

ENGINEER

THE UNIVERSITY OF TENNESSEE, KNOXVILLE • COLLEGE OF ENGINEERING

The University of Tennessee to Lead \$259 Million National Composites Manufacturing Institute

UT Vice Chancellor for Research Taylor Eigmy (right) and COE Governor's Chair in Advanced Manufacturing Suresh Babu (left) were the principal investigators for the proposal that led to UT's leadership of the Institute for Advanced Composites Manufacturing Innovation (IACMI).



President Barack Obama (right) and Vice President Joe Biden (left) announce UT's leadership of IACMI at the Techmer PM plastics fabrication company in Clinton, Tennessee, in January 2015.



THE UNIVERSITY OF
TENNESSEE
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COLLEGE OF ENGINEERING

Contents



1 Dean's Message



2 The Institute for Advanced Composites Manufacturing Innovation Boosts College of Engineering's Profile



6 Faculty Updates

12 Faculty Focus: Dr. Gong Gu

14 Student News

18 Research Updates

20 Special Feature: The Carnegie Community Engagement



22 Research Center Feature: The Reliability and Maintainability Center

24 Development Update

26 Diversity Update



30 Alumni News

30 Memorials



32 Events & Awards

33 Alumni Awards Dinner Recognitions



35 Engineers Day

36 Student and Donor Appreciation Luncheon

37 Halloween Spirit Challenge

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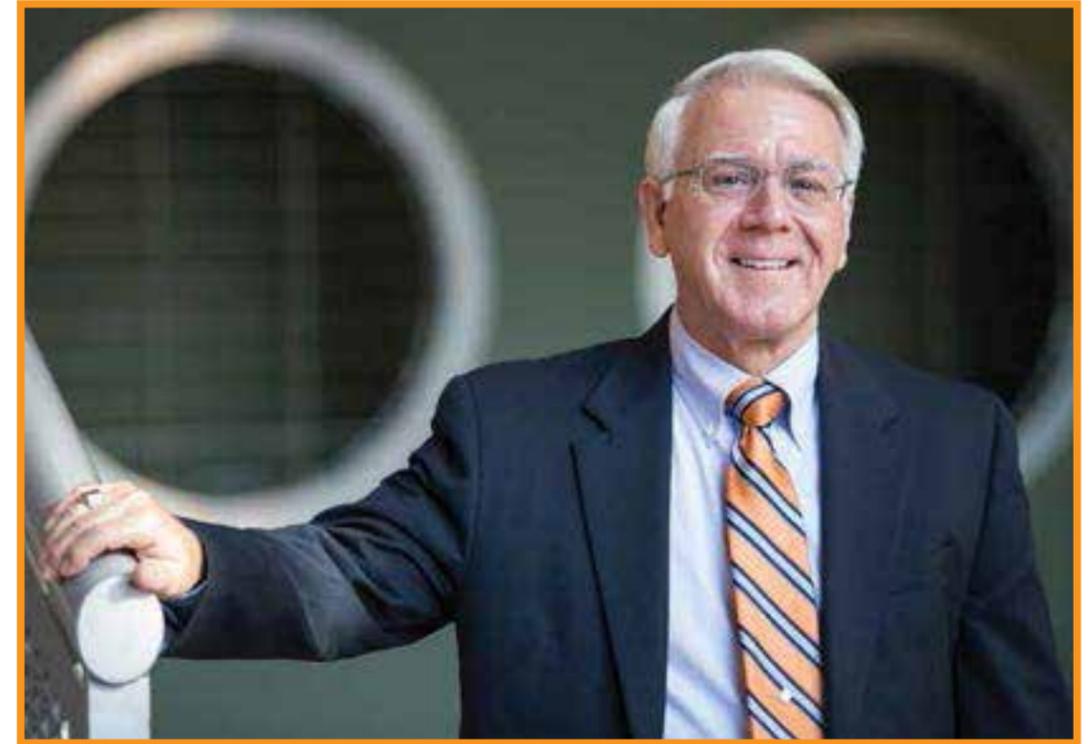
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Dean's Message

I am as excited as I ever have been upon reviewing the topics being covered in this latest edition of *Tennessee Engineer*. More than ever, our students, faculty, and staff are engaged in providing the best education to an increasingly larger number of undergraduate and graduate students. Our freshman class this year is the largest ever and all indications are that the Fall 2015 class will be one of the largest increases that we have seen in the last ten years—thanks to the recently added Volunteer Scholarships for both in-state and out-of-state students. The great news is that those entering students are highly engaged in their education, participating at increasing numbers in our world class cooperative engineering program, in undergraduate research experiences led by our faculty, and in international exchange programs. Many of these experiences are being augmented by the very strong support of our donors and friends of the college as well as from corporations.

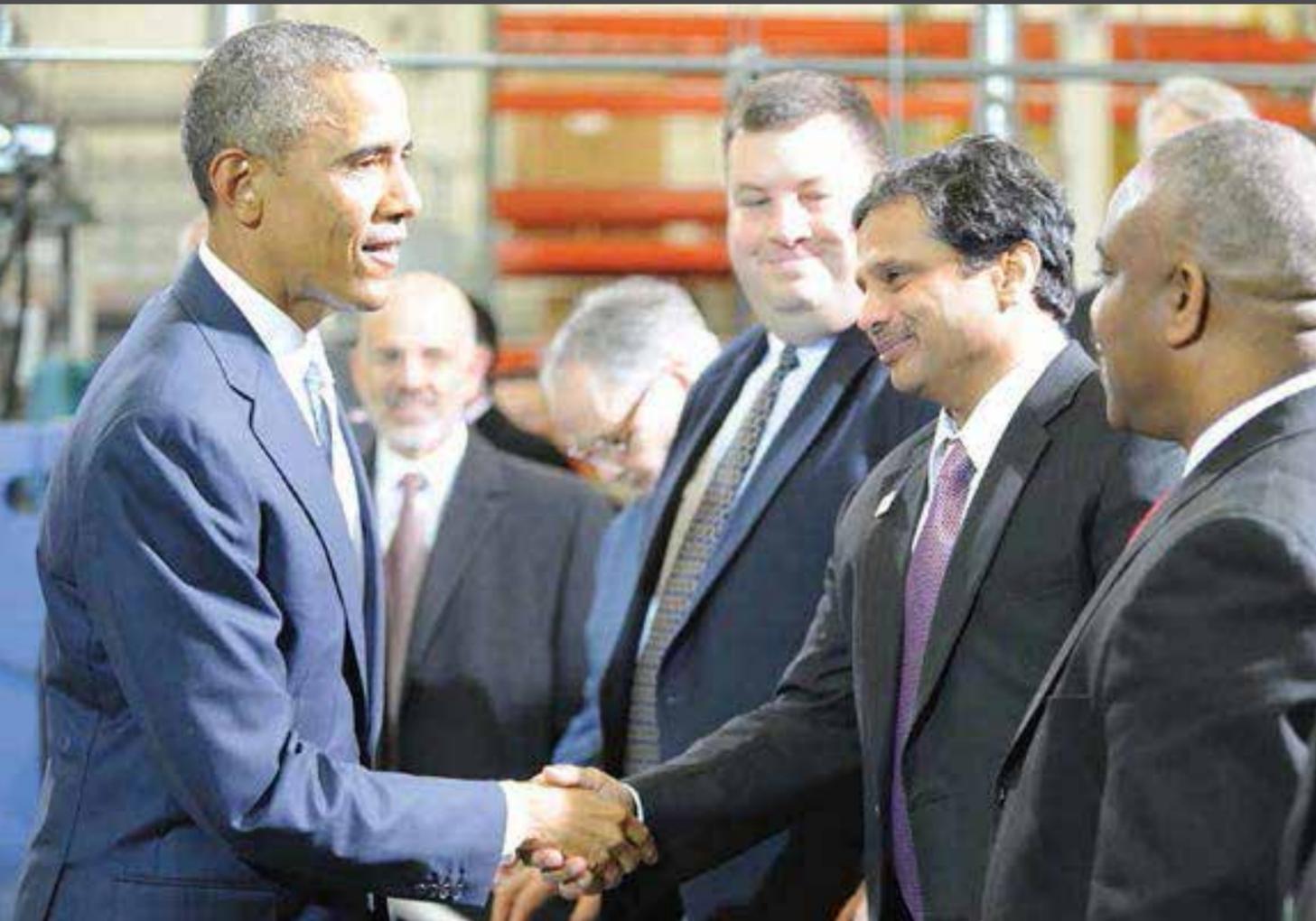
I have said over the last couple of months that the next several years will see a substantial increase in our college's development of partnerships with companies across the US. In this edition, we feature UT's recent success, as announced by President Obama in January in Clinton, Tennessee, of being awarded the fifth of the nation's new manufacturing institutes. The institute, IACMI, will be operated as a 501(c)3 under the University of Tennessee Research Foundation. IACMI focuses on reducing technical risk and develops a robust supply chain for advanced composite materials in automotive applications and others such as wind turbines and compressed gas storage.

It will provide an opportunity for our faculty and students to engage with the one hundred and twenty-two partner members, including numerous industries, non-profit organizations, universities, and state and federal agencies. We already have partnerships and relationships with many of the partners, but IACMI will enhance those and provide opportunity for us to create even stronger relationships with all participants. In the end, our faculty and students will have an opportunity to engage in research and training and to become better positioned to make an impact on the future manufacturing and innovation that are needed for our state and nation to be competitive world-wide. It is exciting to be at the center of this national initiative.

IACMI is one of many of our initiatives in which the college is engaged and comes in a line of other notable successes, such as the college's recent inclusion as a research partner in the National Network for Manufacturing Innovation Institute and the American Light Metals Manufacturing Innovation Institute — Light-Weight-Innovation for Tomorrow (ALMMII-LIFT). These all enhance our existing programs such as the NSF-DOE Engineering Research Center—CURENT, our Reliability and Maintainability Center (RMC, profiled on page 22), and our Engineering Professional Practice co-op programs. Couple these with the activities that our alumni are involved in worldwide and our college and its graduates are making a huge impact worldwide—and even in outside of the world, as we have a UT engineering graduates manning the International Space Station. It is a great time to be a Vol!

Wayne T. Davis
Wayne T. Davis Endowed Chair in Engineering

University of Tennessee to Lead \$259 Million Public-private Partnership



President Barack Obama greets officials from Techmer PM, the University of Tennessee, and Oak Ridge National Laboratory at the announcement that the University of Tennessee, Knoxville, will lead the Institute for Advanced Composites Manufacturing Innovation (IACMI).

On Friday, January 9, 2015, President Barack Obama and Vice President Joe Biden visited the Knoxville area to announce that the University of Tennessee will lead the Institute for Advanced Composites Manufacturing Innovation (IACMI), a \$259 million public-private partnership. The Institute reflects a \$70 million commitment from the US Department of Energy and \$189 million in commitments from IACMI's partners.

Supported by the Advanced Manufacturing Office in the DOE's Office of Energy Efficiency and Renewable Energy, IACMI joins four other institutes backed by the Obama administration in a recent push to accelerate advanced manufacturing.

The selected team, a one hundred and twenty-two-member consortium, connects the world's leading manufacturers across the supply chain with universities and national laboratories pioneering advanced composites technology research and development.

Established as a nonprofit 501(c)(3) in Tennessee by the UT Research Foundation, IACMI has received a \$15 million commitment from the Tennessee Department of Economic and Community Development as part of an effort to facilitate breakthroughs in manufacturing and materials.

IACMI includes founding partners in Tennessee (University of Tennessee and Oak Ridge National Laboratory), Colorado (National Renewable Energy Laboratory), Indiana (Purdue University), Michigan (Michigan State University), Ohio (University of Dayton Research Institute) and Kentucky (University of Kentucky).

The Institute is regionally organized around five focus areas:

vehicles (Michigan); wind turbines (Colorado); compressed gas storage (Ohio); design, modeling and simulation (Indiana); and composite materials and processing technology (Tennessee supported by Kentucky).

UT has emerged as a growing force in the field of advanced manufacturing, as evidenced by the university's ongoing partnership between UT and ORNL, its long history in nonwoven composites, its extensive collaboration with the federal government on composites research and development, and the selections of Dr. Suresh Babu as UT-ORNL Governor's Chair in Advanced Manufacturing and Dr. Art Ragauskas as UT-ORNL Governor's Chair in Biopolymers and Carbon Fiber. A third Governor's Chair in Composites is presently being recruited.

