in Tennessee through their professional activities” and has been given annually since 1957.

## Other award winners at the spring banquet were:

**Special Recognition for Service:**  
**Masood Parang**, Associate Dean for Academic and Student Affairs

**Outstanding Support Staff Award:**  
**Carla Lawrence** (MSE)  
**Michael Allen** (Jerry E. Stoneking *engage* Engineering Fundamentals program)  
**Tracy Rafferty** (Innovative Computing Laboratory)  
**Ben Call** (ISE)

**Moses E. and Mayme Brooks Distinguished Professor Award:**  
**Joshua Fu** (CEE)

**Leon and Nancy Cole Superior Teaching Award:**  
**Hahn Choo** (MSE)

**Charles E. Ferris Award:**  
**Leon Tolbert** (EECS)

**Teaching Fellow Awards, jointly funded by the Charles and Julie Wharton, Frank C. Smartt, Weston Fulton, and McKamey endowments:**  
**Fran Li** (EECS)  
**Lee Han** (CEE)  
**Jackie Johnson** (MABE)  
**Matthew Young** (MABE)  
**Cong Trinh** (CBE)

**Outstanding Faculty Service Award:**  
**David Keffer** (MSE)

**Dean’s Junior Faculty Research Excellence Award:**  
**Mariya Zhuravleva** (MSE)  
**Jim Coder** (MABE)

**Professional Promise in Research Award:**  
**David Donovan** (NE)  
**Joshua Sangoro** (CBE)  
**Kai Sun** (EECS)  
**Stephanie TerMaath** (MABE)  
**Timothy Truster** (CEE)  
**Mariya Zhuravleva** (MSE)

**Research Achievement Award:**  
**Bin Hu** (MSE)  
**Baoshan Huang** (CEE)  
**Peter Liaw** (MSE)  
**Kevin Tomsovic** (EECS)

**Translational Research Award:**  
**Chuck Melcher** (MSE)



Interim Chancellor Wayne T. Davis with Masood Parang and TCE Board of Advisors Chair Misty Mayes.



Masood Parang with Tracy Rafferty, Carla Lawrence, Ben Call, and Michael Allen.



Paul Frymier with Cong Trinh, Jackie Johnson, Lee Han, Fran Li, Hahn Choo, Leon Tolbert, David Keffer, and Matthew Young.



Bill Dunne with David Donovan, Joshua Sangoro, Stephanie TerMaath, Timothy Truster, and Mariya Zhuravleva.





Associate Dean of Academic and Student Affairs Masood Parang stands next to a statue of 18th-century Scottish philosopher David Hume in Edinburgh. Rubbing the statue's right big toe is said to bring good luck.

# 1977 “Time to Move on” 2019

## Parang Retiring After 41 Years with College

For **Masood Parang**, working at the University of Tennessee has always been about one thing: students.

Parang, the college's associate dean for academic and student affairs, announced his intent to retire in 2019 after 41 years in the college as a faculty member and administrator.

“I just feel like it's time for a new face to hold this position,” said Parang, who is also a professor in the Department of Mechanical, Aerospace, and Biomedical Engineering. “I'm the oldest person in the college's administration, and I felt like this period of transition where we've had three deans in less than a year was the perfect time to make this move.”

Parang came to UT from the University of Oklahoma, where he earned his bachelor's, master's, and doctoral degrees in 1971, '72, and '75, respectively, and was an assistant professor at the time.

He said he took interest in a job in what was then the Department of Mechanical and Aerospace Engineering after faculty members he knew in the department encouraged him to apply.

Starting as an assistant professor in 1977, Parang eventually became associate head of the department, playing a key role in helping it merge with the Department of Engineering Science and Mechanics in 1996 and laying the early foundation for biomedical engineering, which became an official part of the department in 2004.

“We've undergone a lot of changes, taken on a lot of challenges since I first came to UT,” said Parang, who became associate dean in 2004. “Back then, we were primarily a teaching college, meaning we taught students how to do various engineering applications, but we underwent a real sea change and have since become a research-focused institution. That didn't happen overnight, and it didn't happen without careful planning, years of implementing ideas, and faculty buying into the idea.”

Through all the changes, Parang has always kept his focus on students and on increasing their opportunities to excel.

As a professor in the mid-90s, he helped students design and conduct experiments with NASA in micro-gravity environments.

To achieve such a setting opened the students up to experiencing a vehicle described as both infamous and awesome, the “vomit comet,” a KC-135 plane that flies in a high-arching parabola, giving passengers several seconds of weightlessness as it makes the peak and descends.

“It was a lot of fun for the students, but a very rigorous process,” Parang said.

Closer to the ground, Parang has also played a critical role in helping FIRST Robotics not only gain a foothold, but thrive in East Tennessee and the surrounding area.

FIRST Robotics approached Parang about the possibility of UT becoming a sponsor a mere six years ago, a time when there were only six teams in the state.

Now, there are more than 70 teams across Tennessee, and the Smoky Mountain Regional—which had to move to Thompson-Boling Arena to accommodate the influx of teams—routinely draws schools from as far away as Texas, Illinois, and Massachusetts.

“It's been very successful, to say the least,” Parang said. “It's brought in high school students to UT who then decide they want to attend here, so it serves as a good ambassador for the college.”

Speaking of which, the college's ambassadors program is another area where Parang helped transform the college. In 2005, just five students were serving as ambassadors. Today, there are 32.

One of the lasting marks Parang will have as his legacy is the growth of what is probably the college's biggest event, Engineers Day.

While the college has celebrated the day for more than a century, the event only drew about 600 students as recently as 2004, when Parang said activities were centered around one room in the Science and Engineering Research Facility.

By comparison, the most recent event in October drew almost 1,800 students from around Tennessee and other states, with competitions, tours, and other interest sessions held in multiple buildings.

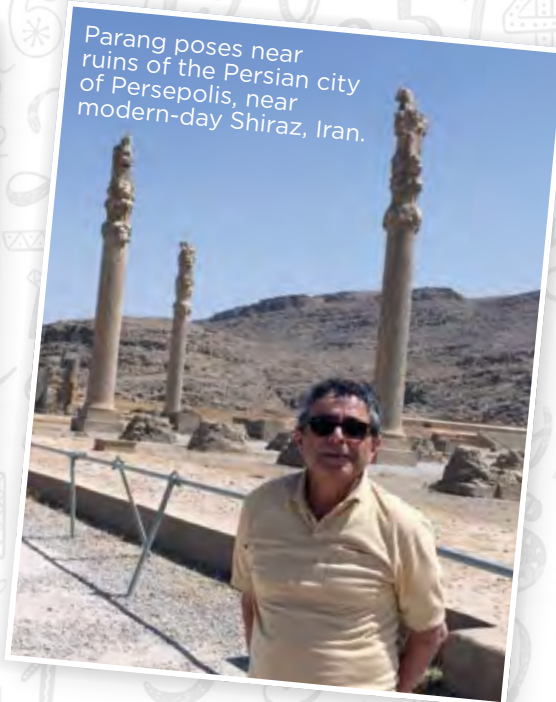
“It's grown quite a bit,” Parang said. “It helps bring in students and shows them what they can experience as an engineering student at UT.”

An experience that, in many ways, has been made better by Parang.





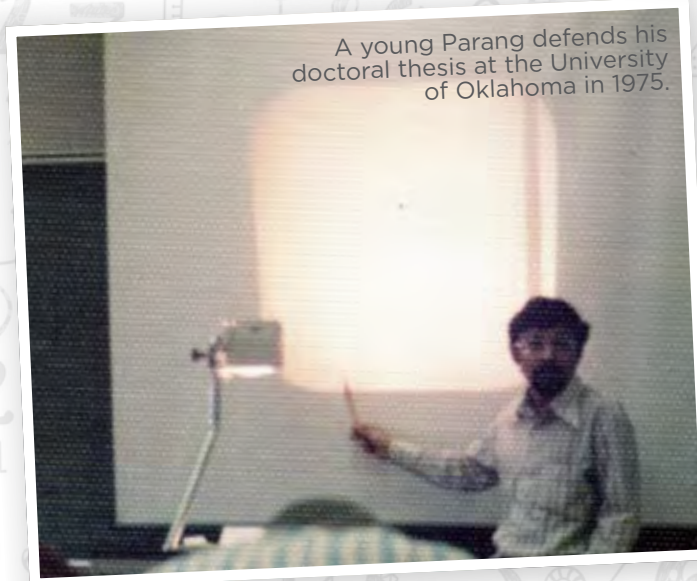
Parang smiles while watching his son, Zhubin, give a kiss to his brother, Farzin.



Parang poses near ruins of the Persian city of Persepolis, near modern-day Shiraz, Iran.



Masood, his wife Safura, and son Bobak together in 1992.



A young Parang defends his doctoral thesis at the University of Oklahoma in 1975.



The Parang family gathered for Zhubin's marriage to Lindsay Champion, from left to right: Sara Parang (Farzin's wife), Farzin, Lindsay, Zhubin, Masood, LJ Robinson, and Bobak.

Several vital college offices fall under Parang's jurisdiction, the success of each he eagerly attributes to the people leading the offices, including:



**Heath Integrated Business and Engineering Program:** Begun in 2016 and directed by Mary Pile, the program merges cohorts of engineering and business students to integrate elements of each discipline, preparing them for advanced entrepreneurial opportunities following graduation.



"Dr. Parang is always thinking about what is in the best interest of the students. I saw that first as a worker in his office during college, and it is even more obvious now that I've worked for him as a member of the college administration.

In fact, my experience working for him as a student was so enjoyable, so worthwhile, that seeing his name as one of the hiring managers for my current position played a significant role in me considering the position and applying.

Something that people should know more about him is how funny he can be. I love his sense of humor and will 100 percent miss his quirky speeches at Tickle College of Engineering events.

He is a great mentor and role model, and will leave a legacy of success when he retires."

—Mary Pile, Heath Integrated Business and Engineering program director and former student worker for Parang.



**Jerry E. Stoneking engage Engineering Fundamentals Program:** The program began before Parang became associate dean but has seen phenomenal growth under current director Richard Bennett.



**Engineering Professional Practice:** Under the direction of Todd Reeves, the office has seen its annual fall and spring expos grow to record numbers semester after semester.



**Diversity Programs:** With Travis Griffin now at the helm as the Fred D. Brown Jr. Director, the office has grown from one staff member to four during Parang's time.



**Global Initiatives:** Judith Mallory has helped build a program that opens doors for students to experience hands-on, service-based engineering in locales from Cuba to Guatemala, India, and beyond.





**A**  
graduate of  
Tullahoma High School,  
Rigney is just the eighth student  
to earn the honor at UT, joining  
**Bernadotte Schmitt** (1905), **Matthew  
G. Smith** (1911),  
**Arthur Preston Whitaker** (1917),  
**William E. Derryberry** (1928),  
**Nancy Ann Min DeParle** (1979),  
**Jennifer Santoro Stanley** (1995),  
and **Lindsay Lee** (2014).