Several departments within the College of Engineering in particular have focused on advancing the use of materials in manufacturing and the process itself.

Carbon fiber, additive manufacturing (3D printing), and the development of other materials are but a few of the areas where UT and ORNL have a shared wealth of knowledge.

The Institute will focus on advanced fiber-reinforced polymer composites that combine strong fibers with tough plastics to yield materials that are lighter and stronger than steel.

The Institute has received commitments from large charter corporate contributors such as those with critical connection to the automotive composites supply chain like Ford, Volkswagen, Dow Chemical Company, and DowAksa; premium members with



From left, Clinton Mayor Scott Burton, ORNL director Thom Mason, TVA President Bill Johnson, Jim DeVries of Ford Motor Company, UT Chancellor Jimmy G. Cheek, and IACMI CEO Craig Blue join officials at the IACMI announcement in Clinton, Tennessee.

national manufacturing impact like Boeing and Lockheed Martin; and small and medium enterprises like Strongwell Corporation, the world's leading pultrusion company, and Local Motors, the world's leading 3D-printed car company, which are both innovation drivers and local to East Tennessee. More than ninety companies across the supply chain support the project.

While advanced composites are used in selected industries such as aircraft, military vehicles, satellites, and luxury cars, these materials remain expensive, require large amounts of energy to manufacture, and are difficult to recycle. IACMI aims to overcome these barriers by developing low-cost, high-production, energy-efficient manufacturing and recycling processes for the composites sector.

The College of Engineering has played a significant role in this initiative from the beginning. Dr. Taylor Eighmy, UT vice chancellor for research and engagement and co-chair of the Institute's board of directors, Governor's Chair Babu, and Fred N. Peebles Professor Dayakar Penumadu from the college's Department of Civil and Environmental Engineering were the leading principal investigators on the proposal.

"This was a very competitive call with many prominent teams nationally going hard after the award," Eighmy said. "Winning this is obviously great for the University of Tennessee, ORNL, and our core team, especially when we think about our path to becoming a Top 25 research university. More importantly, IACMI will be both a magnet and a catalyst for rapid innovation research and development with companies interested in advanced manufacturing, especially here in Tennessee, in close proximity to the university and ORNL."

Babu envisions unique research opportunities for students as well.

"Both undergraduate and graduate students will be involved in this institute for performing research, as well as interacting with industry associates during research projects at UT," Babu said. "We are also planning frequent embedding of these students within the industrial members of IACMI."

Babu has helped to further the establishment of the Manufacturing Demonstration Facility (MDF) at ORNL, and said that most of the manufacturing solutions will be housed in the MDF. The large additive manufacturing equipment will be located at MDF and UT faculty and students will use this equipment for working on research in collaboration with IACMI industry partners.

"I was involved with the IACMI core team since its formation, representing the University of Tennessee, Knoxville, and integrating our technical capabilities and unique university resources in the area of the carbon fibers and polymer composites," Penumadu said. "Working closely with the faculty, IACMI board member and Vice-Chancellor Eighmy, and Dean Davis, I look forward to the opportunities with IACMI as it evolves."

Additional COE professors involved with IACMI include Dr. Gajanan Bhat, a professor in the Department of Materials Science and Engineering and the director of the UT Nonwovens Research Laboratory. COE Dean Wayne T. Davis provided ongoing support and coordination with the engineering college as the IACMI proposal progressed.

"This opportunity adds to the momentum we've already built as a leader in this field," said Davis. "This selection, along with our Governor's Chairs, our strategic focus on advanced manufacturing, and our faculty's applied research into woven composites, carbon fiber and residual stress in composites, all serve to showcase our strategic place in the field of advanced materials. We look forward to our role in advancing manufacturing innovation."

The IACMI plan dovetails with the DOE's Clean Energy Manufacturing Initiative by encouraging collaboration and moving ahead with production methods and materials that require less energy and resources.

"IACMI will be a significant catalyst in advanced composites materials and manufacturing innovation," said Eighmy. "We

are grateful to the US Department of Energy and President Obama for this opportunity and will build on our extensive and long-standing partnerships to hit the ground running."

Dr. Craig Blue, a joint UT-ORNL faculty member, will be the IACMI Chief Executive Officer.

"Having IACMI will not only help cement expertise in traditional manufacturing, but will bring together UT's expertise in design, polymer science, textiles, processing of composites, as well as testing and characterization of composites," said Babu, who is based in the COE's Department of Mechanical, Aerospace, and Biomedical Engineering as well as ORNL.

The Shelby Cobra 3D printed car, which was highlighted during Obama's visit as an example of the changing world of manufacturing, was produced with major contributions from a pair of student interns from UT's College of Engineering—Alex Roschli and Andrew Messing.

Roschli and Messing, both seniors in the Department of Electrical Engineering and Computer Science, are doing internships at ORNL, where the car was printed at the Manufacturing Demonstration Facility.

Roschli worked on printing and assembling components of the car and fitting them with the body, while Messing developed the software that tells the printer how to make various parts.

"Being able to say that you contributed to this cutting-edge technology is amazing and really allows one to think about all the possibilities as a student at UT," said Messing.

One of the stated goals of Obama's visit—also a key topic in recent his State of the Union address—is helping advance manufacturing in the US, adopting new approaches and technology to reduce costs and environmental impact, both of which were achieved in the Shelby project.

"The project was very accelerated, a tremendous achievement by the entire team to produce an operational vehicle on such a compacted schedule," said David K. "Butch" Irick, research assistant professor in the Department of Mechanical, Aerospace, and Biomedical Engineering, who oversaw the team and helped with the development of the car's powertrain.

Irick, who also oversees the EcoCAR projects at UT, said that the ability of the team to innovate and find solutions for still-developing technology was key.



Alex Roschli



Andrew Messing



Dr. Gajanan Bhat

“The UT Nonwovens Research Laboratory (UTNRL) has a long history of working with industry on product development in the areas of specialty fibers, nonwovens and composites. Because of my experience in processing of fibers/fabrics and carbon fibers, I was actively involved in the commissioning of Carbon Fiber Technology Facility (CFTF) at ORNL and hope to continue to collaborate with ORNL and industrial partners in providing solutions to problems in composite manufacturing as a part of IACMI. This project will open additional opportunities for our students to gain hands-on experience with our pilot line facilities. Our industrial partners are also excited about this opportunity to share their expertise with other consortium members in IACMI.”



Dr. Taylor Eighmy

“The university was involved in this project since inception, and as the capture was assembled to go after this award, our involvement was driven, in part, by our shared focus with ORNL in the advanced manufacturing space—metallic, carbon fiber, and composites.”



Dr. Craig Blue

“This has brought together unprecedented commitment from state governments, industry, and research institutions to develop the workforce, create jobs, and increase global manufacturing competitiveness in advanced polymer composites. Our state partners include the top five states for automotive employment and companies representing seventy percent of US automotive manufacturing.”



Dr. Dayakar Penumadu

“I was involved with the IACMI core team since its formation, representing the University of Tennessee, Knoxville, and integrating our technical capabilities and unique university resources in the area of the carbon fibers and polymer composites. Working closely with the faculty, IACMI board members, and Vice-Chancellor Eighmy, and Dean Davis, I look forward to the opportunities with IACMI as it evolves.”



Dr. Wayne T. Davis

“Being the lead institution on this project is a testament to the ideas, research, and faculty that we bring to the table. From our expertise in developing the materials of the future to our work in advanced manufacturing techniques and 3D printing, our college has a wealth of expertise that we can share with the institute, and that really shows in our selection to lead that enterprise.”



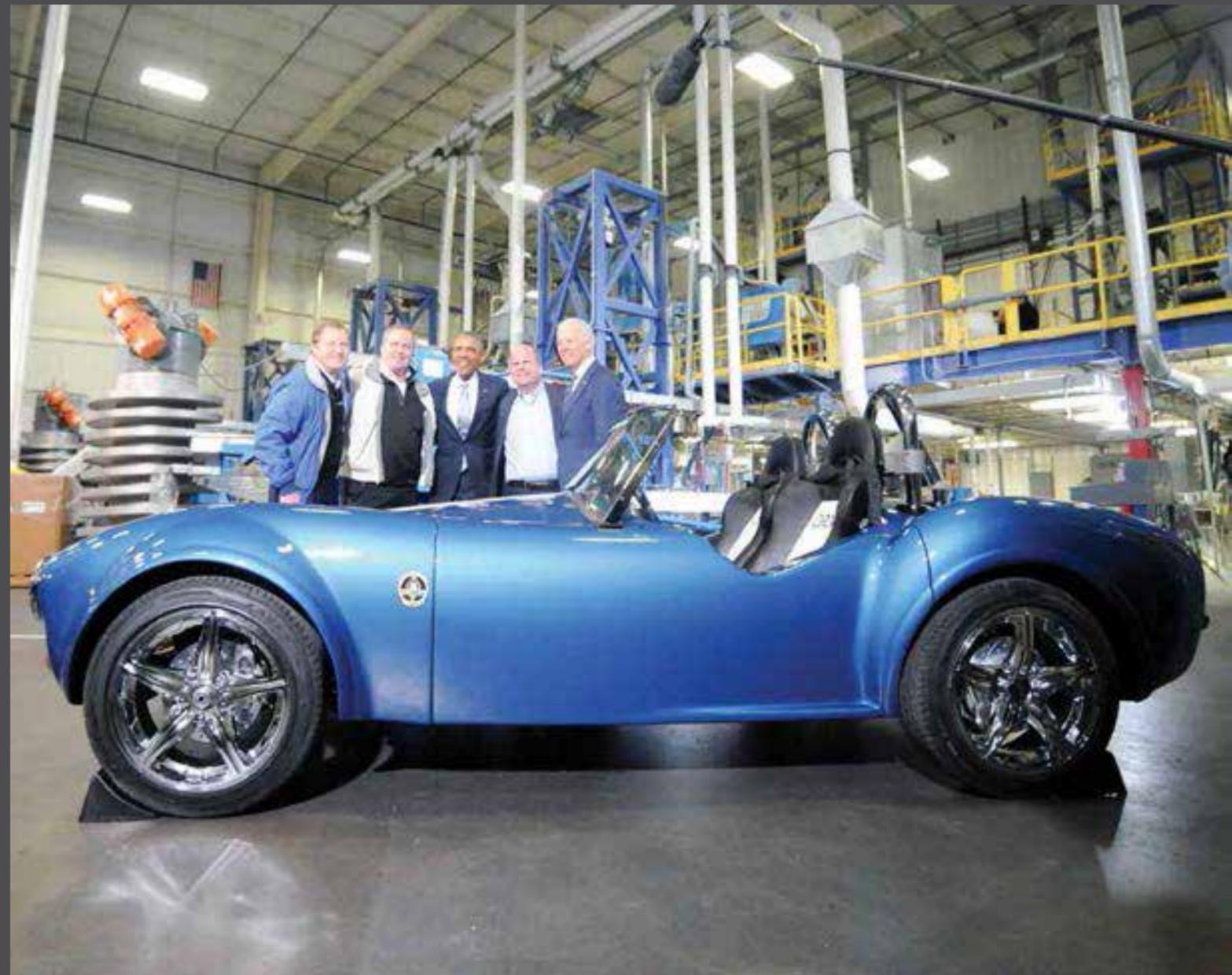
President Obama discusses the IACMI initiative with Martin Keller, associate laboratory director at Oak Ridge National Laboratory, at the announcement event.

The Cobra was 3D-printed with advanced composites that cut its weight in half while improving performance and safety, with a motor powered by wide-bandgap power electronics that are more efficient and less expensive than traditional silicon technologies and can be charged wirelessly. Amazingly, the car was developed and produced by six people in just six weeks. Officials at ORNL were also pleased with what the project achieved.

“They really helped out with the printing and assembly of the car,” said ORNL group leader Lonnie Love. “They, and a number of other UT students, are critical members of our team.”

For more information, visit tntoday.utk.edu/2015/01/09/white-house-picks-ut-lead-national-composites-manufacturing-institute/.

Related video: www.youtube.com/watch?v=VobUkNKpCGE



President Obama (center) and Vice President Joe Biden (far right) take a look at the 3-D printed carbon fiber replica of a Shelby Cobra at Techmer PM, a plastics fabrication company based in Clinton Tennessee. The car was printed by a team including UT engineering students Andrew Messing and Alex Roschli.