# Rhodes Less Traveled

*By David Goddard. Photography by Steven Bridges.*

**Grant Rigney** (senior, ChemE) already had a list of honors and rolls to his name when the fall 2018 semester was drawing to a close. Before it ended, he discovered his selection as a Rhodes Scholar—an incredibly humbling honor.

“I would not have been able to do this without a lot of help along the way, so I want to thank all of the faculty members, staff, students, and researchers I’ve been fortunate to work and study with,” Rigney said. “Knowing about the list of other Rhodes Scholars who have come before me is both daunting and inspiring, and I can’t wait to get started.”

While the list of previous winners from around the world includes notable names in politics, entertainment, and law, Rigney has his sights set on using chemical engineering to find better outcomes and reduce suffering during treatment for medical patients.

Specifically, he is exploring the use of phase transfer catalysts to measure how a patient’s body responds to procedures such as positron emission tomography (PET) and computerized tomography (CT) scans.

Getting a better picture of what such devices do to specific patients may allow for treatments to be tailored on a case-by-case basis, improving care.

That sense of empathy developed at an early age and has remained through his time as a student, leading him to get his nurse’s license in high school, shadow physicians, and develop a clear path toward his future.

“Eventually, I’d like to be a surgeon, specifically in a facility or area that helps improve healthcare for vulnerable patients such as the elderly or in economically depressed areas,” Rigney said. “To get hands-on clinical experience, I went to night school while in high school to get licensed as an assistant nurse, which helped me get a job at an assisted living facility the summer between high school and my first year of college. It helped me see healthcare from a different perspective.”

Rigney said he took an interest in helping others after he and his mom formed a friendship with a less-than-fortunate man in his hometown of Normandy, Tennessee, an experience that showed him the disparities and challenges that some face.

More recently, he has honed his medical skills as an intern at Harvard Medical School and Massachusetts General Hospital.

Not bad for someone who was once fearful of hospitals and surgery.

“I was really scared of operating rooms, hospitals, all of that when I was growing up,” Rigney said. “I got an anatomy book as a gift, and that changed everything. It really opened my eyes to all the possibilities in medicine.”

His Rhodes experience begins following graduation this May with all-expenses-paid studies at the University of Oxford in England this fall, where he plans to obtain master’s degrees in both global health science and epidemiology and in evidence-based social intervention and policy evaluation.

Rigney was initially drawn to UT because of the Haslam Scholars program.

“It offered me opportunities I wasn’t likely to get elsewhere and gave me the chance to be part of a smaller group of motivated and driven people,” he said.

Rigney is also a Neyland Scholar, the editor in chief of *Pursuit*, UT’s journal of undergraduate research, president of the Student Alumni Associates, and a member of UT’s Alumni Board of Directors. He volunteers at Inskip Elementary School and the Fifth Avenue Clinic, and he co-founded UT’s Homeless Prevention University and Community Alliance.

He is also a licensed pilot, a triathlete, and an accomplished musician who plays the fiddle and mandolin, having played in his family’s bluegrass band at more than 400 concerts across the country and abroad.



# Engineering Vols

## Share Their Nuclear Co-op Experiences

Written by Drew Shayotovich, NE senior.



I spent three semesters between 2017 and 2018 working for Dominion Energy's Nuclear Core Design Group in Richmond, Virginia. This group is responsible for the tracking and trending of current nuclear cores as well as the planning for future cores. Nuclear reactors can remain online for 18–24 months before shutting down for refueling. This is thanks to the core design group for optimizing fuel patterns and shuffling for each cycle.

The most unique project I worked on at Dominion was to design my own fuel pattern. I was tasked with creating a fuel pattern for a preliminary 24-month cycle study—the purpose being to limit the number of refueling outages needed, with a downside of having to load the core with more fuel at the beginning of the cycle.

My design had to carefully balance the amount of power coming from the fuel equally throughout the 24 months of operation. During this study I had the chance to use and learn a neutronics code, SIMULATE, that is widely used in the nuclear power industry, but is difficult to find in a classroom setting.

After building a fuel pattern with enough energy to last 24 months that also met all the safety limits, I did an economic comparison on the higher fuel costs versus having less refueling outages. My report was presented to multiple managers in the Nuclear Analysis and Fuels Department for further consideration.

Another opportunity I had while on co-op was assisting with the core onload and offload from inside the control room. For proper maintenance of the core during an outage, every fuel assembly must be removed. With each fuel assembly being unique it is extremely important to track them during each move to ensure each is properly placed back into the core. Effective three-way communication was a critical skill that was always required in the control room.

Not only did my co-op give me valuable lessons and experiences that cannot be gained from a typical classroom, but it also assured me that I love the type of work that I'll be doing for the rest of my career. Nuclear energy is the cleanest and safest form of energy generation in the United States, and I can't wait to continue to be a part of it.

Written by Andrew Naylor, NE senior.

In the fall of my junior year I was offered a co-op position with Southern Company at Farley Nuclear Plant in Dothan, Alabama. As a nuclear engineer, I was ecstatic. As a college junior, I was a little nervous. Even though I had taken some of my departmental classes at this point, I still lacked the more advanced courses and was worried I wouldn't have the knowledge required to be successful.

Truthfully, I was partly right. There was a lot of knowledge I was lacking, but that is by design. Co-op programs are designed to teach you skills that the classroom can't and supplement the material you learn at school. So, what does being a co-op at a nuclear plant actually look like?

Nuclear plants, like many industrial facilities, operate 24/7 and an engineer's day starts early. I was up at 5 a.m. every morning and at my desk by 7. Most mornings were spent reading emails and condition reports and attending group meetings to discuss the daily plan.

I was in reactor engineering, which is responsible for monitoring the reactor core as well as all the nuclear fuel on plant site. This group's plan of the day could change at a moment's notice, and this is what I enjoyed most. Being open to spontaneity led to many unique opportunities and maximized my experience.

My favorite experience was doing new-fuel inspection. Around every 18 months we power down one of the reactors and refuel it; this is known as a refueling outage. Before we power down, we receive all the new nuclear fuel and inspect it on site. The new fuel is rigorously inspected before it leaves the fabrication facility, but our inspections are an extra precaution to ensure nothing happened during transport. Not many people can say they have been inches away from about 1,000 lbs of uranium. Of course, this was all completely safe since uranium emits very little radiation when it is new.

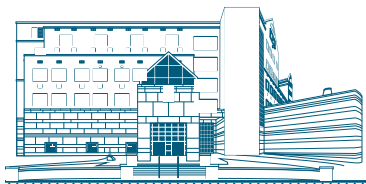
Doing a co-op was the best decision I made in my undergraduate career so far, no question. Not only did it supplement my education, but it jump-started my career and confirmed that nuclear power is the industry I want to be in.



Andrew Naylor during his co-op rotation







## Research Tidbits

### Brakewood Part of Grant to Study Equity Issues in Cashless Fare Payments



Assistant Professor **Candace Brakewood** (CEE) is one of five researchers across three universities who are collaborating on a new project funded by the National Institute for Transportation and Communities (NITC).

The project team is taking a look at the socioeconomic effects of modernizing transit fare payment systems.

As public transit agencies modernize systems, the opportunity to pay with cash is eliminated, which stands to impact low-income segments of the population.

“As public transit providers harness the power of new technologies—such as mobile apps for fare payment—it is critical that we consider underrepresented populations and find inclusive solutions that meet the needs of all transit riders. This research project will take an important step toward achieving this goal,” said Brakewood.

Project objectives include qualitative and quantitative approaches to answer the following:

- What kind of advanced fare payment systems are being implemented, and what measures are used to address concerns of exclusion?
- How effective are these mitigations for addressing exclusion in different populations from a user perspective?
- How effective are these mitigations in terms of agency costs?

Statistics show that 15 percent of adults in the US don’t have a bank account or credit card, and many do not have access to a smartphone. These numbers may be even higher among public transportation users.

### Cherry Studies Impact of Walking Under the Influence

Most might assume pedestrians would be innocent victims in alcohol-related car crashes, but CEE Professor **Chris Cherry** has uncovered data that shows how often pedestrians who are “walking under the influence” (WUI) are the cause of car accidents that result in their injury or sometimes even death, with some surprising results.

Between 2011 and 2016 there were 11,309 reported crashes in Tennessee that involved pedestrians. Cherry and PhD student **Amin Mohamadi Hezaveh** explored data from the Tennessee Integrated Traffic Analysis Network to determine the role of alcohol in



crashes involving pedestrians, specifically those who were WUI.

Cherry and Hezaveh discovered a number of interesting details, including that almost one-fourth of pedestrians killed after being

struck by cars had alcohol in their systems, males were 1.9 times as likely to be involved in such accidents as females, and the 40–54 age group had the highest likelihood of being injured or killed while WUI.

Their work showed that improved lighting, sidewalk access, and better record keeping of such accidents could help improve future outcomes.



### Trinh Leading Department of Energy Bio-Research Project

Ferguson Faculty Fellow **Cong Trinh** (CBE) is leading an effort to produce bioesters—building blocks for many of the things produced through chemical and biomolecular engineering—by utilizing the oil-producing yeast *Yarrowia lipolytica*.

Trinh’s approach involves using the yeast as a one-step process to obtain esters, gaining efficiency over the labor-intensive chemical approach of the past.

His method ensures the host is not destroyed, meaning the yeast can be reused, further improving efficiency.

By controlling the metabolism of the yeast, Trinh said his team can make designer bioesters with tailored characteristics for use in various applications, from perfumes to artificial flavoring.

The main challenge Trinh’s team faces is to make *Yarrowia* more robust since it must effectively digest complex biomass materials like switchgrass. There will be a rigorous microbe selection as well as genome and molecular characterization to reveal the underlying mechanisms of how the new strains yield desirable results.

### Hazen Researches Effects of Fracking on Water Health

UT-ORNL Governor’s Chair for Environmental Biotechnology **Terry Hazen** (CEE) is leading a three-year study looking at how aquatic microbial communities are impacted by biocides associated with hydraulic fracking.

Noting fracking’s rising role in the energy sector, Hazen pointed out that much remains unknown on how chemicals used in the process can affect the health of water-based ecosystems. By studying the effectiveness of alternative biocides to combat corrosion, the hope is that microbial communities might not build up immunities as they currently do.

The study will specifically observe a set of streams in Pennsylvania that are near active hydro-fracking sites, comparing them to streams not within active fracking areas.

Additionally, Hazen’s team hopes to look at what systems, biologically speaking, actively resist biocides and biocide-resistant strains.

The project will make observations over many years to help give the team a clearer picture of what the long-term impact of fracking might be, with the hope that their work could help develop future contamination-detection techniques.





Hydrocephalus Research Turns Personal for TerMaath’s Team

A team led by MABE’s Zeanah Faculty Fellow **Stephanie TerMaath** is making promising strides in the treatment of hydrocephalus—a debilitating and sometimes fatal condition caused by an excess of cerebrospinal fluid surrounding the brain and spinal cord.

One million Americans suffer from the condition. Occurrence in newborns—once in every 1,000 births—makes it as common as Down’s Syndrome and more prevalent than spina bifida or tumors.

Cerebrospinal fluid provides immune support, regulates circulation, and cushions the head and spine, but it can cause severe problems with vision, coordination, mental abilities, and even death if not absorbed naturally or if an excess is produced.

Their approach has been to make shunts more resistant to obstruction by improving fluid flow.

The project hits home for the team on a personal level, with TerMaath and several other team members either having shunts themselves or having friends or family who do.

MABE Assistant Professor **James Coder**, Taylor Erwin and Ryan Glasby from the Joint Institute for Computational Sciences, and UT Medical Center neurosurgeon James Killeffer round out the team.

The National Institutes of Health is funding the research through an R15 grant.



Mench, Zhang Hydrogen Research Earns \$2 Million Grant

Hydrogen is increasingly recognized as a potential energy carrier with growing applications in vehicles, grid modernization, energy storage, fuel production, metal refining, and other areas.

Now, a team including Department Head of Mechanical, Aerospace, and Biomedical Engineering **Matthew Mench** and Associate Professor **Feng-Yuan Zhang** is taking a look at improving proton exchange membrane (PEM) electrolyzer cells.

PEM cells are key to the use of hydrogen as a fuel source, splitting water into hydrogen—which is used as fuel—and oxygen as a “waste” gas.

Although great strides have been made in recent years in the technology of fuel cells and electrolyzers, widespread implementation of hydrogen-generating components has been limited by cost, and they remain more expensive than natural gas.

This new concept will make use of advanced manufacturing technology to design specifically chosen patterns for the layer, allowing hydrogen to be produced more efficiently than through conventional electrolysis and at a purer level than through natural gas reformation.

The proposed work, which builds on previous research done in Zhang’s lab, will more efficiently convert the water into its constituent gases, reducing the cost of hydrogen fuel cells.

Microgrid Research Could Keep Power Flowing After Disasters

Hurricanes cause problems, injuries, and even deaths in a number of ways, not the least of which is failure of the power grid, with the case of Hurricane Maria serving as a perfect example, where it took seven months to restore most power in Puerto Rico.

Power loss can be life-threatening in many ways—from hospitals and shelters losing the ability to run critical care devices to failed pumping stations exacerbating flooding to fires sparked by people trying to cook or provide heat.

But microgrid technology now being refined in the Min H. Kao Department of Electrical Engineering and Computer Science will make it less likely for the power to go off and, if it does, allow it to be restored much quicker.

Min H. Kao Professor **Leon Tolbert**, UT-ORNL Governor’s Chair for Power Electronics **Yilu Liu**, and joint UT-ORNL Professor **Fred Wang** bring a wealth of expertise to microgrids and grid stability.

Microgrids unite to distribute power across a region, but if something threatens the system they can operate independently. So, when a storm strikes a power plant, the grid goes into “island mode” with each microgrid focusing just on its own area so one plant going down doesn’t affect the operation of the rest.

Tolbert noted that another advantage of microgrids—their smaller size—also means they are more localized, easier to control, and easier to repair if and when problems arise, meaning power could be restored in hours rather than days or weeks.



Image courtesy of NASA.



“Smart” Biomaterials Hold Promise for Medical, Scientific Breakthroughs

Neuromorphic computing came about in the last few decades as a way to mimic how synapses and neurons in the brain process, learn, and remember information, sparking the promise of more capable and efficient computing systems.

A cross-departmental team including Interim Dean and John Fisher Distinguished Professor **Mark Dean**, Professor **James Plank**, and Associate Professor **Garrett Rose** of EECS; and Assistant Professor **Andy Sarles** of MABE have joined forces with ORNL’s Pat Collier to further push the boundaries.

Blending physics, computer science, mathematics, biology, and electrical engineering, the team developed methods for assembling and characterizing membranes that mimic living cells with engineerable properties.

Combining the two concepts to create “neuromorphic cell mimics” could also lead to “smart” biomaterials with applications ranging from hyper-focused drug delivery to unmanned rescue missions.

Although similar experiments have been done before using solid-state materials, the team’s use of soft, biomolecular ‘memristors’—variable resistors that “remember” state changes after being powered off and then back on again—sets their research apart. Memristors can also operate with multiple levels of input rather than simple on-or-off binary switches, making them ideal to help the team replicate complex neural synapses.





### Donovan Research Team Helping to Keep Impurities out of Fusion

Fusion holds great promise to one day become a major source of power for the world’s ever-growing needs, with a nearly limitless fuel supply, zero carbon emissions, and only short-lived waste products.

The fuel (hydrogen isotopes) is confined by magnetic fields and is heated until it is hot and dense enough to fuse and release energy. The magnetic confinement isn’t perfect though, and particles can escape and hit the inner wall.

This gradually erodes the wall and releases impurities into the fuel, which wastes energy and lowers the efficiency of the reactor.

**David Donovan**, assistant professor in the Department of Nuclear Engineering, is part of a multi-institutional team that developed a first-of-its-kind technique to coat a region of the wall with a rare isotope of tungsten that, when eroded, acts as “tracer particles.”

By monitoring where these tracers landed around the reactor, Donovan and the team were able to model how impurities traveled during operations. Understanding the transport of these impurities will lead to techniques to direct them away from the hot fuel and towards the exhaust instead, bringing fusion closer to the goal of producing net power.

### Medal’s Models Get to the Root of the Problem

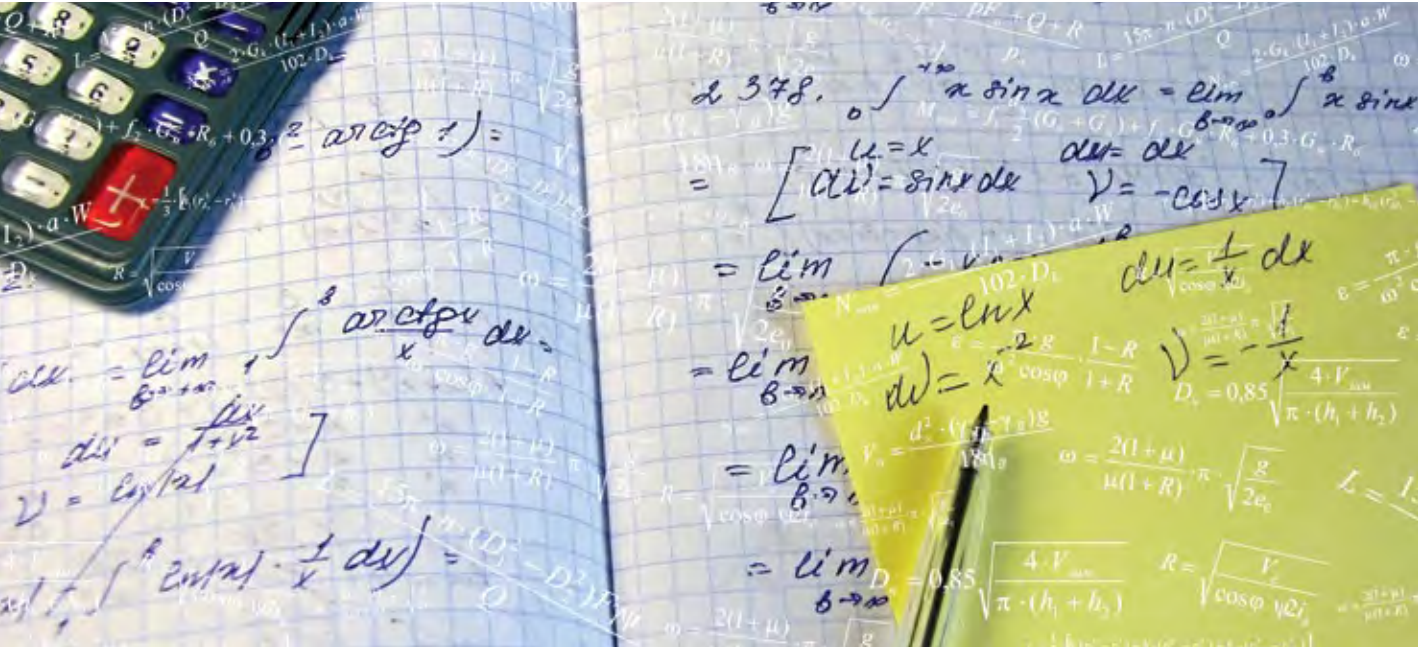
While trial and error certainly have their place in scientific discovery, sometimes the nature of the work doesn’t allow for error, and modeling provides a better solution.

That’s where **Hugh Medal**, assistant professor in the Department of Industrial and Systems Engineering, comes into play.

Medal devises ways to solve problems involving issues that are either too time-intensive or are of too delicate a nature to run the risk of failure while exploring solutions.

By using advanced mathematics, Medal has been able to devise optimization ideas that take into account a wide number of variables, including unknown factors.

One of the many considerations that Medal has introduced to optimization modeling is installing consideration for time versus quality, meaning whether it is more important to get a faster result or a more accurate result.



### Zhuravleva Developing Novel Crystals

UT’s Scintillation Materials Research Center and Department of Materials Science and Engineering are each go-to areas for researchers around the world in need of particular crystals, with applications ranging from medicine to homeland security.

Assistant Professor **Mariya Zhuravleva**, a key figure in both, has come up with a new approach to creating crystals by a technique known as ‘micro-pulling down,’ which is unique to academia in the US.

This technique relies on forces such as gravity for successful growth and allows for the development of crystals with properties that open the door for new insights into quantum physics as well as improve energy production, medical functionality, and lighting.

As a sign of the importance of her work, the National Science Foundation recognized Zhuravleva with an Early CAREER award, one of the most prestigious honors a young faculty member can receive.





# PARTNERS TO THE CORE

*By David Goddard. Photography by Shawn Poynter.*

The University of Tennessee, Knoxville, and Oak Ridge National Laboratory are both known for their nuclear engineering prowess, but their integral relationship is much deeper and broader, impacting many areas of the two institutions.



**C**ollaborations with universities play a key role at Oak Ridge National Laboratory (ORNL) by connecting the lab, including its world-class scientists and engineers and facilities, with cutting-edge faculty who help push the frontiers of research and provide students an opportunity to blossom into scientists.

Of all the universities working with ORNL, none are as closely connected as the University of Tennessee.