Zawodzinski, Paddison Selected For Royal Academy of Engineering Fellowships



Dr. Thomas Zawodzinski



Dr. Stephen Paddison

The United Kingdom's Royal Academy of Engineering awarded Thomas Zawodzinski, the Governor's Chair Professor in Electrical Energy Storage, and Stephen J. Paddison, the Gibson Endowed Chair in Engineering Distinguished Visiting Fellowships.

Both professors serve in the Department of Chemical and Biomolecular Engineering.

The program was established to develop capacity and facilitate collaborations by distinguished international experts with UK universities. With only three total professors from the United States being selected the previous year, having two from the same college, let alone the same department, is an amazing accomplishment.

Paddison, who is a member of the Royal Society of Chemistry among other notable organizations, will spend a month in the Department of Materials Science and Metallurgy at the University of Cambridge.

He and his host, James A. Elliott, a reader in the department, will visit research groups at Imperial College London, the University of Surrey, and the University of St. Andrews.

"Although I have spent significant time in the past at Cambridge University as a Visiting Fellow and Scholar, this is nevertheless a real privilege and honor that promises to be another intellectual and fruitful experience," said Paddison.

Paddison will spend the month of June in the UK and will present lectures and seminars on the multiscale modeling of materials for batteries and fuel cells.

Zawodzinski will spend part of the upcoming summer visiting the laboratory of Professor Nigel Brandon, Department of Earth Science and Engineering at Imperial College in London to continue collaborative work.

Research proposals will be formulated to forge connections and collaborations between UT and the various UK institutions.

For more on the Royal Academy of Engineering, visit raeng.org.uk.

COE Faculty Members Receive \$1.2 Traffic Safety Project Grant

Two faculty members associated with the College of Engineering's Center for Transportation Research (CTR), Professor Shashi Nambisan from the Department of Civil and Environmental Engineering and CTR Transportation Research Director Jerry Everett and their research team have won a \$1.2 million grant from the US Center for Disease Control and Prevention (CDC) that will greatly improve the nighttime safety of drivers and passengers on Tennessee's highways. The grant from the CDC will offer support for the project for three years.

The high number of injuries and deaths from traffic incidents prompted agencies such as the World Health Organization and the United Nations to recognize the epidemic proportion of these problems. In response, the CDC created a competition to select a team that would lead efforts to improve nighttime seat belt usage and Nambisan and Everett's team were the winners.

"This project brings together researchers, practitioners and the public in a collaborative fashion to address a real-world transportation issue," said David Clarke, CTR director. "Highway traffic safety is a key aspect of our center's mission, and we can achieve that better by getting everyone on the same page."

Nambisan pointed out that, on average, the number of people killed in traffic incidents each day in the United States is roughly the same as having an airliner crash every day. Statistics have shown much higher rates of injuries and fatalities involving unbelted motorists with high blood alcohol content in post-dusk incidents compared to daytime ones, highlighting the need for the study.

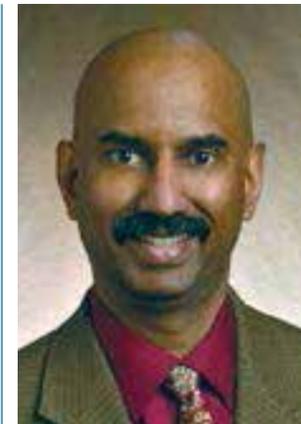
"Most of the studies done so far and the efforts to enforce have focused only on daytime hours," said Nambisan. "The focus of this initiative is to increase the seat belt usage rate at night through coordinated enforcement and outreach efforts."

The study will be conducted in Knox, Blount, Loudon, Roane, and Sevier Counties, with data from Rutherford County—where no outreach will take place—being used for comparison purposes.

Observations will be made about driver behavior at a variety of locations such as sporting events or at highway checkpoints.

"The strength of our partnership with the Governor's Highway Safety Office is critical to this study," said Everett. "Additionally, without the help of law enforcement this project wouldn't be possible."

Following a period of outreach and advertising, more observations will take place to see what impact the message has had.



Dr. Shashi Nambisan



Dr. Jerry Everett

From the standpoint of law enforcement, the potential for the study comes down to changing the behavior of a specific portion of the population.

"We currently have an eighty-eight percent seat belt use rate across the state," said Governor's Highway Safety Office Director Kendell Poole. "However, our studies show that around half of our traffic crash fatalities are unbuckled. This means that half of our fatalities come from twelve percent of our population."

"It is important to evaluate enforcement and educational programs in order to be the most effective in getting our message across and help us understand which interventions can impact that last twelve percent."

In addition to the Governor's Highway Safety Office, UT's College of Business Administration, UT Athletics, UT's Office of Sorority and Fraternity Life, and the Tennessee Hospitality and Tourism Association also have joined the effort.

By partnering with such a wide range of people and organizations, the reach of the study will have a much better chance of hitting the key demographic the group hopes to address, teens to people in their mid-thirties.

The program kicked off this year, with periods of observation and outreach lasting three to four months at a time thereafter.

MSE Faculty Member Receives Funding for International Research Project

An international research team led by Dr. Haixuan Xu, an assistant professor in the Department of Materials Science and Engineering, has received a US Department of Energy grant to help with work involving a key component of nuclear reactors.

The grant, worth \$800,000 over three years, comes as part of the Nuclear Energy University Programs (NEUP) funding, and will be used to work on a pair of particular steel alloys.

The NEUP support will allow Xu's team to investigate and

understand the defect evolution in the materials. The goal of the project is to get fundamental insight into the effects of radiation on the alloys so that researchers can better predict and detect how they will break down over time and adjust the materials accordingly.

The alloys would be used in sodium-cooled reactors. Xu's research is important because little is known about how the materials stand up to high levels of radiation over time.

The first objective will be to use ion radiation to see how the materials sustain damage, while

the second will look at the mechanical properties of the alloys post-irradiation to see how the damage might have been avoided.

That insight could then be applied to other alloys, spreading the benefits of the research beyond the primary goal.

Other institutions with researchers collaborating on the project include Oak Ridge National Laboratory, the University of Wisconsin, and the University of Lille in France.



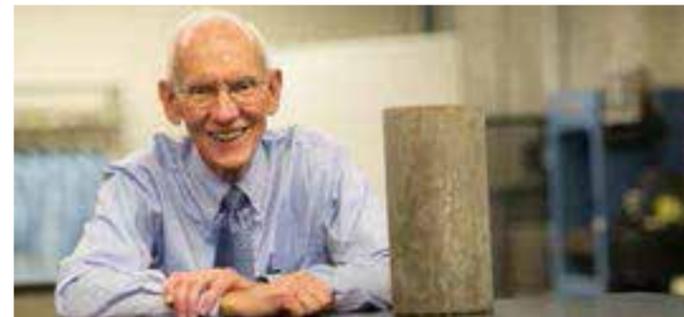
Dr. Haixuan Xu

CEE Professor Receives Award from ASC and Named Professorship Endowment

An iconic member of the College of Engineering received a high honor recently as the Dr. Edwin G. Burdette Professorship Endowment was announced. UT alumni Charley and Lynn Hodges established the endowment in honor of Burdette's service and commitment to UT, in particular the Department of Civil and Environmental Engineering (CEE) and its students. Burdette has been in the department for over fifty years.

Burdette, who is the Fred N. Peebles Professor in the CEE department, has also been named the Peter G. Hoadley Award winner for 2014.

The award, given to the outstanding engineering educator by the Tennessee Section of the American Society of Civil Engineers, was presented to Burdette on September 27, 2014.



Dr. Edwin Burdette

Burdette is considered an expert in the study of concrete and concrete-based construction.

Burdette is a fellow of both the American Society of Civil Engineers and the American Concrete Institute.

EECS Fisher Professor Named National Academy of Inventors Fellow



an icon in the world of personal computing, has been named a National Academy of Inventors Fellow for 2014.

Dean holds three of IBM's original nine patents for personal computers, including one for the technology that allows multiple devices to be plugged into a computer at the same time.

Dr. Mark Dean, the Fisher Distinguished Professor in the College of Engineering's Department of Electrical Engineering and Computer Science and



Dr. Mark Dean

Dean is also a member of the National Inventors Hall of Fame and is an IBM Fellow, the technology company's highest honor.

MSE Professor is Named ASM International Fellow

Dr. Claudia Rawn, an associate professor in the Department of Materials Science and Engineering (MSE), has been named a 2014 ASM International Fellow, earning one of the highest honors attainable in her field.

Rawn is the third member of the department to be honored in the last seven years.

Rawn is the director of the Center for Materials Processing and a faculty member of both the Institute for Biomedical Engineering (iBME) and the Joint Institute for Advanced Materials (JIAM). She has helped organize the MSE department's Materials Camp since 2004.

ASM started its fellows program in 1969 to help recognize specific achievements or contributions to the field of materials science.

Rawn's award stems from her work using in situ X-ray and



Dr. Claudia Rawn

neutron diffraction to study a variety of novel energy materials from superconductors to gas hydrates. Rawn and the other members of the 2014 class were formally inducted at an October 14, 2014, meeting in Pittsburgh.

EECS Professor Mockus Named New Ericsson/Harlan Mills Chair



Dr. Audris Mockus

Dr. Audris Mockus, a faculty member in the Department of Electrical Engineering and Computer Science whose research focuses on analyzing programming steps leading to problems in computer software—known as digital archaeology—has been named the new Ericsson Harlan Mills Chair of Software Engineering at UT.

The position, initiated with a \$1 million endowment from telecommunications giant Ericsson in 1998, was created to help expand software engineering research.

Mockus joined the EECS Department after working at Avaya Labs.

Mills, for whom the award is

named, was a pioneering mathematician and software engineer. He helped redefine how software development teams should be organized and showed how mathematics can be used to ensure error-free software, both of which are now ideas considered industry standards.

Although he never worked at UT, Mills was a close colleague of longtime UT professor Jesse Poore, who established the Harlan D. Mills scholarship fund upon Mills' death in 1996. The Harlan D. and Luella Mills Scholarship in the Department of Electrical Engineering and Computer Science still bears his name.

Ericsson, recognizing the contributions of both to software engineering, made Poore the inaugural Harlan Mills Chair in 1998, a position he held until his death in 2012.

Faculty Member Named First Jerry and Kay Henry Endowed Professor



Dr. David Mandrus

David Mandrus, a professor in UT's College of Engineering, has been selected as the first Jerry and Kay Henry Endowed Professor.

Mandrus, of the Department of Materials Science and Engineering, was chosen for the honor because of his research, teaching, and publication record.

A fellow of the American Physical Society, Mandrus' research has covered everything from LED research to researching materials for the electronics of the future.

The endowment, which comes with a monthly stipend and is designed to be extended every five years, highlights a string of recent successes for Mandrus, who serves in

a joint faculty position with Oak Ridge National Laboratory.

Since February, Mandrus' work has appeared in the noted scientific journal *Nature* twice, he has been chosen as a Gordon and Betty Moore Foundation Synthesis Investigator, and he was one of three UT College of Engineering professors recently named to the "World's Most Influential Minds" list by Thomson Reuters.

Mandrus is currently working on a project involving the use of the intrinsic magnetism, or spin, of electrons to create new possibilities for future electronic devices, including sensors and new types of computer memory. These new devices will be smaller and require practically no energy to operate.

He is also a member of a University of Washington-led team taking part in the National Science Foundation Office of Emerging Frontiers in Research and Innovation's recently announced initiative to develop 2-D technology advancements.

Eastman Chemical Funds Two COE New Professors of Practice

Eastman Chemical has continued its strong partnership with the UT College of Engineering by naming two new professors of practice.

Dr. Yan Xu, of the Department of Electrical Engineering and Computer Science (EECS), and Dr. Matthew Young, of the Department of Mechanical, Aerospace, and Biomedical Engineering (MABE), received the designation as part of the company's \$2 million-plus commitment to the college.

"Eastman's collaboration with the College of Engineering is an excellent example of a successful partnership between business and education," said Etta Clark, Eastman's vice president of global public relations and policy. "By developing a strong foundation, we are enabling students to be successful in the workforce."

Professor of practice positions are set up so that faculty can provide detailed hands-on education in specific areas.

Young's research is paving the way for advances in manufacturing that encourage innovative and productive critical thinking and problem solving—important skills in the modern business world.

Thanks to his selection, Young has been able to give students practical instruction from his own experiences, train them in the latest tools of the trade, and offer advice when asked about curriculum or career choices.

Xu, whose expertise lies in the realm of power systems, will have the opportunity for her classes and research to help educate students about the most up-to-date ways of ensuring companies have their energy and electricity needs met.

"Eastman's partnership with our college continues to be valuable to students and faculty alike," said Leon Tolbert, head of the EECS Department. "Having someone like Yan Xu on our faculty to provide real-world examples from her industrial career helps students to relate the theoretical material they are learning in class with practical engineering issues they will face in their careers."

For the departments and the college as a whole, Eastman's contributions continue to prove invaluable.

Matthew Mench, head of the MABE Department, pointed out how the impact of Young's selection is felt throughout the department.

"He's developing a style, a prototype of applying basic practical knowledge that can be used in other classes," said Mench. "Having that helps our students know that they will graduate with a particular set of skills that place them ahead of people they are competing with for jobs."

In addition to the two positions—and a third on the way in the Department of Chemical Engineering—the company has funded a total overhaul of lab space in the Nathan W. Dougherty Engineering Building, the refurbishment of additional lab space, a new student lounge, and summer programs. Eastman also continues to be a strong provider of paid co-op and internships for engineering students.

For Eastman, a Fortune 500 company based in Kingsport, Tennessee, the decision to partner with UT came naturally.

"Eastman is committed to securing the best and brightest engineering graduates, and the entire region benefits from the economic impact of students graduating with advanced degrees and securing local jobs," said Clark. "Combining our efforts helps us both succeed."



Dr. Yan Xu



Dr. Matthew Young

Hines Receives SEC Award

Dr. J. Wesley Hines, professor and head of the Department of Nuclear Engineering, is the recipient of the 2014-2015 Southeastern Conference (SEC) Faculty Achievement Award for the University of Tennessee.

The awards honor those with outstanding records in both teaching and scholarship who serve as role models for both junior faculty and students, and have been recognized by colleagues nationally or internationally. This puts Hines in consideration for the SEC Professor of the Year Award.

For more information on the SEC awards, visit www.thesecon.com/sec-faculty-achievement-awards.php.



Dr. Wes Hines

Sawhney Honored By IEOM Society

Dr. Rupy Sawhney was honored with the Outstanding Educator Award for 2015 by the Industrial Engineering & Operations (IEOM) Society. The society recognized Sawhney for exceptional contributions to the field of industrial engineering and operations management. Sawhney is a professor in the Department of Industrial and Systems Engineering and a Heath Fellow in Business and Engineering. For more information about IEOM, visit ieom.org.



Dr. Rupy Sawhney

UTSI Professor Receives 2014 Outstanding Aerospace Engineers Award

University of Tennessee Space Institute H.H. Arnold Chair John Schmisser was recently honored by Purdue University as one of that school's Outstanding Aerospace Engineer alumni for 2014. UTSI is located in Tullahoma, but is a part of the College of Engineering.

Schmisser, who is a professor in the Department of Mechanical, Aerospace, and Biomedical Engineering at UT, got his PhD from Purdue in 1997. Prior to coming to UT, he was the Chief of the Energy, Power and Propulsion Sciences Division and Program Manager for Aerothermodynamics within the Air Force Office of Scientific Research.

He received the award for his "demonstrated excellence in industry, academia, governmental service, or other endeavors that reflect the value of an aerospace engineering degree."

For more details, visit www.utsi.edu/news/News_2014/release11-13-2014schmisserreceivesoutstandingaerospaceengineersaward.htm.



Dr. John Schmisser

NE Faculty Members Receive Three Grants Totaling \$2.6 Million

Professors in the College of Engineering's Department of Nuclear Engineering are part of three separate nuclear safety research projects that collectively have been awarded \$2.6 million.

The US Department of Energy's Nuclear Energy University Programs has made the three allocations:

- \$800,000 to a team led by Associate Professor Ivan Maldonado and including Governor's Chair Brian Wirth that is looking at nuclear reaction safety and performance
- \$1 million to a team including Assistant Professor Jamie Coble that is developing new ways of monitoring and calibrating at nuclear facilities
- \$800,000 to a team including UCOR Faculty Fellow Jason Hayward that is developing a new imaging system capable of monitoring dry storage casks

Maldonado's team will try to analyze and evaluate fuels that are more tolerant to accidents, helping with overall safety, and easing some of the concerns the public has about nuclear energy.

Additionally, the team—including Oak Ridge National Laboratory researchers Jeff Powers and Andy Worrall—will study how those fuel ideas perform in an effort to increase efficiency.

The project Coble is working on is being headed by Pacific Northwest National Laboratory (PNL) but features UT as a collaborating institution, for which the university's share will come to around \$290,000 over three years.

The Nuclear Energy Enabling Technologies Advanced Sensors and Instrumentation program will oversee the project, which could help nuclear engineers more efficiently design and run facilities while increasing safety.

In addition to UT and PNNL, the team will include Knoxville-based Analysis and Measurement Service Corporation, run by UT alumnus Hash Hashemian, and researchers from the Korea Atomic Energy Research Institute and Chosun University.

The third project, on which Hayward will serve as a collaborator, is headed by Oregon State University. Currently, massive amounts of plutonium are housed in such facilities, but the technology to more accurately monitor it isn't readily in place.

The team hopes to use cosmic ray muons, a type of particle, to more effectively and yet inexpensively monitor the facilities.

The research could have a massive impact on nuclear energy and safety worldwide, since teams could more easily track nuclear fuel.



Dr. Ivan Maldonado



Dr. Brian Wirth

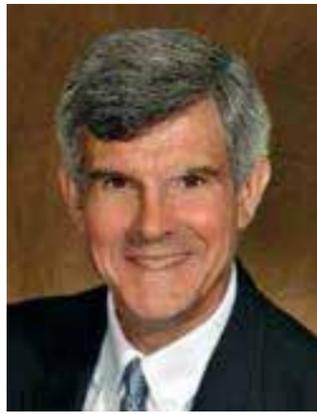


Dr. Jamie Coble



Dr. Jason Hayward

MSE Professors Receive \$2.2 Million Grant from National Science Foundation



Dr. George Pharr



Dr. Erik Herbert

Dr. George Pharr, the director of the Joint Institute for Advanced Materials (JIAM) and a UT-Oak Ridge National Laboratory joint professor in the Department of Materials Science and Engineering (MSE), and Dr. Erik Herbert, also a MSE professor, have received a \$2.2 million grant from the National Science Foundation (NSF).

Pharr and Herbert developed the concept for the "Development of and Broad-Based Materials Research with the Next Generation Nanomechanical Testing Laboratory" along with Warren Oliver of Nanomechanics Inc.

"This is a huge coup for our university, especially because it comes in the highly competitive realm of proposals worth more

than one million dollars," said Dr. Kurt Sickafus, head of the MSE department. "This award and the work accomplished with it has the potential to impact advanced materials research across the world."

Pharr and Herbert's proposed research seeks to address the next generation of nanomaterials studies by looking at what tools will be needed and doing so with a wide-ranging appeal across the materials science field.

By making sure that technological advances are both applicable and open to such a large swath of materials scientists, everything from fuel cell research to designing more earthquake-resistant structures could be affected.

"The testing system we will develop will be the only one of its kind in the world and will allow us to test nano-sized objects at temperatures up to 1,100 degrees Celsius," said Pharr. "By obtaining data with high precision and at extremely high rates we can determine the strength of many of the small-scale objects that are fueling the nanotechnology revolution. Our data will be key to the successful development of many next-generation nano-devices."

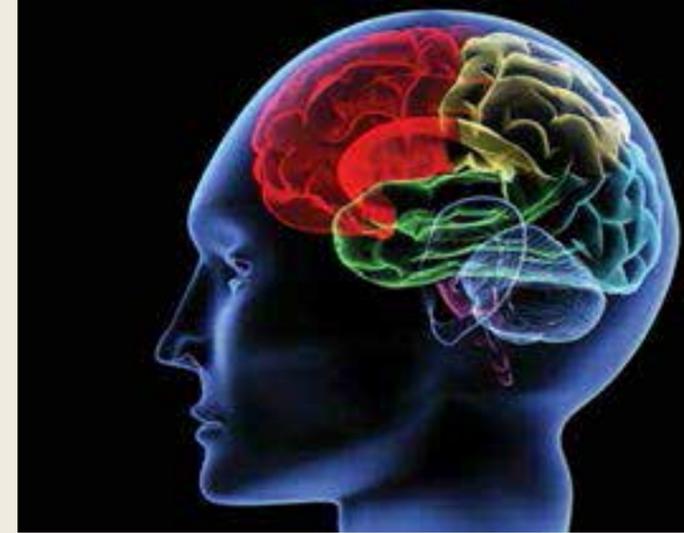
The team plans to create summer workshops for students at both the undergraduate and graduate levels and will partner with a local small business, Nanomechanics Inc, to commercialize the new technology.

More than seventy percent of the funding—\$1.54 million—will come through the NSF's Major Research Instrumentation program, with the remainder coming through UT.

"In addition to developing and building the next-generation nanomechanical testing platform, we get to do it working alongside a number of the best and brightest minds in our field," said Herbert. "We hope to develop advancements in our understanding of the fundamental aspects of materials, from elasticity to conductivity."

The project will last five years and will be housed in JIAM.

EECS Professors Team Up to Move Analog Brain Closer to Reality



Dr. Jeremy Holleman



Dr. Itamar Arel

Holleman's expertise is in the area of analog computational circuits, which map mathematical operations onto transistors and often provide lower power consumption than the more commonly used digital circuits.

Arel has initiated the concept for developing a machine-based "brain" model to help control a wide array of devices—an idea based on studies of human cognition.

By using Holleman's analog designs along with Arel's overall concept, the team was able to reduce energy requirements down to about one-third of one percent of what a digital system would have needed, while also making it possible to put the system on a microchip.

Such a breakthrough paves the way for smaller, more efficient devices in everything from implantable medical devices to military-grade equipment.

Devices capable of thinking become smaller and less dependent on frequent recharging. The possibilities for future applications include self-dosing medicinal implants or devices capable of making nerve impulses to damaged limbs become more real.

As part of the project team, Holleman and Arel have recruited seven graduate students to work with the project, which provides them with valuable hands-on research experience.

Dr. Jeremy Holleman, an assistant professor, and Dr. Itamar Arel, an associate professor, both faculty members in the Department of Electrical Engineering and Computer Science (EECS), are leading a research team working on a breakthrough project involving machine learning, the science that makes it possible for devices to "think" on their own.

The two professors have secured grants from the National Science Foundation (NSF), the Intelligence Advanced Research Projects Activity, and the Defense Advanced Research Projects Agency (DARPA), which is funding their current project.

The DARPA Unconventional Processing of Signals for Intelligent Data Exploitation (UPSIDE) grant came to the university via the College of Engineering's Center for Intelligent Systems and Machine Learning (CISML) and includes participation by fellow EECS Associate Professor Gong Gu as well as researchers at Stanford University and Oak Ridge National Laboratory (ORNL). It provides support of \$4.8 million over four years and funds the use of the team's unconventional computing strategies to improve the video processing systems used by drones.

Siemens PLM Software Donates \$37 Million In-kind Grant to EcoCAR3 Program



Dr. Butch Irick

Siemens PLM Software has donated an in-kind software gift estimated at \$37 million to the College of Engineering. The grant gives students access to the same technology used by automotive manufacturers, aerospace developers, and high-tech electronics companies.

The software will be used by the EcoCAR3 program led by Department of Mechanical, Aerospace, and Biomedical Engineering Research Associate Professor David "Butch" Irick, who serves as faculty advisor for the team.

"It is certainly no understatement to say that a grant of this nature is a major boost," said Wayne Davis, dean of the College of Engineering. "This

will certainly make a difference to the efforts of Butch Irick and his students working on EcoCAR3."

The software—specifically NX™ software for computer-aided engineering and Teamcenter® for Product Lifecycle Management, or PLM—will be used by UT's EcoCar3 team as it begins the first year of its competition. PLM software does exactly what the name implies by helping oversee the life of a product from the drawing board to eventual retirement.

Irick and his students have participated in all but one of the Advanced Vehicle Technology Competitions over the past twenty years, and contributions such as Siemens' have proved critical over that time.