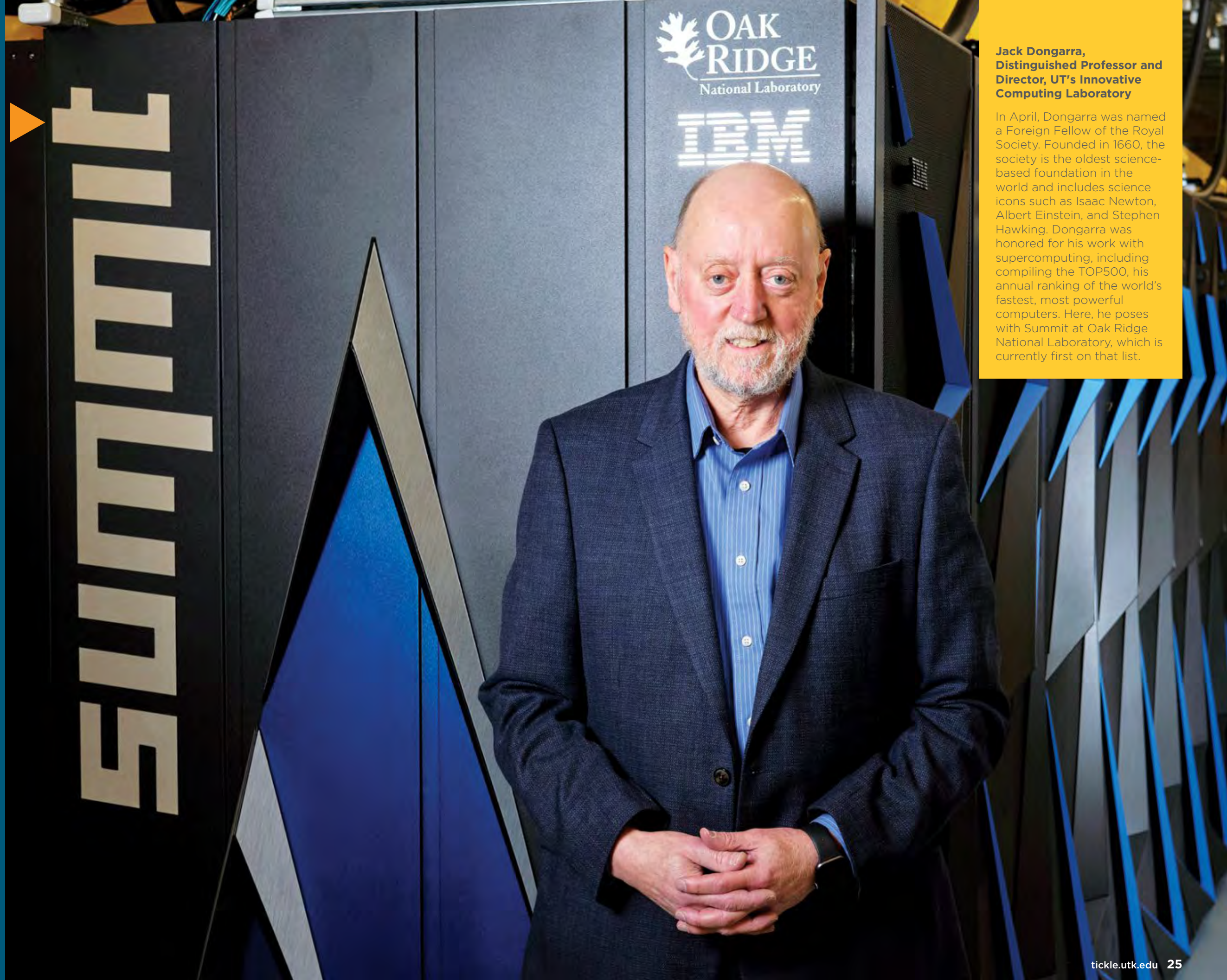
With ORNL's main campus just 30 miles from UT—and with some lab spaces much closer—ORNL and UT have been partners in growth for decades (p. 28).

“Oak Ridge National Laboratory and its associated staff, facilities, and technology are a natural complement with our professors, researchers, students, and projects,” said Tickle College of Engineering Interim Dean Mark Dean, who has collaborated with ORNL on several projects himself (p. 30). “Together, we are able to tackle a wide range of issues vital to our community and country.”

The last twelve years alone has seen the creation of a new type of tenured faculty in the form of joint UT-ORNL Governor's Chairs (p. 31), an interdisciplinary graduate program that is now one of UT's largest (p. 32), a number of other joint faculty positions, and hundreds of research opportunities for both graduate and undergraduate students.

Some of those projects, initiatives, and areas of research include:

- Advanced manufacturing and materials: Numerous UT faculty and ORNL staff members and facilities are dedicated to this particular thrust that is transforming East Tennessee into a regional and national center of expertise, involving seven of the aforementioned Governor's Chairs;
- High-end supercomputing: With the world's fastest computer at ORNL and several pioneers of computing,



**Jack Dongarra,  
Distinguished Professor and  
Director, UT's Innovative  
Computing Laboratory**

In April, Dongarra was named a Foreign Fellow of the Royal Society. Founded in 1660, the society is the oldest science-based foundation in the world and includes science icons such as Isaac Newton, Albert Einstein, and Stephen Hawking. Dongarra was honored for his work with supercomputing, including compiling the TOP500, his annual ranking of the world's fastest, most powerful computers. Here, he poses with Summit at Oak Ridge National Laboratory, which is currently first on that list.





**“[ORNL’s] scope requires scientists and engineers with diverse backgrounds and world-leading expertise to tackle complex, interdisciplinary problems. The University of Tennessee is a key part of filling that pipeline.”**

Alan Icenhour, Associate Lab Director for Nuclear Science and Engineering

artificial intelligence, and machine learning on UT’s faculty, including Professor Lynne Parker, who has maintained her link to UT while serving as associate director for artificial intelligence for the White House Office of Science and Technology Policy, and Distinguished Professor Jack Dongarra, UT and ORNL are helping push the boundaries of what is possible;

- Bio-engineering and bioenergy: Experts including Governor’s Chair Art Ragauskas work on a wide variety of alternative energy topics, including biofuels, the membranes they are stored in, fuel cells, how they are used, and how they connect to the grid;
- Transportation: Vehicles on the land, sea, and in the sky are undergoing vast improvements in performance, safety, and fuel economy thanks to the researchers shared by the two.

### Innovation as an Answer

Much of what has been made possible through the UT-ORNL partnership can be described in one phrase: a collaborative partnership (p. 29).

Whether meeting rising energy demands while trying to reduce pollution or developing lightweight materials for use in next-generation aircraft, effective collaboration lies at the heart of the research.

“The challenge of the modern world is that people want things to be faster, easier, more reliable, and to use less power, preferably from renewable resources,” Dean said. “That might seem like an impossible task from the outside, but it plays directly to the strengths of our partnership.”

Take nuclear science, for example. The global demand for power is an ever-growing issue, especially with an increasing emphasis on gathering energy from sources that have little to no carbon impact.

To meet that demand, UT and ORNL are working toward elusive “green energy” solutions, a key part of which is nuclear (p. 31).



However, change is a constant in nuclear technology, making collaborations like the one UT and ORNL have in nuclear engineering vital to national and even worldwide interests.

“At ORNL, our research in nuclear science and engineering covers a wide scope that includes fission, fusion, isotopes, security, and modeling and simulation,” said ORNL Associate Laboratory Director of Nuclear Science and Engineering Alan Icenhour. “This scope requires scientists and engineers with diverse backgrounds and world-leading expertise to tackle complex, interdisciplinary problems. The University of Tennessee is a key part of filling that pipeline.”

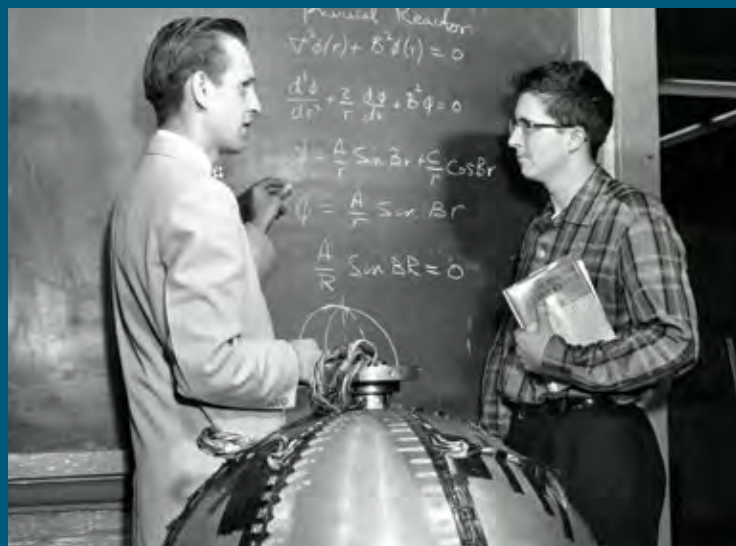
Currently, 72 engineering faculty members hold joint appointments with ORNL, while dozens, if not one hundred or more, engineering students annually participate in research or projects at the laboratory.

“Our staffs collaborate on projects that provide students opportunities to learn, perform research, and develop abilities to answer compelling science and technology questions,” Icenhour said.

“In ORNL, we know we have a partner who is doing things that are pushing the boundaries of computational science, of energy, of developing composite materials for vehicles and applications that might not yet have even been invented,” said Interim Chancellor Wayne Davis, who helped nurture the UT-ORNL relationship during his time as UT’s dean of engineering. “And, in us, they know they have an institution willing and eager to help them accomplish both their goals as well as ours. It really is a win-win in every aspect.”

For more than 75 years and counting.





## A Partnership That Endures

UT's relationship with ORNL began shortly after World War II, when the university's proximity to ORNL and the lab's need for scientists resulted in a natural bond. The resulting revolution has transformed the Tennessee Valley into "Innovation Valley," lifting the economic profile of the region, and landing the state a place on the periodic table with the element Tennesseine named for the efforts surrounding its discovery by UT and ORNL scientists.

### 1964

The relationship strengthened when the Ford Foundation bestowed a grant to fund researchers at ORNL to teach at UT as adjunct faculty, with 19 faculty members teaching at UT by the end of the year through the new program.

### 1982

Union Carbide held the original post-war management contract, giving way to Martin Marietta in 1982. UT began exploring the idea of managing the lab.

### 1984

The Tennessee Higher Education Committee announced a new "Centers of Excellence" program. The Science Alliance, created specifically to foster collaboration between UT and ORNL, and the Center for Materials Processing, which sees the two frequently interact, are two of the three UT centers created through the act. The Distinguished Scientist program, part of the Science Alliance, was begun to bring in top researchers in shared areas of expertise.

### 1998

UT approached Battelle Memorial Institute, a well-established, highly regarded entity dating back to 1923, about partnering on managing ORNL. Battelle's Bill Madia met with then-UT President Joe Johnson, and a new enterprise was formed.

### 1999

The lab management contract became available again. UT was ready with a successful bid and partner in Battelle.

### 2000

The US Department of Energy handed UT Battelle the reins to ORNL, in turn sparking dramatic growth, a transformation of the ORNL campus, and firmly cementing ORNL on the global stage.

### 2000-present

Billions of dollars' worth of research has taken place in the intervening years, with the completion of facilities such as the Spallation Neutron Source in 2006 and Cherokee Farm Innovation Campus in 2016 that draw in external users and top scientists from around the world to East Tennessee. Cherokee Farm became The University of Tennessee Research Park at Cherokee Farm in 2018.

### 2006

The UT-ORNL Governor's Chair program is launched, bringing top faculty to the two institutions in joint roles and strengthening key research areas of advanced manufacturing, advanced materials, biological sciences, energy sciences, and urban design.