"Having support like this grant makes taking part in the EcoCAR competition a reality," said Irick. "It would be extremely challenging, to say the least, without the generosity of companies like Siemens."

Siemens PLM Software's academic program encourages teaching and development across academic levels.

An in-kind grant serves as a way for corporations to provide much-needed resources or material to programs by eliminating

the extra step of having to use traditional monetary grants for purchasing.

For Siemens, supporting programs like UT's provides the added benefit of ensuring that the best and brightest students in the US have a better chance to compete with those from universities around the world.

"Siemens PLM Software is dedicated to helping develop the next generation of highly trained and highly qualified engineers and technologists," said Bill Boswell, the company's senior director of partner strategy. "Our academic partnership with UT encourages students to pursue careers that will revitalize manufacturing in the U.S. and around the world."

The EcoCAR3 competition is focused on the ability of university teams to take a Chevrolet Camaro and convert it into a hybrid vehicle without sacrificing any of the "muscle car" persona that the auto conveys.

UT is one of sixteen schools in the competition, which pairs engineering students with business and communications students as part of the overall team goal of designing, marketing, and advertising the vehicle.



The EcoCAR 3 Team (left to right): Team faculty advisor Dr. Butch Irick; Grace McGinnis; Chris Woudstra; Sarah Zimmerman; Preston Jacobson; Ellie Boehmer; Alex Cox; Michael Potts; Dean Wirth; Nick Ponzio; and Ben Allen.

EECS Associate Department Head and Professor Lynne Parker Selected as National Science Foundation Division Director



Dr. Lynne Parker, the associate head and a professor in the Department of Electrical Engineering and Computer Science (EECS) has been selected as the division director of Information and Intelligent Systems in the Computer and Information Science and Engineering Directorate at the National Science Foundation (NSF). Parker started her new role with the NSF on January 5, 2015.

"To be selected for this is a prestigious honor, not just for me but for UT and for the College of Engineering," said Parker. "This puts us in select company with other universities like Stanford, Carnegie Mellon and California-Berkeley, and really validates our place on the map."

Parker is the first current UT faculty member to be selected as a divisional director, though others have served as program officers.

For Parker, who has played a key role in the Center for Intelligent Systems and Machine Learning (CISML) at UT and in the development of "smart" robotics, the position means a chance to keep the spotlight on this increasingly important field.

"This is a really good opportunity to take a look at the fields of robotics and artificial intelligence," said Parker. "It's a chance to

not only set the pace, but also to look ahead at what the next developments might be, both internally, such as with funding, and externally, such as with outreach and policy."

Parker will commute to the UT campus once a week to continue her research in the EECS department.

Working with the White House Office of Science and Technology Policy, Parker said she envisions some of the bigger initiatives—such as Brain Research through Advancing Innovative Neurotechnologies (BRAIN) and working with big data—to be among the first priorities.

Tying cyberphysical systems into a city's infrastructure is another research possibility.

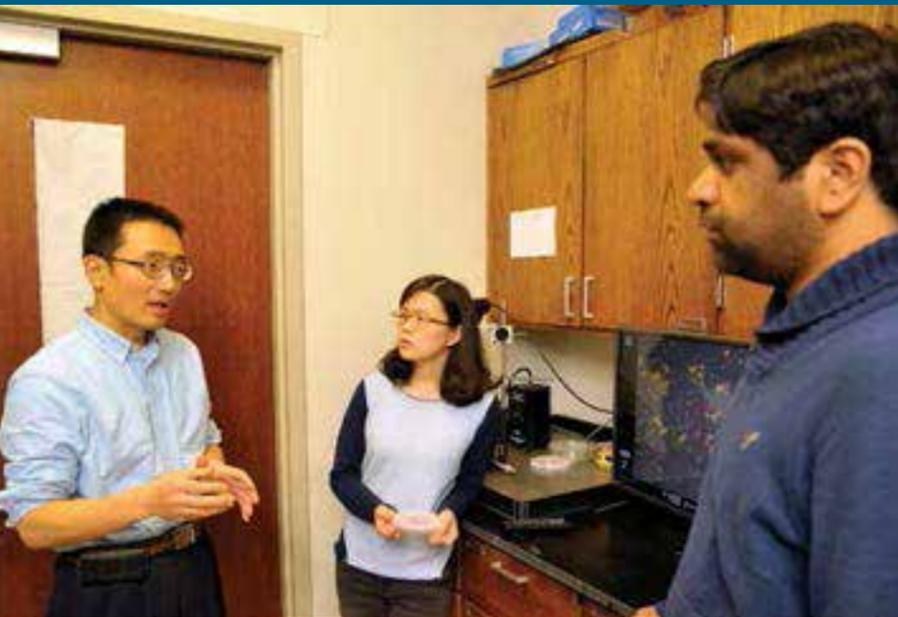
The prestige for the university and the COE that comes with Parker's appointment—which could last anywhere from one to three years—also comes with the added bonus of having a faculty member who is part of the inner workings of the NSF, a primary source of funding for numerous engineering research projects.



Dr. Lynne Parker

Faculty Focus: Dr. Gong Gu

Dr. Gong Gu—Department of Electrical Engineering and Computer Science



Dr. Gong Gu, at left, works in the lab with graduate students, from left, Wan Deng (left) and Ali Mohsin (right).

Dr. Gong Gu followed his fascination with the material graphene from industry research and development into the academic world of the College of Engineering (COE). He has found success in the move, with major breakthroughs that made the pages of the journal *Science* in 2014.

"Graphene is a two-dimensional material with many wonderful properties," said Gu, an associate professor in the Department of Electrical Engineering and Computer Science (EECS). "I became interested in it, and later got a small grant from DARPA (Defense Advanced Research Projects Agency) to work on it. That project got me started."

Gu's previous position, at the Sarnoff Corporation, gave him some room for investigation. His initial project inspired him to expand his exploration, though, and he knew he needed a university setting for that. He found a warm welcome at UT.

"I liked the people who interviewed me. That's very important," said Gu. He did wonder, momentarily, how his particular interests would fit in to the EECS. He noticed very few colleagues working in electronic materials and devices—areas relevant to his research on graphene—and wondered if that could make for slim collaboration opportunities.

"I then noticed faculty members in other departments—such as the Department of Materials Science and Engineering—doing related work, as well as user facilities and collaboration opportunities at Oak Ridge National Laboratory," said Gu. He realized that he would have more opportunities at UT than elsewhere.

"I ended up also working with colleagues in very different fields in EECS," he said. "A diverse department is actually an advantage."

Gu has collaborated on a project with Dr. Itamar Arel and Dr. Jeremy Holleman, both faculty in EECS, and looks forward to more interaction. He thanks a long list of colleagues for welcoming him to the UT engineering community.

"Dr. Syed Islam was very helpful in getting me started on research and teaching," said Gu. "I also thank my mentor, Dr. Aly Fathy, for sharing his teaching experience and guiding me on many things."

Many EECS faculty members helped Gu get started here with lab space and equipment. He is grateful for the support shown by former EECS department head Dr. Kevin Tomsovic and current head Dr. Leon Tolbert, as well as Joint Institute for Advanced Materials (JIAM) director Dr. George Pharr and deputy director Dr.

Hanno Weitering. In addition, Associate Dean for Research and Technology Bill Dunne and research director Jada Huskey helped with lab space and proposal assistance, and the EECS office staff helped him navigate administrative processes.

"I had heard of southern hospitality before, but that really impressed me after I moved here," he said. "People in Knoxville and at UT are very nice. I often got lost in my early days living in Knoxville, but people didn't honk no matter how long I stopped at intersections!"

Gu and family—wife Jane Xu and their daughter Rulan, age twelve—enjoy life in Knoxville, and traveling the world as well. He took an immediate liking to UT's Big Orange color, and even to the way COE buildings are situated on The Hill.

"The landscape is very interesting to me," said Gu. "You can enter a building at any level."

Gu tries to pass along the hospitality he experienced by bringing enthusiasm and fun into the classroom, often relating technical aspects of engineering to common experiences.

"High-frequency signals propagate along co-axial cables as waves, and the wave could be reflected back if care is not taken," he said. "That care could be the use of an extra piece of cable with the right specs. When I teach electromagnetic fields, I show the students that this extra piece of cable actually does the same thing as the anti-reflection coating on our eyeglasses, something closer to our everyday life."

Gu seeks motivation and curiosity, along with a solid knowledge in basic science and engineering, in students that join his research group. These traits are valuable when working with the exciting potential that graphene offers. The group gained notice in 2014 when they synthesized a one-dimensional boundary between crystals of graphene and hexagonal boron nitride, a boundary that is predicted to have an exotic property called spin polarization. If proven, this property could lead to electronic—or "spintronic"—devices that run on ultra-low power.

"There is still a long way to go to directly verify the predicted spin polarization," said Gu. "That's something my group really hopes to achieve. Besides, in the world of 2-D materials, there are myriad new physical phenomena to explore. We will continue to synthesize new structures, explore new physics, and eventually build new devices. New physics will lead to new device concepts."



Dr. Gong Gu (far right) outlines research goals with members of his research team (left to right) Vineet Khullar, Wan Deng, and Ali Mohsin.



I am honored to be the recipient of the Gonzalez Family Endowed Professorship. This award is particularly significant to me since it is supported by Dr. Ralph Gonzalez, the former head of the Department of Electrical Engineering and Computer Science. This association sets a high bar and encourages and stimulates me to live up to his legacy. The resources provided by this professorship will allow us to build a world-class image processing program that will add to Dr. Gonzalez's legacy and will benefit our faculty and students for many years to come.

Dr. Hairong Qi
Gonzalez Family Endowed Professor
Department of Electrical Engineering and Computer Science

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THE UNIVERSITY of TENNESSEE
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Student News

WomEngineers Day to Bring Advice, Resources to Knoxville



Lorraine Martin, executive vice president and general manager of Lockheed Martin's F-35 Lightning II program, will be the opening keynote speaker for the inaugural WomEngineers Day Conference.



Denise Koessler-Gosnell, a PhD candidate in the Department of Electrical Engineering and Computer Science and a data analyst with PokitDok, will speak at the WomEngineers Day conference.

Leadership in the workplace, financial management techniques and finding a work-life balance are a few of the topics on the docket for WomEngineers Day, scheduled to be held at the Knoxville Convention Center on April 11, 2015. The conference aims to bring together people interested or involved in engineering and other STEM—science, technology, engineering and math—fields of study.

While most attendees will be from the University of Tennessee, Knoxville, College of Engineering, the invitation extends to students at local high schools and other universities. Organizers also feel that one of the keys to a more welcoming, inclusive environment is bringing men and women together, thus the conference is open to all.

"Everyone can benefit from the topics that will be covered," said Jessica Boles, the event's lead coordinator and a senior in the Department of Electrical Engineering and Computer Science at UT. "The goal is to educate students in professional and personal topics not found in the engineering classroom."

The idea for the conference came about after Boles and others attended professional conferences through their roles at UT. While the information in those events proved valuable, the cost to attend—sometimes \$400 or more—prohibited most from attending if sponsorship wasn't an option. Boles said she wanted to find a way to make such an experience more available while maintaining the high caliber of speakers and topics of a regular engineering conference.

She and fellow COE student Alyx Wszolek had a chance to talk to College of Engineering Board of Advisors chairman Eric Zeanah and board member Bennett Crosswell during their fall meeting, with both showing immediate interest in the idea.

"When we met with them and talked about issues some students face, they basically asked what they could do to help," said Boles. "I shared this dream I'd had for a while and they said 'Let's do it.' We're extremely fortunate to have their encouragement and support."

The day-long conference will feature topics of leadership, career, challenges, starting one's own business, and more. Speakers will include Lorraine Martin, executive vice president and general manager of Lockheed Martin's F-35 Lightning II program; COE Board of Advisors members and alumni Bennett Crosswell, Peter Hoffman, and Misty Mayes; UT alumni Mickey Johnson, Adam Kimberlin, Jay Koehler, Tammy Wilson, and Jacinda Woodward; current computer science PhD candidates Denise Koessler Gosnell and Catherine Schuman; and COE Associate Dean for Faculty Affairs Veerle Keppens.

For more conference information, visit womengineersday.com.

COE Students Win in Boyd Venture Challenge



Catalyst Cycling team is, from left, Justin Clark, a junior in computer science; Zach McCormick, a junior in mathematics; and Nick McCormick, a sophomore in mechanical engineering.



Make Me Modern Inc. is, from left, Anthony Meyer, a junior in electrical engineering; Thomas Truett, a senior in business management; and Daniel Lawhon, a junior in computer engineering.

Four student startup companies—including two from COE students—have received a total of \$32,500 to advance their businesses from the fall 2014 Boyd Venture Challenge. Each business received \$5,000 to \$10,000 in seed funding after winning the pitch competition. The engineering student companies were Catalyst Cycling LLC and Make Me Modern Inc.

The Catalyst Cycling team is Justin Clark, a junior in computer science; Zach McCormick, a junior in mathematics; and Nick McCormick, a sophomore in mechanical engineering. Their company, which sells innovative cycling parts and accessories, is already gaining market traction with their carbon fiber wheel covers.

Make Me Modern Inc. is Anthony Meyer, a junior in electrical engineering; Thomas Truett, a senior in business management; and Daniel Lawhon, a junior in computer engineering. They are developing the software Breeze that will enable customers to preview their existing website in a variety of provided modern designs and allow them to update the look of their website with a simple push of a button.

Conrad Receives Mallicote Fellowship



Daniel Conrad (*BS/MSE '12*) (center) is pictured with, from left, Richard Mallicote (*MS/EE '79*) and Patricia Mallicote (*BS/Liberal Arts '72, MS/Social Work '75, MBA '85*). Conrad is the first recipient of the Richard and Patricia Mallicote Endowed Fellowship for engineering students pursuing a Master's Degree in Engineering and a Master's of Business Administration Degree as part of the Dual Degree Program. He completed the program and earned both degrees in December 2014.

College of Engineering Launches Leadership Program



COE alumnus J. Michael Stone

The College of Engineering created the J. Michael Stone Engineering Professional Practice Leadership Program in October 2014. Named for Stone, a 1963 alumnus of the college, the program will be set up to facilitate growth in leadership skills for students participating in the engineering cooperative education program.

"We recognize that learning leadership skills is a major component for their future success," said Dr. Wayne Davis, dean of the college. "By beginning that development their freshman year and expanding it when opportunities and challenges arise, we believe that we can help

them be prepared professionally as well as scholastically."

The program is not the first time that Stone has helped his alma mater. Stone, owner of Blue Water Partners LLC, also established the Prados Scholarship in honor of Professor Emeritus John W. Prados of the Department of Chemical and Biomolecular Engineering. It awards \$12,500 annually to two students who are chemical engineering majors and business minors who have participated in the co-op program.

Stone's latest way of giving back was announced at the college's student and donor appreciation luncheon, where Davis presented him with an award to honor his commitment.

College of Engineering Researchers Discover Key Finding in Cerebral Palsy Research

The possible detrimental effects on balance following a surgical procedure performed on many children with cerebral palsy is now better comprehended thanks to research conducted in part by a doctoral student in the College of Engineering.

The team reviewed a procedure in which the rectus femoris muscle is disconnected from the front of the knee and reattached to the back of the leg to correct problematic muscle function and improve mobility. Though commonly done to allow for more flexibility in the knees of patients, the surgery has inconsistent outcomes.

Misagh Mansouri, a PhD candidate in the Department of Mechanical, Aerospace, and Biomedical Engineering (MABE), and his advisor, Dr. Jeffrey Reinbolt, an assistant professor in the department, looked at how the procedure affects the balance of those with cerebral palsy.

"A lot of study has been given to how the surgery affects the range of motion, but we wanted to know if and how that translates into actual dynamics of balance in children with cerebral palsy," said Mansouri. "Using the real-world data from our collaborators at the Gillette Children's Hospital, we created patient-specific models of children with cerebral palsy for both pre- and post-surgery and with different crouch postures."

Mansouri began by interfacing two powerful software programs: MATLAB to simulate brain activity and OpenSim to simulate the body. The newly combined software—which has been made open-source to allow its adoption by other researchers—gives teams a chance to tweak various aspects of the simulation.

"Simulations can complement experiments to become a great asset to health care professionals, said Reinbolt. "We are working on using patient-specific simulations to improve not only treatment of movement disorders but interactions between people and the environment as well."

Ninety-two different muscle actuators—basically synthetic lightweight muscles capable of acting like the real thing—spread across twenty-one lower-body joints provide for an almost limitless number of conditions and movements, opening up all aspects of the physiology of cerebral palsy sufferers for study.

Mansouri pointed out that movement disorders account for \$849 billion each year in medical expenses, lost wages, and lost productivity.

That cost impact, combined with the obvious physical and emotional tolls of such conditions, further spurred Mansouri and Reinbolt to take a "body-first" approach to their study.

"Unlike many other studies in the field of biomechanics, we are not trying to simply track some experimental movements," said Mansouri. "We created biologically-inspired controllers based on

"The lessons I learned at UT, both in the classroom and on co-op work assignments, have guided my success and are still with me today," said Stone. "The College of Engineering has always given students a good foundation, but being able to take that next step and introduce leadership skills will make it even stronger."

The program is run through the Office of Engineering Professional Practice, which helps students find paid co-op and internship positions. The funding will provide tools and resources for students to use while they are out on co-op assignments in addition to leadership development activities that will be available once they return to campus. Those opportunities have long been seen as vital to the development of engineering students by allowing them to put into practice what they have learned in the classroom.

Stone has long been a proponent of students continuing their learning experience in business, finance and leadership after graduation to prepare them for advancement throughout their careers. Adding a leadership development program at the undergraduate level was the next logical step.

"Being able to provide leadership development tools to students on their co-op assignment can greatly enhance the practical skills they are learning," said Todd Reeves, director of UT's Engineering Professional Practice program. "His generosity will allow us to instill this concept of lifelong learning at a critical point."

the central nervous system to run muscle-actuated simulation with the goal of predicting and improving functional outcomes."

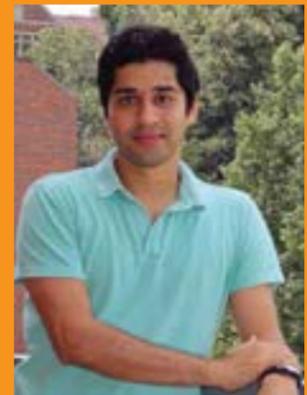
However, once Mansouri and Reinbolt—whose team included researchers from Stanford University, the University of Western Australia, and UT—reviewed the data, it became apparent that the hoped-for miracle that the surgery might provide did not work out.

"Our simulations showed that children who had the surgery were more likely to lose balance and fall during tripping than ones who did not, regardless of degree of crouched posture and whether they had the surgery on one side or both side of their knees," said Mansouri. "There are certainly more studies to be done and factors to be tested, but these results indicate that rectus femoris plays an intrinsic role in postural response to any challenges relating to balance."

Mansouri said more work is needed before the their research, funded through grants from the National Institutes of Health and the National Science Foundation, can be applied clinically.

For their next step, they want to test balance in different directions, such as side-to-side and diagonal motion, to go along with the forward-and-back motion studies they have completed.

The project was recently discussed on the University of Tennessee WUOT National Public Radio (NPR) show *All Things Considered*. The program can be accessed at wuot.org/post/method-focus-childrens-health. The aired NPR *All Things Considered: The Method* version is available at cpa.ds.npr.org/wuot/audio/2015/01/20150130. The MethodWEB.mp3 is on top and starts about the 4:15 mark. The extended version at cpa.ds.npr.org/wuot/audio/20.



Misagh Mansouri



Dr. Jeffrey Reinbolt

DENSO Boosts UT Engineering's Hybrid Vehicle Research



From left: DENSO's Brian Crawford and Scott Sheets present a check to MABE Department Head Dr. Matthew Mench. They are joined by DENSO's Sara Harris, far right.

Engineering students researching hybrid vehicle technology at the University of Tennessee, got a \$50,000 shot in the arm in fall 2014 from the DENSO North America Foundation.

"The support DENSO has given and continues to give our college is a tremendous asset for our students," said College of Engineering Dean Wayne Davis. "They have directly impacted, in a positive way, our ability to educate students in a number of automotive-related areas."

Part of the Department of Mechanical, Aerospace, and Biomedical Engineering, the Advanced Powertrains, Controls, and System Integration—or APCSI—Rolling Laboratory will allow students to develop new technology in those areas much faster than ever before.

The lab is designed so that students can test their ideas in a simulated vehicle environment, a technique known as in-the-loop testing, rather than having to install them in "real" automobiles. Avoiding the need to constantly change out the parts they are testing will save researchers time and money and can help manufacturers get the latest products to market faster as well.

That opportunity, combined with the company's past history with UT, made DENSO's support natural.

"Our longstanding partnership with UT's engineering program is important to the quality of products we produce around the world," said DENSO Manufacturing Tennessee Senior Vice President Mike Brackett.

The added bonus of the support is that it will allow UT students to focus more on hybrid vehicles and other green technology, helping them prepare for the rapidly changing automotive world.

For its part, DENSO views the grant not just as an opportunity for advancements in technology but as an investment in what it feels is UT's greatest resource: students.

According to the company, that has a benefit to everyone involved.

"Supporting these high-caliber educational programs provides us with local student co-ops, senior design collaboration and full-time engineers," said Brackett, who is also a board member of the North America DENSO Foundation. "This alliance has ongoing value to us and the entire automotive industry."

The foundation, an offshoot of the Japanese automotive parts manufacturer of the same name, started in 2001 with the goal of helping support the ideas of students in the fields of engineering and technology. In addition to the current grant, they have also sponsored the EcoCar program as well as emissions research and control programs at UT.

UT Engineering Students Help ORNL, Local Motors Print Drivable 3D Car



John Rogers, co-founder and CEO of Local Motors, left, and Douglas Woods, president of the Association for Manufacturing Technology, drive away from the International Manufacturing Technology Show in Chicago over the weekend in a car printed with the help of UT students.

The only "car" that most people associate with printers is a "car-tridge" of ink, but may soon change, thanks in part to several University of Tennessee, Knoxville, students.

UT, Oak Ridge National Laboratory, Local Motors, Cincinnati Incorporated, and Oak Ridge Associated Universities teamed up to print a working, drivable car at the International Manufacturing Technology Show in Chicago in September 2014.

The Strati 3D, officially produced by Local Motors, which has an office on Market Square in Knoxville, highlighted the show and placed what sounds like a product of science fiction firmly in the realm of reality.

"This brand-new process disrupts the manufacturing status quo," said John B. Rogers Jr., CEO of Local Motors. "It changes the consumer experience and proves that a car can be born in an entirely different way."

For UT students, the project was an opportunity to get real-world learning in what is known as additive manufacturing.

"Our students were critical to the success of the effort," said Dr. Taylor Eighmy, UT's vice chancellor of research and engagement. "We are so fortunate to be able to collaborate with ORNL and the Manufacturing Demonstration Facility as we do."

The students worked largely at the US Department of Energy's Manufacturing Demonstration Facility (MDF) with support from Volkswagen Chattanooga's Distinguished Scholars Program.

"They did a fabulous job and were critical to the project," said Craig Blue, the MDF's director. "They were essential to the car being built in Chicago, and the overall project accelerated the adoption of innovative 3D printing."

James Earle, a UT graduate, spearheaded the Local Motors efforts at the MDF, while a handful of UT students played key roles.

One of the biggest tasks involved improving the performance of software that allows engineers to see exactly how the printed layers will look before committing to printing them.

"We had an initial goal of coming up with software that could generate tool paths faster than existing programs but still allow us to have complete control," said UT's Kyle Goodrick, who worked on the overall project with fellow students Andrew Messing, Aaron Young and Alex Roschli. Goodrick and Roschli are electrical engineering majors, while Messing and Young are majoring in computer science.

Much in the same way that a printer prints one line after the next, a 3D printer builds one layer of the final object after the next. Messing worked on the framework to plan the printing paths, while Goodrick and Young worked on ways to improve their visualization and facilitate easier repair. Once at the show, Roschli and Messing operated the printer.

"The car is done, but our work on this project is just beginning," said Roschli.

Young added that he was able to directly use some of the things he learned in class while working on the project, again showing the connection between the work and research at UT and ORNL.

ORNL group director Lonnie Love said that UT's students played a critical role on the project, adding, "From our perspective, to say that this project would have been a failure without the students is not an overstatement."

College of Engineering Helps Kick Off Robot Season



Dr. Masood Parang, associate dean of the College of Engineering, addresses robotics teams during the launch of the 2015 FIRST Robotics Competition.