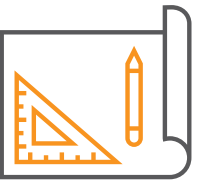
### 2010

The Center for Interdisciplinary Research and Graduate Education is created out of the desire of then-Governor Phil Bredesen to bring UT and ORNL closer together. Named for Bredesen in 2011, the Center initially offers an Energy Science and Engineering doctorate, with a Data Science and Engineering doctorate added in 2017.

## ORNL Collaborations Across UT

### College of Architecture and Design:

The Institute for Smart Structures explores the use of new materials and designs for housing, including such collaborative projects as ORNL's Additive Manufacturing Integrated Energy (AMIE) demonstration that connects a 3D-printed building and vehicle to showcase a new approach to energy use, storage and consumption.



### College of Arts and Sciences:

The Genome Science and Technology program brings UT graduate students in contact with life sciences research and projects at ORNL.



### College of Law:

The Clayton Center for Entrepreneurial Law encourages placements with ORNL to help students gain insight into particular forms of business law related to research.



### College of Veterinary Medicine:

Research Associate Professor Maria Cekanova leads a team in the Department of Small Animal Clinical Sciences' Laboratory of Translational Research and uses ORNL's neutron science capabilities to help study imaging related to cancer treatment and genome therapy.



### Haslam College of Business:

Heath Faculty Fellow Russell Zaretski leads the Data Science and Engineering doctoral program at the UT-ORNL Bredesen Center for Interdisciplinary Research and Graduate Education, among other connections.



### Herbert College of Agriculture, UT Institute of Agriculture:

Several projects related to the development and use of lignin as a renewable carbon and fuel source.



### UT Space Institute:

Many notable projects, including the lightweighting of materials and the development of hypersonic flight have brought ORNL and UTSI closer together.







## Furthering Education

One of the unique ways in which UT helps ORNL and other labs in Oak Ridge is through a continuing education course taught by Heath Fellow in Business and Engineering **Rupy Sawhney**.

Sawhney teaches a cohort of students from ORNL, Y-12, and Pantex, among others, in the realm of bringing best business practices and techniques to what they do as engineers in their particular fields.

Launched in 2011, the classes meet on Fridays on-site in Oak Ridge. Classes are project-based, focused on solving real-world tasks or challenges from the employees' companies, which mutually benefit from the experience.

Participants can also receive PMBOK (Project Management Body of Knowledge) certification, something Sawhney said incentivizes workers because it often leads to higher salaries.

## A Practical Partnership: Neuromorphic Computing



Neuromorphic computing involves developing a computer-based "brain" that can learn and mimic the natural bio-based systems of the human body.

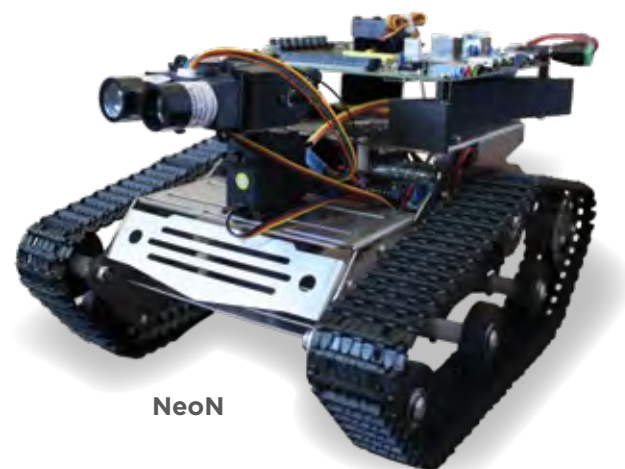
**Katie Schuman** earned her doctorate from UT in 2015 and is now a growing expert on the subject for ORNL. She teamed up with Interim Dean Mark Dean, Professor Jim Plank, and Associate Professor Garrett Rose, all from the Min H. Kao Department of Electrical Engineering and Computer Science and, through the use of ORNL's Summit computer, founded TENNLab, which focus solely on neuromorphic computing.

One of TENNLab's first big breakthroughs was NeoN (NEuromorphic cOntrol for autonomous robotic Navigation), a robot that learns from its mistakes as it navigates, becoming smarter and more efficient along the way, all the while "remembering" what worked and what didn't.

The project holds promise for search and rescue missions, hostage situations, battlefield scenarios—any situation where it would be preferable to use a robot to keep a human out of harm's way. Other work being done through the group includes:

- mrDANNA—a project by Rose that uses memristive technology to develop software that learns
- VLSI and FPGA—both led by Dean, Very Large-Scale Integration is the idea of creating a single chip that holds millions of transistors or other devices, while Field Programmable Gate Arrays are integrated circuits that can be tuned or reprogrammed by the end user
- Optimization—Schuman and Plank have teamed up to push the boundaries of large-scale computing through the most optimal developments

Currently, two student groups are working on new neuromorphic robots that build on the concepts of NeoN using the next generation of neuromorphic architecture: GRANT, built by Jonathan Ambrose and Adam Foshie, and SABR, built by Alec Yen and Yaw Mensah.



NeoN



## Green Energy: One Goal, Many Paths

The quest to find and refine the best source of "green energy" is a journey going on in labs around the world. UT's partnership with ORNL is bringing many areas of expertise together to allow all of the separate possibilities to take place at the same time, often with overlap between disciplines.

Take biofuels, for example. UT and ORNL grow the plants from which the fuel is derived, converting it into the fuel itself while producing hydrogen peroxide as the sole waste product. The leftover plant lignin is used as a source for carbon fiber, all while advancing battery membranes, output, and durability.

Nuclear energy, which also has a zero-carbon footprint, is another area where UT and ORNL have clear expertise. The two share experts in every facet of nuclear energy production, including the study of new, high-end materials better capable of withstanding the tremendous forces within reactors, figuring out how materials respond to massive doses of radiation, maintaining the upkeep and efficiency of reactors, and ensuring the process is secure from acts of war or terror.

## UT-ORNL Governor's Chair Program Benefits Society

The UT-ORNL Governor's Chair program is perhaps the single best example of the close bond that UT and ORNL share.

Begun in 2006 at the behest of then-Tennessee Governor Phil Bredesen, the program was conceived as a way to more closely ally the prowess of ORNL with the academic strengths of UT, with the goal of an academic, economic, and scientific catalyst for East Tennessee.

An example of how the program benefits the state and general public can be found by looking at the work of **Terry Hazen**, UT-ORNL Governor's Chair for Environmental Biotechnology.

Hazen is working to ensure the environment is made safe for humanity through cleanup of toxic sites, studying water runoff and its effect on water quality, or by helping prevent environmental accidents.

The impact of his work is both far-reaching and personal, with a recent project impacting people across the South who depend on the Tennessee River for drinking water, agriculture, business, and recreation. Hazen and his team identified several superfund sites along the river and its tributaries that could pose potential health risks for millions.

By developing methodology that predicts not only which sites were potential hazards, but also exactly how contamination from the sites would spread downstream, Hazen and his fellow researchers were able to provide vital information to help agencies identify potential risk areas and prepare for any negative scenarios, thus protecting the livelihoods of those who depend on the waterway.

While it's just one project among many being led by the 14 current Governor's Chairs, it illustrates the broad impact the program is having on both institutions as well as society in general.





## In Their Words:

Students describe the Bredesen Center experience

As yet another joint venture between UT and ORNL, the Bredesen Center for Interdisciplinary Research and Graduate Education serves as one of the primary routes through which UT graduate students interact with the national lab.

The center, directed by UT-ORNL Governor's Chair for Advanced Manufacturing **Suresh Babu**, currently has 100 students pursuing its Energy Science and Engineering (ESE) program and another 21 in the newer but growing Data Science and Engineering (DSE) program, with 69 graduates from ESE to date.

Here are reflections from two current students, in their own words.



**Ishita Ray**, ESE doctoral candidate

**Faculty supervisor:** Min H. Kao Professor  
Leon Tolbert

**Research:** Distributed Energy and  
Grid Management

I found out about the Bredesen Center from an ORNL booth at a Georgia Tech Career Fair while looking for internship options during my time as a master's student.

The fact that the work with the center is both interdisciplinary and multidisciplinary makes it a unique offering. It is the perfect program for those who may want to pursue non-traditional roles outside of industry and academia.

Through the center, I am working on microgrid controls research at CURENT and with the Min H. Kao Department of Electrical Engineering and Computer Science. I have also been able to take policy courses and participate in related projects that may not be available to doctoral students outside the center.

Most doctoral students at UT cannot be involved in research projects outside of UT, at least full-time. The center makes it easier to work at ORNL and study at UT. This system is especially helpful for ORNL staff who enroll in the program and don't want to make a big transition.

If I wanted people considering the program to know one thing, it would be telling them about the freedom and flexibility to pick courses, especially in the knowledge-breadth area. The center is very supportive when it comes to extracurricular activities and also allows students to take time to find the right advisor. And, unlike other programs, students can find advisors after they have started the program.

Through the center, you gain access to policy projects and experts that may not have been encouraged otherwise. Because the center is multidisciplinary it prevents students from feeling siloed and isolated, and builds a strong sense of community.



**Reed Wittman**, ESE doctoral candidate

**Faculty supervisor:** UT-ORNL Governor's Chair for  
Electrical Energy Conversion and Storage  
Tom Zawodzinski

**Research:** Energy Conversion and Storage

I did an internship at ORNL working on carbon fiber, and the recruiter and people I worked with at ORNL also recommended the Bredesen Center and I thought it sounded interesting.

Having the opportunity to work with people both at UT and ORNL and the ease at which you can work at ORNL if you want to makes it different than most programs. Also, the educational backgrounds of other students are remarkable. There's a wonderful variety of people gathered together in this program and you get to interact with a lot of people you would not normally interact with and really get to know what they do. I probably would not be working with my advisor on the project I am now without the Bredesen Center, as he is in a different department from what I would have applied to at UT.

Through the center, I work on zinc-air batteries. I focus on the zinc electrode, trying to understand the fundamental reactions and processes and then use that information to improve the design of the electrode to improve the lifetime and performance of the battery.

Because of the center, I have easier access to the unique facilities and personnel at ORNL than most. I primarily work at ORNL and have done so since my classes finished, but I conduct a number of experiments at UT as well. Each location has people and equipment that the other does not, and together it allows me to do the experiments I need to do very easily.

Having said that, this is not for everyone. You have to make your own path in terms of courses and finding the right advisor and fit. It can be really hard to do that and deal with the uncertainty of what is the right decision. That being said, I still feel this was the right program for me and I'm glad I chose this program.

It is certainly unique to UT, and I don't know if there is something else like it at another university. What it really did was get me to ponder other options when considering what I wanted to research. That's more than a standard disciplinary track program would have done.





## Best of Both Worlds:

### Partnership Benefits from Joint Appointments

**David Mandrus**, the Jerry and Kay Henry Endowed Professor in UT's Department of Materials Science and Engineering, is one of the world's most cited researchers. He's also an example of a key component of the UT-ORNL partnership: joint appointments. Mandrus recently discussed some benefits of the arrangement.