FIRST Robotics kicked off its 2015 game, Recycle Rush, with a live reveal broadcast online to teams around the world, including twenty-nine teams who gathered at Cox Auditorium on the UT campus on Saturday, January 3, 2015.

"Saturday marked the first time that any of the teams get to see the challenge of this year's game," said L.J. Robinson, Tennessee's regional director of For Inspiration and Recognition of Science and Technology (FIRST). "The kickoff event is a big deal in its own right, with gatherings held around the world to watch the announcement. Certainly, it's an exciting moment for those new to the competition."

The UT gathering had five new teams: Austin-East Magnet High School, Bearden High School, and Knox County Schools Career Magnet Academy at Pellissippi State in Knoxville; and Red Bank High School and Ivy Academy from the Chattanooga area. Teams learned that Recycle Rush will focus on designing, building, and programming robots that can stack plastic totes, place recycling bins on top of those totes and then place litter—represented by pool noodles—into the recycling bins.

Teams were treated to a free lunch on behalf of the College of Engineering—a major sponsor of the competition locally—before heading to Estabrook Hall to start working with designs, materials, and mentors to begin building the initial concept of their robots.

In addition to the lunch, the college's presence included an address by Associate Dean Masood Parang. Also, Dr. Bill Hamel of the Department of Mechanical, Aerospace, and Biomedical Engineering hosted a prebuild workshop.

"Our relationship with FIRST Robotics and with these budding engineers is one we take very seriously," said Parang. "Being able to help nurture these young minds is frankly securing the creative technical and engineering workforce of the future."

Teams had six weeks to work on their robots, which were then bagged and held securely until the start of the regional competition on April 2, 2105, in Knoxville.



Bearden High School's Patrick Woodworth, left, and Shea Payne look over their team's robot.

Nuclear Engineering Students Receive NNSA Fellowships

Two graduate students from the Department of Nuclear Engineering received fellowships from the National Nuclear Security Administration (NNSA) Graduate Fellowship Program (NGFP). The NGFP prepares and builds the next generation of leaders in nuclear security, working directly in NNSA program and site offices across the country.

Tracey Wellington accepted a fellowship position in the NNSA Office of Defense Nuclear Nonproliferation and Arms Control, Nuclear Controls (NA 242) in Washington, DC. Her fellowship is for June 2015 through June 2016. She is currently working on her PhD in energy science and engineering through the Bredesen Center.

Fareed Yasin accepted a fellowship position at the NNSA site office at the Pantex Plant near Amarillo, Texas. A 2014 graduate of the nuclear engineering program, he is working on his MS degree. His fellowship will also run from June 2015 through June 2016.

For more information about the program, visit ngfp.pnnl.gov.



Tracey Wellington



Fareed Yasin

Telesis Academy of Science and Math

A fourth-grade class from the Telesis Academy of Science and Math in West Covina, California, "adopted" the University of Tennessee for the school year in a program geared toward ensuring college preparedness for the students of the school. The College of Engineering sent the class UT and COE related items to help them celebrate the UT spirit. To read more about the school, visit www.telesisacademy.net.



Students at the Telesis Academy

Research Update

COE Professors Make Invisibility Research Breakthrough



Dr. Ramki Kalyanaraman



Dr. Gerd Duscher

Dr. Ramki Kalyanaraman, a professor in both the Department of Materials Science and Engineering (MSE) and the Department of Chemical and Biomolecular Engineering (CBE), Dr. Gerd Duscher, also a professor in MSE, recently made a breakthrough in research that could lead to a better coupling of light and magnetism, which in turn could yield improvements in data storage, sensing, imaging, and optical communication.

Using silver and a cobalt-iron compound, they focused on exploring the unique interactions of those materials—specifically, their magnetic and visibility properties. The concept is that by finding the right mix of materials with these properties you can make data archiving faster, cheaper, and with a higher density of storage.

In finding the right mix of materials, their team happened upon an entirely unexpected result.

The group—which also includes researchers from Washington University and Southern Illinois University and support from UT's Center for Materials Processing and Oak Ridge National Laboratory's Center for Nanophase Materials—found that the reaction between silver and cobalt serves to significantly enhance the optical interaction with cobalt.

Essentially, the team has discovered a magnetic material with extremely strong optical interactions that place it under consideration as a metamaterial, meaning a material with properties not found in nature. This discovery also opens up its possible use for invisibility and cloaking.

So far, though, this activity is all still occurring at the nano level. Eventually, the researchers hope that the other properties of the materials might make them useful as medical sensors, possibly detecting when unusual changes are happening in the body, such as the development of cancer.

The team—which includes graduate students in materials science and chemical engineering—is currently studying how and why the pairing behaves as it does and whether it can be duplicated using other materials.

COE Professors Receive \$1.75 Million Grant for Homeland Security Support

The Department of Homeland Security (DHS) is recognizing the UT College of Engineering's (COE) leading role in research into advancements in safety and detection surrounding nuclear-related issues since the beginning of the atomic age through its Academic Research Initiative.

Dr. Chuck Melcher, the director of the Scintillation Materials Research Center (SMRC) and a research professor in the Department of Materials Science and Engineering (MSE), and Dr. Eric Lukosi, assistant professor in the Department of Nuclear Engineering (NE), have been awarded a \$1.75 million five-year grant to investigate novel low-cost scintillators for radiation detection.

The project—which will be funded through the Academic Research Initiative of the Domestic Nuclear Detection Office of DHS—was initiated as a way to answer the main challenges facing nuclear radiation detection—cost and efficiency.

Currently, germanium and cadmium zinc telluride semiconductors provide the best energy resolution for gamma-ray detection, but both are very expensive per unit volume.

Conversely, sodium iodide or plastic scintillators—basically, materials that glow when in the presence of radiation—cost much less per unit volume but also suffer from a reduced energy resolution.

Low-cost detectors that are able to effectively distinguish NORM and special nuclear materials within seconds would not only make the world safer but also minimize the economic impact of tracking nuclear materials.

Melcher credits MSE Research Assistant Professor Mariya Zhuravleva's research—described as a “model project” by DHS—with providing the central concept for the study he and Lukosi will do.

Zhuravleva was awarded a \$2 million grant from DHS in 2012 to study and develop crystals that could be more efficiently used in



Dr. Chuck Melcher



Dr. Eric Lukosi



Dr. Mariya Zhuravleva

border locations to detect radiation.

The team's results led to breakthroughs in the types of substances being grown for scintillation purposes, some of which will now be used by Melcher and Lukosi.

Additionally, Dr. Larry Miller and UCOR Faculty Fellow Jason Hayward, both in nuclear engineering, previously worked on programs funded through DHS that initiated the ongoing partnership between UT and DHS.

By the time this latest project wraps up the university and the COE will have spent thirteen years at the forefront of Homeland Security's efforts towards nuclear nonproliferation.



Homeland Security

MABE Professor's Research Offers Promise for Heart Valve Patients

Dr. Zannatul Ferdous, an assistant professor in the College of Engineering's Department of Mechanical, Aerospace, and Biomedical Engineering (MABE) is leading a research team addressing the issue of heart disease, thanks in part to a BRIGE—Broadening Participation Research Initiation Grants in Engineering—grant from the National Science Foundation (NSF).

Cardiovascular diseases are the world's number one cause of death, with some estimates indicating that as many as one-third of the planet's deaths in a given year are attributable to some form of the disease.

While heart valve disease is only one of many afflictions falling under that heading, its widespread impact—affecting up to thirty percent of the elderly population in developed countries alone—makes it a key component of the overall problem of heart-related ailments.

“Currently, the treatment option for valve disease is mainly end-stage replacement or repair surgeries, and no early treatment or detection options exist,” said Ferdous. “The goal of our lab is to understand these diseases and develop alternate treatment options such as functional tissue-engineered heart valves.”

One of the main issues with heart valves that the group is focusing on is what is known as calcification, a process where calcium deposits build up on the valves, eventually restricting the

flow of blood through the heart.

By studying the root causes of calcification and constructing new heart valves through tissue engineering—using cells to construct organic human tissue—Ferdous and her group aim to eventually develop calcification-proof valves.

Heart valves make sure blood flows at the right pace and in the right direction with each pulse of the heart. When a valve fails it can lead to blood leaking between chambers or even block off its circulation completely.

“We are tackling calcification head-on, looking at risk factors from everything like age and gender to chemical factors and cell characteristics,” said Ferdous. “At the same time, we are developing custom devices that will allow us to truly mimic all the forces at play in the heart. This will be a significant improvement.”



Dr. Zannatul Ferdous

CTR's Southeastern Transportation Center Develops System to Manage Hazardous Materials Transport



Vehicles carrying hazardous materials are a part of everyday traffic in the modern world, with 1.2 million shipments a day in the United States alone.

The majority of drivers who share the roads with these vehicles may not be aware of the danger, but when a crash occurs, there can be shockingly little information available to first responders as they assess the situation. This can lead to evacuations, closures, and even injuries to both emergency personnel and the public at large.

A breakthrough being developed in conjunction with UT's Southeastern Transportation Center has the possibility to improve the situation.

The e-HM system—being devised by a UT-led consortium that includes Labelmaster Services, Blue Dot Solutions, and Oak Ridge National Laboratory (ORNL)—will allow such materials to be tracked in real time from the moment they are loaded until they arrive at their destination.

“This is a big step forward in terms of being able to track these materials,” said Stephen Richards, director of the STC. “At the same time, giving authorities the information they need in a far speedier manner is a vital part of this as well.”

Under the current paper manifest system used by most trucking companies, certain accidents have made it impossible to access cargo descriptions. That can leave fire and police officials aware only that a trailer has a hazmat placard on it but not what the material is or how much of it was on the truck. Surprisingly, current regulations don't

even require paper manifests to be updated as products are offloaded.

“The reality is that someone shipping a clothing item or shoe can track that all over the world, but the system for tracking hazardous materials is in the Dark Ages,” said Bob Richard of Labelmaster.

The way the system will operate will be much like an online shopping cart, with the technology being compatible with smart phones and tablets. Tracking will begin at the point of shipment with a bar code or QR code being scanned or photographed and thus entered into the virtual manifest.

Descriptions and quantities of materials and their packaging, as well as any federal regulations or safety precautions for those materials, will be included as part of the upload and will be updated after each pickup and delivery as part of a driver's standard routine.

The information will then be linked to the relevant emergency response guides and safety data sheets, and be made available to emergency personnel in real time, perhaps even upon dispatch, letting them know what they are facing at the scene of a crash or spill before they arrive. The next step will be to get feedback from businesses, emergency response personnel, and government agencies such as the FBI.

In order to facilitate the program, representatives from ORNL; businesses like Eastman Chemical, FedEx, and UPS; first responders at all levels of government; and partners such as the University of



STC Director Stephen Richards



Dr. Shashi Nambisan

Kentucky and the Mississippi Department of Transportation came to the university and discussed various ideas and plans on how to move forward and possible tweaks to the system.

“It was a great opportunity for us all to get together and share some of our ideas and our thoughts and concerns,” said Professor Shashi Nambisan of the Department of Civil and Environmental Engineering, the faculty member leading the e-HM initiative at UT. “This project is one that could have wide-ranging implications for years to come, so bringing together people that it will affect the most was critically important to developing an e-HM system that is based on broad stakeholder engagement.”

The STC began its current mission of promoting transportation safety through research and education in 1994 as part of the Center for Transportation Research (CTR) in the College of Engineering.

College of Engineering Programs Receive Prestigious Carnegie Community Engagement Classification Designation



Aiton Kohls, director of CTR's Traffic Signal Academy; Matt Cate, coordinator of the TN Transportation Assistant Program (TTAP); former CTR employee Jonathan Watson; and CTR Director Dave Clarke focus on a transportation project in downtown Knoxville.



Participants work on an engineering project during the eVOLS summer pre-college program.

The University of Tennessee, Knoxville, received some well-deserved good news in January when the Carnegie Foundation named UT to its prestigious Carnegie Community Engagement Classification for 2015.

The recognition comes for institutions that Carnegie feels do the best job of teaming up with communities to address the needs of the citizens in the areas they serve.

For the College of Engineering, the award held special meaning, as several college-led initiatives were singled out as exemplars—groups that stood above and beyond the norm and are said to be examples to others.