#### What is the biggest benefit of holding a joint appointment with UT and ORNL?

"Holding a joint appointment allows me to help develop students on the university side while pursuing high-level research at ORNL. In turn, being able to do cutting-edge research at ORNL helps me bring new ideas and methodology to the university, which helps students grow."

#### What are some other advantages?

"The advantage of working at a university is that you get to work with, help shape, and learn from the next generation of scientists and engineers. The biggest benefit of working at a national laboratory is that you are exposed to and challenged by some of the leading minds in science, which is incredibly stimulating intellectually and helps one stay abreast of the latest developments in rapidly moving fields like quantum materials."

#### Are joint appointments a draw for faculty and researchers to come to this area?

"Without a doubt. For the reasons we've discussed, having the chance to work with students while also having access to one of the world's most renowned labs is an incredible opportunity for both faculty and their students."

#### What kind of research do you conduct, and how does being a joint appointee affect that?

"My main focus is on the design and discovery of new materials with novel and often unexpected properties. One of my current interests is the discovery of materials known as Kitaev quantum spin liquids. These materials are predicted to possess emergent quasiparticles known as Majorana Fermions. Such materials could potentially revolutionize quantum computing. As neutron scattering is essential for the characterization and understanding of Kitaev materials, it is obviously a huge advantage to be next door to some of the top neutron scientists in the world as well as some of the best facilities in the world such as the Spallation Neutron Source."

#### How does your joint appointment benefit students?

"Having access to a national lab in addition to a university is extremely beneficial for students. I strongly believe that, in order to get the best educational experience possible, students should interact with the world-leading experts at ORNL. Such interactions give students a new and far more accurate perspective on science."



# Female Engineers Take the Lead

By Élan Young and Randall Brown. Photography by Randall Brown.

Around two thirds of the college’s student organizations are currently led by women who bring dynamic, fresh approaches to their leadership roles. They gain experience in collaboration, strengthen their Volunteer community, and, through outreach, inspire younger women with confidence for their own STEM careers. Here, four of these 2018–2019 leaders offer their personal take on how it all fits together.

Alumni, if you’re interested in getting involved with these or other UT engineering student organizations, visit [tickle.utk.edu/student-organizations](http://tickle.utk.edu/student-organizations).



**Kendra Jackson**  
*CEE senior, NSBE President*

Jackson joined the UT chapter of the National Society for Black Engineers (NSBE) her freshman year.

“Being an out-of-state student, I felt like it was a great organization to meet other students who look like me

and are also on the journey to get their engineering degrees,” she said. “The chapter has such a family-oriented atmosphere that I became friends with so many people and learned how to move forward academically.”

Originally from Cincinnati, Ohio, Jackson graduated valedictorian of her high school. After a high school summer internship with Greater Cincinnati Water Works, she gained exposure to public utilities, which inspired her to choose civil engineering as a major.

“I participated in the program for the next two summers, working at the Metropolitan Sewer District of Greater Cincinnati,” she said. “My mentor here was a black woman named April Norman. She praised my work ethic and encouraged me to pursue a career in engineering. It was awesome to see a black female excelling as an engineer, and she—along with my family—let me know that I could do the same.”

Once at UT, Jackson was identified as a natural leader. She became NSBE’s TORCH chair her sophomore year. As a junior, she served as programs chair and planned everything from general body meetings to NSBE’s Volunteer Networking Event where company reps network with students the night before the Engineering Expo.

As a senior, Jackson realized being chapter president would allow her to implement new beneficial ideas. She guides the chapter’s goals and vision and helps other officers plan events for the chapter.

“My goals for this school year are to expand NSBE’s presence on campus, grow our chapter professionally so that we are prepared for internships, co-ops, and for full-time employment when we graduate, and lastly, I want to increase our involvement in the Knoxville community and possibly start a NSBE Jr. chapter,” she said.

**Laura Ferrer**  
*CEE senior, SHPE President*

Ferrer joined UT’s chapter of the Society for Hispanic Professional Engineers (SHPE) as a freshman and has never looked back. Born in Barranquilla, Colombia, she moved to the US at age seven and now calls Martin, Tennessee, home.

“I learned about engineering in middle school,” she said. “I chose to study civil engineering because I recognized my love for math and science, as well as my love for designing and constructing projects assigned to me in class.”

Since joining SHPE, Ferrer has received support to help her complete a co-op, two research programs, and a study abroad experience.

She has served as SHPE’s vice regional student representative for the Tennessee and Alabama chapters, and continues to “lean on SHPE to succeed.” Now as president, Ferrer works to reciprocate the support she received as a young student.

“Personally, I like to make connections with my board and members, advising students through hurdles and helping them develop as people and students,” she said. “I might not always have all the answers, but I will at least point them to the direction of someone who does.”

SHPE meetings this semester included speakers from Proctor and Gamble, Norfolk Southern, and International Paper. The group also gets together for socials and hosts Engineers Day events.

In November, Ferrer and other board members traveled to the SHPE National Conference in Cleveland, Ohio, to learn about research, internship, co-op, and full-time positions while attending informative breakout sessions catered specifically to them.

“We support and help each other through our years of school and stay in contact after we graduate,” she added. “In fact, during our first general body meeting, we Skype called two of our alumni.”

At the end of the day for Ferrer, the group is family, or “familia,” as she calls it.



**Kalie Knecht**  
*ME senior, SWE President*

As a high school senior, a coal-cleaning chemical spilled into the Elk River upstream from Knecht’s hometown of Charleston, West Virginia.

“Thousands of people in the region were advised to not use their tap water for two weeks, which is not what modern life should be like in a developed country,” said Knecht. “Because nuclear energy is a great alternative to coal, the spill—along with my fascination for nuclear physics—influenced me to pick nuclear engineering as my major.”

She initially joined the Society for Women Engineers (SWE) to make friends and destress from classes, but sought a leadership role after completing her first co-op.

“After a year of seeing what it is like to be a woman in the engineering work force, the importance of SWE’s mission became apparent to me,” said Knecht. “I wanted to directly influence our section to better prepare women to enter their first jobs after graduation.”

Knecht strives to share the importance of teamwork, leadership, and communication skills that strengthen the career path for fellow students. SWE’s largest effort in this regard is SWEeties, a program designed to improve the retention of female engineering students through continuous mentoring, networking, and professional development training. They won an award for SWEeties at WE18, the 2018 national SWE conference.

“Incoming engineering students are paired with upperclassmen and they meet up throughout the semester to complete goals,” said Knecht. “This program has a twofold effect of letting mentors and mentees feel like competent professionals, but also allowing them to feel included by finding a friend within SWE.”



**Maria Lafond**  
*ME senior, Tau Beta Pi President*

Lafond chose to pursue mechanical engineering because she enjoys challenges that inspire her to find creative solutions. Likewise, the Knoxville native became president of Tau Beta Pi, the engineering honor society, to increase her level of campus engagement and gain leadership experience.

“Before I became president, I was involved by participating in committees, community service, and chapter events,” said Lafond. “I saw areas where the chapter could grow even more and succeed.”

Lafond and Vice President Evan Newell attended the Tau Beta Pi National Convention in fall 2018.

“Two big takeaways from the convention included our chapter receiving a Chapter Project award for the variety and quality of our events/projects, and that Knoxville and our chapter will be hosting the 2021 National Convention.”

In the meantime, Lafond and team seek to increase the UT chapter’s profile and visibility to current and future students. Tau Beta Pi membership represents all engineering majors.

“We also plan to keep service a priority by participating in community service events as a group, such as volunteering at the Tennessee Science Bowl and Science Olympiad,” she said. “We are planning various social and networking events amongst our chapter and with the local alumni chapter.”

Tau Beta Pi’s MindSET program also takes them into the Knoxville community once a month to promote STEM among K-12 students via hands-on activities and science presentations.



## Other female 2018–2019 student organization leaders include:

**Emily Diehl**, Engineering Ambassadors

**Camille Bergin**, American Institute of Aeronautics and Astronautics

**Jillian Newmyer**, American Nuclear Society

**Jenna Williams**, American Society of Ag and Biological Engineering

**Maria Bruce**, American Institute of Chemical Engineers

**Lauren Desjardins**, Biomedical Engineering Society

**Megan Pitz**, Engineering Mentor Program

**Maeve Lawniczak**, Institute of Electrical and Electronics Engineering

**Lucy Hayes**, Institute of Industrial and Systems Engineering

**Brianna Musico**, Materials Research Society

**Savannah David**, Pi Tau Sigma ME Honor Society

**Natalie Wieber**, SLOPE

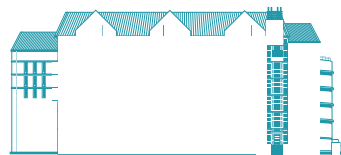
**Mihaela Dimovska**, Systems: Women in EECS at UTK

**Casey Gredzieleski**, Theta Tau

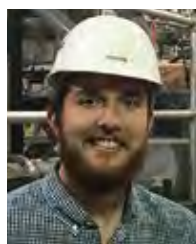
**Madelynn Allison**, Women in Industrial and Systems Engineering

**Amanda Bachmann**, Women in Nuclear





# Student Notes



**Jonan Duran** (NE, PhD) was recognized by the American Nuclear Society for his outstanding research. His paper, entitled “Multiple Analytical Approach to Isotopic Transport Analysis in Magnetic Fusion Devices,” won Best Paper at the Technology of Fusion Energy conference.



**Tyler Bennett** (CBE) had the honor of his article, “Jolly Green MOF: Confinement and Photoactivation of Photosystem I in a Metal-Organic Framework,” being selected as the inaugural cover of the journal *Nanoscale Advances*. The article co-authors are Michael D. Vaughn, **Seyyed Ali Davari**, Kiman Park, **Dibyendu Mukherjee**, and **Bamin Khomami**.



**Nikhil Jagirdar** (ISE, '18) and **Pradeep Velur Rajashekaran** (ISE, '18) received first place in the Data Analytics & Information Systems Division Mobile

App Competition at the IISE Annual Conference in Orlando, Florida, in May for Speak for Myself®.



A team of UT students, including MABE seniors **Connor Barnhill** and **Robert Nickle**, has been accepted into the SpacePort America Cup Competition this June. The three-day event will be held in Las Cruces, New Mexico, along with a conference, field tests, launches, and an awards ceremony. UT's team is looking to launch a rocket that will carry a payload to study microbes at high altitudes.

**Shawn Zamperini** (NE) earned Best Presentation at the 2019 ITER International School in Korea in January. The unique award is an engraved section of the superconductor used in ITER, a multinational nuclear fusion experiment underway in France.



A team of engineering students took first place in the Academic Technology Bowl at the National Society of Black Engineers Fall Region 3 Conference in November. This is UT NSBE's first win in this competition. The team included **Kendra Jackson** (CEE), **Mubuso Nkosi** (CBE), **Kassidy Bone** (MABE), **Hunter Mann** (EECS), **Shannon Sharpe** (MABE), and **Talecia Dyson** (CEE). Thanks to their win, they moved on to compete at the national convention in late March where they placed third—the team's highest ever finish at this event.



UT's YNOT competitive robotics team received the prestigious Community Award at the 2018 Vex Robotics World Championships. The honor is presented to the university-level team that demonstrated the most meaningful leadership and influence toward promoting STEM education in their local community. YNOT currently travels across the state to mentor young teams to serve as judges and referees at middle and high school Vex competitions. The team includes **Clare Remy**, **Grant Kobes**, **Westena Anderson**, **Craig Wiley**, **Buddy Swan**, and **Chris Cannon**.



**Ali Boggs** (CEE, PhD) was honored by the Collaborative Sciences Center for Road Safety at the Council of University Transportation Center's 28th Annual Outstanding Student of the Year Awards Ceremony. Boggs's research includes examining self-driving vehicle crashes and disengagements and commercial vehicle parking shortage.

**Jared Smith** (EECS) earned first place in the Applied Research Competition at CSAW 2018, considered the largest student-run cyber security event in the world. He presented the paper, co-authored with EECS Assistant Professor Max Schuchard, titled “Routing Around Congestion: Defeating DDoS Attacks and Adverse Network Conditions via Reactive BGP Routing.”



**Robert Minneci** (MSE, PhD) was recognized with a poster award at the Manufacturing and Materials Joining Innovation Center (Ma2JIC) Industrial Advisory Board meeting at The Ohio State University in January. Minneci's presentation, “Characterization of SLM GRCop-84 by Neutron Scattering: Loading,” tied for second place.



**Cliff Hawkins** (MBA/MSE, '18) was awarded UT's Spirit Award in December. The award is given to the MBA graduate who has contributed most to the success of the MBA teams of which this person was a member. Hawkins was selected by his peers to recognize his work to create a collaborative environment and ability to motivate and inspire a team to achieve its goals.



**Madison Allen** (NE) was named the 2018-19 recipient of the American Nuclear Society's Hans P. Loewen Memorial Scholarship. Scholarships are granted to student members of ANS who demonstrated a high commitment to the standards set by the society.



# Faculty Notes



Dongarra Professor **Michela Taufer** (EECS) will receive a 2019 IBM Faculty Award for \$20,000. This highly competitive award recognizes her leadership in high-performance computing and its importance to the computing industry. Taufer will lead work with IBM to bring the IBM Onsite Deep Learning Workshop to campus.



Professor **Lynne Parker** (EECS) has been selected as a 2018 American Association of Science Fellow for her work as a leading researcher in robotics and for her distinguished professional service. Parker is now the 32nd faculty member at UT so honored, and the 10th from the college. She is currently serving as assistant director for artificial intelligence for the White House Office of Science and Technology Policy.



Associate Professor **Andrew Yu** (ISE) was selected as president elect of the Data Analysis & Information System Division of IISE. The division brings together members concerned with the cost-effective utilization of computer technology.



Postelle Professor and Department Head **Wes Hines** (NE) gave a talk at the 2019 Conference on Nuclear Training and Education entitled “The Transformation of a Nuclear Engineering Department.” Hines outlined the decade-long process of turning the department into the largest nuclear engineering PhD program in the country using strategic processes. He was also appointed general chair of the organization's next conference in 2021.



Professor **Hans DeSmidt** (MABE) is part of the Revolutionary Vertical Lift Technology (RVLT) Advanced Propulsion Team that received the prestigious NASA Agency Honor Award. The team was recognized at the 2018 Agency Honor and Center Awards Ceremony in September.



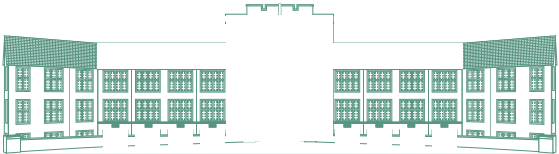
Professor **John Schwartz** (CEE) was named director of the Tennessee Water Resources Research Center, one of 54 state water resources research institutes of the National Institutes of Water Resources.





Henry Professor **David Mandrus** (MSE) and UT-ORNL Governor's Chairs **Terry Hazen** (CEE) and **Arthur Ragauskas** (CBE) were selected by Clarivate Analytics as being among the world's most cited researchers for 2018. While the methodology Clarivate uses is fairly complex, it results in a list of the top 1 percent of researchers in a given field.

Professor **Michael Simpson** (MSE) was inducted as a 2018 fellow of the National Academy of Inventors. The acknowledgment comes for his work in biosensors and nanotechnology.



## Alumni Notes



**Suzanne Roat** (MS/ChE '87, PhD/ChE '91) retired in August after a 20-year career at Chevron. During that time, Roat served as both an optimization engineer and senior commercial advisor, among other roles. She is currently the president of Suzanne Roat Consulting, providing strategy and supply chain optimization advice across the crude oil sector.



**Thomas Magette** (BS/NE '77, MS/NE '79) has been promoted by Talisman International to the position of president. Magette joined Talisman as a consultant in 2017 and had then taken on the role of director for strategic development and operations earlier this year. He brings more than 40 years of experience managing and conducting work in the nuclear industry, both commercial and federal.



**Dara Eckerle-Mize** (BS/BME '04, MD '08) recently received the TODE (Technology, Organizational Development, and Evaluation) Award from the Department of Biomedical Informatics at Vanderbilt University Medical Center. Mize is currently an assistant professor of medicine in the division of diabetes, endocrinology, and metabolism as well as an assistant professor of biomedical informatics.

Professor **Mark Balas** (UTSI) received the 2018 AIAA Aerospace, Guidance, Navigation, and Control Award, considered a lifetime achievement, for his sustained excellence in developing the frontiers of theory and practice in advanced adaptive control systems.

Associate Professor **Xueping Li** (ISE) was named a fellow of UT's Center for Transportation Research for the 2018-19 academic year. Li also currently serves as president of the Modeling & Simulation Division of IISE.

The National Science Foundation recently announced support for a variety of studies aimed at understanding Earth's biodiversity, including a project led by UT-ORNL Governor's Chair for Microbiology and Civil and Environmental Engineering, **Frank Loeffler** (CEE). He is researching the role of microbes in controlling emissions of nitrous oxide—also known as laughing gas—from the ground.

**Graham Taylor** (BS/BME, '07, MS/BME '15, PhD/BME '16) and **Nima Tamaddon** (BS/ME '11, MS/ME '15, PhD/ME '16) are the founders of T&T Scientific, a company that makes tools and devices to help scientists and researchers more effectively and efficiently develop and utilize nanoparticles, known as liposomes. They recently partnered with UTRF to license their patent pending cell membrane measurement system in order to begin developing and marketing the system.

**Nair Flores** (BS/ES '01) was recognized as a 2018 Women Leaders in Tech Law by *the Recorder* in November. *The Recorder* recognizes lawyers for their outstanding work with technology companies and tech-related issues. Flores lives in the San Francisco Bay Area and serves as the senior director of the intellectual property legal team at Lyft.



**John Tickle** (ISE, '65) was named chair of the UT Board of Advisors as part of the group's first meeting in January. The board will advise the chancellor and create communications related to the budget, tuition, and other campus policies.

The National Academy of Construction elected **Mark Cox** (BS/ChE '89) a member of its class of 2018. Cox, a senior vice president at Eastman and a member of the college's Board of Advisors, joined 36 others in the class who were selected from more than 300 leaders.



# Print a Plane (and fly it, too)

By Laura Tenpenny. Photography by Shawn Poynter.

"We did an electro-optical mount that was one of our most challenging pieces to date. That part should be flying sometime next year," said Jonaaron Jones (BS/MSE '13, MS/MSE '15).

This piece and others like it, produced at Jones's Knoxville business Volunteer Aerospace (VA), represent the great trust that a growing number of aerospace industry giants have put in Jones and his relatively new company.

VA has made a name for itself in additive manufacturing, 3-D printing metal parts for major aerospace corporations and the defense industry. This advanced manufacturing process makes possible complex geometries and specs and significantly reduces the amount of time and energy taken to produce these parts compared with traditional manufacturing methods.

Recently, VA has expanded into manufacturing primary plane parts. These primary pieces are essential to a plane's operation and therefore require the utmost accuracy and reliability. This area is where VA excels and why Jones has had such exponential growth since starting up in 2017.

**"Additive manufacturing has garnered the respect of the industry, and now we're able to print these essential plane parts. Having that level of trust with a company, that they trust your process enough to go fly with it, that's big,"** said Jones.

Jones founded Volunteer Aerospace at the close of a Defense Production Act Title III program focusing on 3-D printing liquid rocket engine components held in partnership between UT, ORNL, and Aerojet Rocketdyne. The program runs through the US Department of Defense and provides immediate resources to government defense and security entities through domestic, industrial operations.

Jones's love for metalworking began when he was a teenager. He attended Oak Ridge High School where he was part of its robust welding program. After graduating, he went into the workforce, gaining industry experience.

"This led to where I am today. I wouldn't change it if there had been the option to go straight to school," Jones emphasized.

That metallurgical background gave him the context to recognize his interest in additive manufacturing during his time at UT studying Materials Science and Engineering. He began working at ORNL's



Manufacturing Demonstration Facility through the lab's partnership with UT for his graduate studies, learning on the very printer that he would later purchase to start his business.

He credits his venture into additive manufacturing to his graduate advisor and one of his most influential professors, UT-ORNL Governor's Chair Suresh Babu, who encouraged him to see what was happening at ORNL.

"Up to that point I had just seen the polymer stuff, you know, at-home plastics. It wasn't that exciting. Then I went to ORNL and saw their metal additive machines that print metal parts. That's kind of when it clicked that it's what I wanted to do" said Jones.

Over its two years of operation, VA has grown from one 3-D printer to three, with plans to bring on two more pieces of metal additive equipment in 2019. According to Jones there are only about ten additive manufacturing shops like theirs in the country, so work is fairly steady. Jones anticipates it will continue to burgeon.

"We plan to stick primarily with just 3-D printing of metals, and we're looking to build our own facility. Once we have that, we want to focus on full-value chain, a one-stop shop for our customers. We want to print the part, post-process, machine, assemble, and deliver it. That's the goal for the next five years, to get to that point," said Jones.

Judging by the pace at which VA has grown, Jones's vision for the future may take off more quickly than expected.



# ENGINEERING DIVERSITY PROGRAMS 45<sup>TH</sup> ANNIVERSARY CELEBRATION

## **45 Years of Community Excellence:** *A Celebration of Continuing Growth*

More than 150 people turned out Friday, November 2, 2018, for a gala celebrating the 45th anniversary of Engineering Diversity Programs (EDP) at the Tickle College of Engineering.

Using the theme “45 Years of Community Excellence: A Celebration of Continuing Growth,” the event took place at the Foundry at World’s Fair Park and drew alumni from across the years, as well as faculty, staff, and students for a day celebrating the office, its impact, and the successes yet to come.

“This was a good way for us to get together and talk about some of the things this office has meant,” said Director Travis Griffin. “It serves to connect current students with alums that came before them.”

As part of the ceremony, the director’s position that Griffin holds was renamed the Fred D. Brown Jr. Director in honor of Brown, who pioneered engineering diversity efforts at UT.



Travis Griffin and Interim Dean Mark Dean



Alumni Dwight Hutchins, Rodney Brooks, and Cavanaugh Mims



(L-R) Alumni Linda Gouto, Melanie Smith, DeAnna Walker, Sierra Ellis, Travis Griffin (director), Imani Jackson, Cullen Johnson, Nathaniel Ige, Elvis Ofor, Daniel Caballero, Jasmine Worlds, and Brandon Lowe.

JOIN  THE  
JOURNEY

Join Jaqueria.  
**Join the Journey.**

[tickle.utk.edu/campaign](http://tickle.utk.edu/campaign)

“When you step foot on UT’s campus, the opportunities are endless, you just have to look for them. I have taken advantage of the Engage Living & Learning Community, the Minority Engineering Scholars program, the National Society of Black Engineers, and Intercollegiate Summer Bridge. These programs helped form me into a successful college student and grew my professional skills. Receiving the Fred D. Brown Jr. Engineering Scholarship is an honor that is allowing me to fulfill my educational goals, focus on my future career, and worry less about financial expenses. I am highly appreciative to my award donors.”

—Jaqueria Stout, Fred Brown Scholar, Fall 2018.



# Campaign Continues its Successful Journey

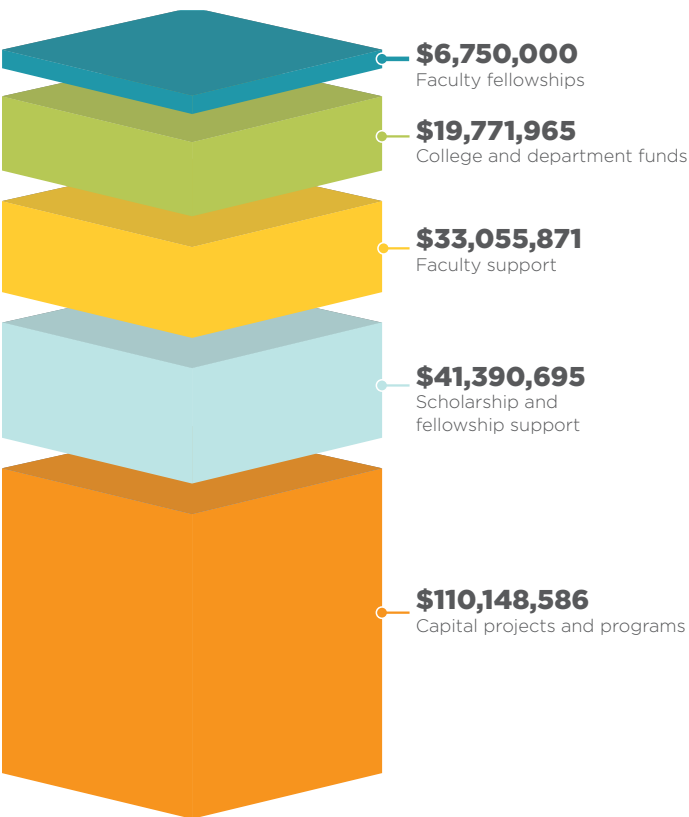
When the University of Tennessee launched the Join the Journey fundraising campaign at the start of 2012, the Tickle College of Engineering established a goal of \$150 million—funds that were planned to invigorate the college, expand facilities, provide student scholarships and faculty support, and cement its place as a driving force for education and research at UT and beyond.

In 2017, the college surpassed its goal three years early and extended its aim to \$200 million with an end-of-2021 deadline. That goal has now also been surpassed, with more than \$211 million raised.

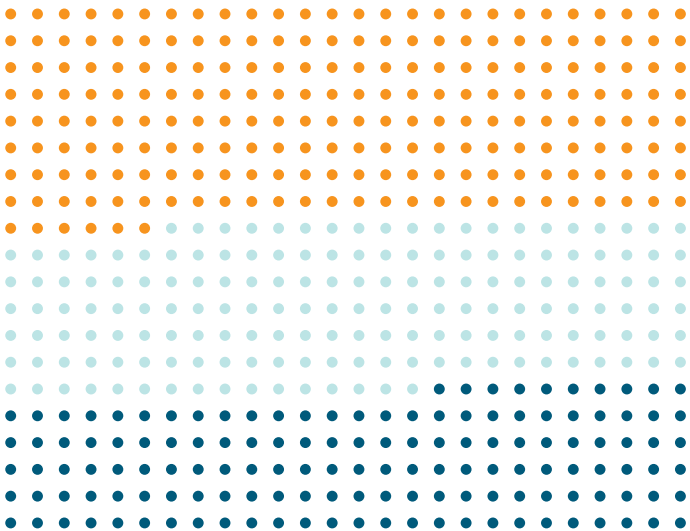
Included in this remarkable run of success are the addition of three buildings, with a fourth in the construction phase, the creation of new initiatives and programs, and the naming of the college itself.

As the campaign marches on, here is a look at what has been raised, where funds have gone, and how they have transformed the college.

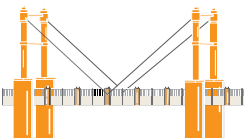
### Campaign Support



### Fellowship and Scholarship Support



- 214 Gifts toward scholarships or fellowships
- 166 Faculty support donations
- 140 Student support donations



3

New buildings opened



10

Newly created awards



40%

Increase in number of alumni donors



- 4 Named professors of practice
- 17 New endowed positions
- 41 New faculty

## In Memoriam

- Edwin F. Abercrombie** (BS/CS '75), July 11, 2018.  
**Donald Harrison Allen** (BS/ChE '61), January 28, 2019.  
**Jerald "Jerry" C. Armstrong** (BS/EE '66), December 9, 2018.  
**Rufus Dean Ault** (BS/EE '49), January 15, 2019.  
**Thomas Michael Bishop** (BS/ME '82), January 8, 2018.  
**William Joseph Blackburn** (BS/EE '60), September 25, 2018.  
**Zack B. Bolt** (BS/ChE '67), December 14, 2018.  
**William "Perk" Cooper** (MS/ME '82), February 2, 2019.  
**Walter Griffith Davies Jr.** (BS/IE '53), January 15, 2019.  
**Margaret Drake** (BS/ME '59), October 4, 2018.  
**Kenneth Bishop Garner Sr.** (BS/ME '51, MS/ME '68), November 14, 2018.  
**Jesse Gibbs** (BS/EE '50), September 24, 2018.  
**Rhonda Gayle Nutt Goble** (BS/EE '93), September 30, 2018.  
**Joseph Leak Haymore** (MS/IE '85), November 26, 2019.  
**Gene Holthofer** (BS/ME '48), December 6, 2018.  
**Robert Allen Hummel** (BS/ME '67), October 2, 2018.  
**David A. Jenkins** (BS/CS '86), January 29, 2019.  
**Robert Gaines Lee Jr.** (BS/ChE '62), February 16, 2019.  
**Richard Felix Maas** (BS/ME '68), December 5, 2018.  
**Edwin A. McDougale** (BS/CE '69, MS/CE '75), January 23, 2019.  
**Samuel E. McGowan** (BS/ME '69), January 13, 2019.  
**Robert Metzger** (BS/NE '66), August 10, 2018.  
**Michael Andrew Montgomery** (BS/EE '80), January 8, 2019.  
**Edwin Shipman Morgan** (BS/EE '59), January 24, 2019.  
**John Clifton Moyers** (BS/ME '52), January 12, 2019.  
**James Leeland Patton** (BS/ChE '54), May 26, 2018.  
**Billy Campbell Pierson** (BS/ME '58), September 27, 2018.  
**Frank Martin Pugh** (BS/IE '68), January 20, 2019.  
**George F. Ritchie** (BS/ME '59), October 26, 2018.  
**Julian "Jimmie" Roadman** (BS/EE '58), January 24, 2019.  
**Dearl Johnson Roberts** (BS/EE '55), November 3, 2018.  
**Allan M. Robinson** (BS/ME '55), September 30, 2018.  
**Joe Wilson Simmons** (BS/EE '62), October 5, 2018.  
**Charles Edward Sprinkle** (BS/IE '59), January 21, 2019.  
**John Leonard Stephens** (BS/IE '59), November 27, 2018.  
**Phillip Rogers Taylor Sr.** (BS/EPH '63), December 8, 2018.  
**Hilton Allen Tunnell** (BS/ME '50), September 28, 2018.  
**Henry Park Tyler** (BS/ME '57), May 5, 2018.  
**Thomas H. Wood** (BS/ChE '60, MS/ChE '61), October 7, 2018.  
**Steven F. Yaros** (PhD/AE '77), September 27, 2018.

## Dan Doulet 1927-2018



The college and Department of Industrial & Systems Engineering lost a longtime figure last October, when former Professor and Department Head Dan Doulet passed away at the age of 91.

A native of Cocoa Beach, Florida, he earned his bachelor's from the University of Florida in 1947 before earning his master's at UT in 1953.

He returned to the college as a professor in 1957, serving as department head from 1970 through 1976 before rejoining the faculty. Doulet retired from UT in 1992.

He was selected for the department's inaugural Hall of Fame class in 2016.

Outside the classroom, his prowess in industry led to the creation of multiple businesses, including American Accessories Incorporated and Dunlap Industries Inc.

He is survived by his wife of 69 years, Katherine Johnston Doulet, his son Clayton Joseph Doulet, and brother, Louis Durwood Doulet.



114 Perkins Hall  
Knoxville, TN 37996  
865-974-0533  
[tce@utk.edu](mailto:tce@utk.edu)  
[tickle.utk.edu](http://tickle.utk.edu)

 [utk.tce](https://www.facebook.com/utk.tce)

 [@utk\\_tce](https://twitter.com/utk_tce)

 [@utk.tce](https://www.instagram.com/utk.tce)

 [linkedin.com/schools/utk.tce](https://www.linkedin.com/schools/utk.tce)

Non-Profit Org.  
US POSTAGE  
**PAID**  
Permit No. 481  
Knoxville, TN

All qualified applicants will receive equal consideration for employment and admission without regard to race, color, national origin, religion, sex, pregnancy, marital status, sexual orientation, gender identity, age, physical or mental disability, genetic information, veteran status, and parental status. In accordance with the requirements of Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act of 1990, the University of Tennessee affirmatively states that it does not discriminate on the basis of race, sex, or disability in its education programs and activities, and this policy extends to employment by the university. Inquiries and charges of violation of Title VI (race, color, and national origin), Title IX (sex), Section 504 (disability), the ADA (disability), the Age Discrimination in Employment Act (age), sexual orientation, or veteran status should be directed to the Office of Equity and Diversity, 1840 Melrose Avenue, Knoxville, TN 37996-3560, telephone 865-974-2498. Requests for accommodation of a disability should be directed to the ADA Coordinator at the Office of Equity and Diversity. A project of the Tickle College of Engineering. PAN E01-1301-013-018-19 Job 372964.

# Rhodes Less Traveled.

**Meet UT's eighth Rhodes  
Scholar, the college's first.  
Page 12.**



*Photo by Steven Bridges*