All told, a dozen groups, institutes and initiatives with varying involvement and support from the College of Engineering were chosen:

The Appalachian Community Health and Disaster Readiness Project, designed to help with Red Bird Mission, Manchester Memorial Hospital and Emergency Management Services of Clay County;

The Center for Transportation Research, which serves a variety of transportation, safety and economic needs throughout the country;

CURRENT's Adventures in STEM girls camp, which introduces advanced engineering, mathematics and biology to middle school girls;

Full-Service Community Schools, which helps meet the basic needs for Knoxville-area schools in an attempt to improve graduation rates and livelihoods;

Great Smoky Mountains National Park and UT, for the education opportunities and research that UT provides;

The Institute for a Secure and Sustainable Environment (ISSE), which seeks to improve water quality and study the watershed of the surrounding area;

The Institute for Smart Structures, which aims to improve the construction of buildings of the future through both design and materials;

Plan East Tennessee, a regional partnership founded with the understanding that surrounding communities benefit from shared ideas and growth;

The pre-college summer program in engineering, which is a series of grade-level-based summer camps that introduce

students to increasingly complex concepts in engineering and helps provide study prep for college;

The Smart Communities Initiative, which pairs UT with communities so that they can get the full advantage of the university's knowledge, research, and know-how;

UT Student Field-Work Engagement with International Partners, which helps pair students with real-world opportunities, primarily in the agriculture industry;

VolsTeach, which targets students in STEM fields with an interest in teaching in the hopes of strengthening those courses for U.S. students.

With fifty groups being selected in total at UT, having a dozen ties to the College of Engineering serves to highlight the strength of the program at UT.

"Certainly, seeing the involvement we have is a good reflection on the college, our students, our faculty and what we can provide," said Dr. Wayne Davis, dean of the college. "Not just what can do for UT, but to our community and even the greater good."

Each group at UT will have one particular week at UT that it is being celebrated.

The Office of Research and Engagement—through the Office of Community Engagement and Outreach—is coordinating that effort under the mantra "50 Partnerships that Make a Difference" and has a calendar noting when each entity gets its week in the sun.

For more on the program, visit engagement.utk.edu/partnerships-that-make-a-difference.



Students working with the ISSE program plant a Beaver Creek riparian area.

UT Engineering alumni work for these matching-gift companies and many others:

Alcoa. AT&T. ADP. Abbott Laboratories. Accenture. Agilent Technologies. Alstom Power. Amsted Industries. Apple. Armstrong. Atmos Energy. BASF. BP. Ball Corporation. **B&W Y-12.** **Bechtel.** Boeing. Bridgestone/Firestone Americas. Brink's Co. Brystal-Myers Squibb. Capital Group companies. Cardinal Health. Chevron. Cisco Systems. Coca-Cola. ConocoPhillips. DCP Midstream. **Denso.** Dow Chemical Company. Duke Energy. **DuPont.** Eaton Corporation. **ExxonMobil.** FMC Technologies. Fluor. GenCorp. General Electric. Georgia Power. Google. Harley-Davidson. **IBM.** Integrity Applications Incorporated. Intel. J.P. Morgan Chase. Johnson & Johnson. Johnson Controls. Kimberly-Clark. Lennox International. Levi Strauss. Lincoln Financial Group. **Lockheed Martin.** Medtronic. Merck & Co. Inc. Microsoft. **Motorola.** Norfolk Southern. Northrop Grumman. PepsiCo. Piedmont Natural Gas. Procter & Gamble. Qualcomm Incorporated. Raytheon Company. Rockwell Collins. SAIC. Schering-Plough. Schneider Electric/Square D. Shell. **Siemens Energy.** Southern Company Services. Takeda Pharmaceuticals. Telcordia Technologies. Texas Instruments. **Verizon.** Wells Fargo.

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Dr. Araceli Espinoza Joins the College of Engineering as Special Projects Coordinator

Dean Wayne T. Davis is pleased to announce that Dr. Araceli A. Espinoza joined the College of Engineering as the Special Programs Coordinator in September 2014.

Espinoza will direct the development of the college's upcoming Distinguished Lecture Series and will also provide coordination with a variety of programs and projects related to the college's journey to the Top 25 public colleges of engineering. She will also assist with the college's efforts to provide a more diverse faculty and student body.

The College of Engineering Distinguished Lecture Series will officially launch in the fall of 2015. The plan is to showcase speakers who are internationally and nationally renowned in their field. The college hopes to present at least five lectures per semester.

"UT faculty and students, as well as those from other institutions, will be able to enjoy the lectures in person, via live webcast, or through an archive of the presentations," Espinoza said.

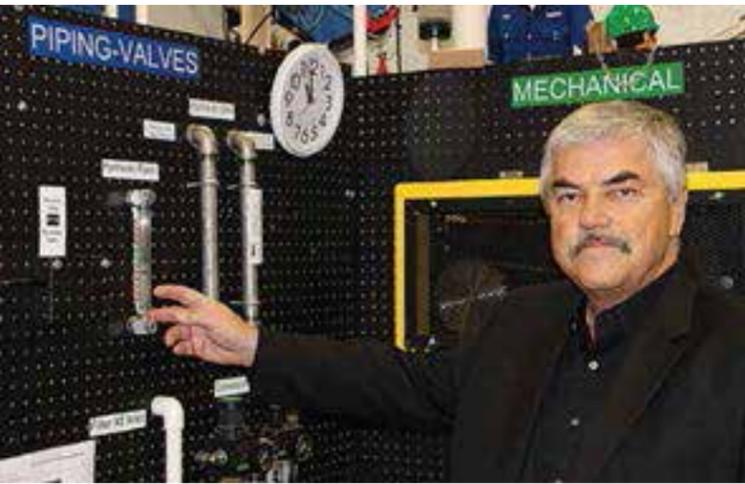
Espinoza earned her BA in American Studies from U.C. Berkeley and completed a ME in Postsecondary Administration and Student Affairs from the University of Southern California, where she also earned a PhD in Urban Education Policy.

Espinoza's research focuses on the postsecondary experiences and outcomes of racial and ethnic minority (REM) students, first-generation college students and REM students in the STEM fields. She has given multiple presentations at national conferences and has published her research in peer-reviewed journals including the *Journal of College Student Development*. Her work can also be found in the books *The Education of the Hispanic Population: Selected Essays and Fostering Success of Ethnic and Racial Minorities in STEM: The Role of Minority Serving Institutions*.



Dr. Araceli Espinoza

College of Engineering Research Center Spotlight: The Reliability and Maintainability Center



Dr. Klaus Blache, director of the Reliability and Maintainability Center, points out equipment that the center uses in its instruction.

The Reliability and Maintainability Center (RMC) seeks to lead in the advancement of reliability and maintainability education and practices within both the academic and industrial communities. Students gain valuable on-the-job experience through research projects and the center's internship program. Companies benefit from access to fresh ideas and approaches that save on cost by increasing throughput and improving safety and quality for their industries.

"We deliver programs and processes that lead to better results in the member companies," said Dr. Klaus Blache, RMC director and research professor in the Department of Industrial and Systems Engineering.

The RMC launched in 1996 with twelve participating companies and now has more than fifty member companies, including Alpha Natural Resources, Amazon, Bayer, Cargill, Dow Chemical, Energizer, DuPont, Eastman Chemical, General Motors, Goodyear, Keurig Green Mountain, Koch, Nissan, Oak Ridge National Laboratories, Owens Corning, Schlumberger, and the Redstone Arsenal/US Army.

Blache contributes the growth to maintaining an active profile for the center, including targeted meetings with potential member

companies and coverage in national publications such as *Uptime* and *Maintenance Technology*. A growing professional development program has also brought many groups to the center. RMC also attends several conferences each year, offering keynote and technical presentations on reliability/maintainability and presenting membership opportunities in both the center and the College of Engineering's Reliability and Maintainability Engineering (RME) minor and graduate program.

Two members of the RMC Board of Advisors (member company representatives voted in by all member companies for three-year terms) are replaced each year. As evidence of the RMC interest by companies, thirteen individuals ran for the open positions decided on in February 2015.

"The RMC is recognized as the premier program for RME students and reliability and maintainability professional development," said Blache. "We're business-focused, so if they use our processes and programs, the end result is that they are going to improve their operations and they're going to save money."

That recognition is reinforced by the positive experience of member companies, as evidence in testimonials from industry representatives like Barry Cross, global operations support manager for Schlumberger's Drilling & Measurements Business Unit.

"Schlumberger joined the RMC with the intent of stepping out of our comfort zone (oilfield service industry) to see what other industries and individual companies were doing with respect to reliability and maintainability of their equipment," said Cross. "The ability to network with reliability and maintainability practitioners, sharing non-proprietary information, learning what had worked and not worked in the past, was very valuable, helping to guide our strategy long term."

In other corporate interactions, the RMC partnered with Emerson Process Management to name the 2014 Reliability Program of the Year, a distinction that went to LyondellBasell's Channelview, Texas, plant. The winning reliability manager provided a keynote at the 2015 Maintenance and Reliability Conference (MARCON).

The RMC holds regular meetings for members to share practices and information, and sponsors MARCON for discussing new methods, applications, and techniques. The 2015 conference was held February 23-26 in Knoxville. It featured ten workshops and more than thirty papers, which included four keynote presentations. It was held at the Knoxville Convention Center to accommodate growth since the previous year.

"This year we boasted about eighty percent practitioner papers," said Blache. "Also, keynotes from Koch Industries, Novelis,



UT students gain experience during a reliability and maintainability study-abroad course in Munich, Germany.

ArcelorMittal, and LyondellBasell, plus an opening address by the CEO of *Uptime Magazine*. The 2016 MARCON will be our twentieth anniversary for the RMC, and will have some very special events."

The RMC offers a Reliability and Maintainability Implementation Certification (RMIC) program for working professionals. The first graduate of the RMIC—from Nissan—was recognized in a presentation at the 2015 MARCON. The program consists of six courses and a results-based project (in industry) aimed at delivering measurable improvement. Several companies have already made it a requirement for their R&M engineers and technicians.

"After completing the coursework, earning the RMIC requires a three-to-six-month, RMC-mentored, in-plant project with measurable results," said Blache. "So, it's a two-to-three-year professional development journey. The growth here will be quick, since we have several hundred company students that have taken eligible professional development courses that can count for the RMIC."

Summer internships through RMC put engineering students in the field with member companies, starting with a one-week training program during the spring that mixes academics and professional training.

"We keep the students for the first week and put them through a reliability and maintainability boot camp," explained Blache.

A unique aspect of the spring class is that it is a mix of about thirty to forty percent students attending with company representatives. Company participants usually continue to work closely with students, in mentor or supervisory roles, for the thirteen weeks of the internship. The program boasts high job-placement rates for graduates, often with the companies where students intern. Some RMC graduates are now bringing their companies to the program.

RMC continues to add new programs to its roster. Blache led a 2014 faculty-led study-abroad course, "Global Perspectives on Lean, Reliability, and Maintainability," in Munich, Germany. In January 2015, RMC presented a boot camp class at the Nissan Training Center in Smyrna, Tennessee, and other offsite locations are in discussion. Other new offerings from RMC include in-house

training on maintainability concepts with companies like Georgia Pacific. The center is also putting together the RMC Data Mining and Benchmarking Lab, funded by Grainger, for undergraduates doing internships to learn applied skills.

Also, more than one hundred and sixty College of Engineering students were invited to MARCON, as a maintainability class assignment, to listen to the professional presentations and investigate technologies with exhibitors.

The RMC works in conjunction with the Reliability and Maintainability Engineering (RME) academic program, directed by Dr. Mingzhou Jin. Undergraduate students can minor in reliability and maintainability, while graduate students can earn master's degrees or graduate certificates through either on-campus or distance-learning courses.

"The RMC helps to advance reliability and maintainability education and practices," said Jin. "The center helps to connect students and faculty in the RME program with industry to achieve exceptional value by arranging internship and providing real-world projects. MARCON provides students an opportunity to hear industrial practices directly from reliability practitioners. The conference also provides the RME program a recruiting and job placement opportunity."

The RMC teaching labs will move this summer from Estabrook Hall to offices on floor B-1 of Perkins Hall. The Factory Teaching Lab will go to B-67; the Spare Parts Best Practice and Technologies Lab to B-69; and the RMC Teaching Classroom to B-60. Room 501 of East Stadium Hall is being converted into the Data Mining and Benchmarking Lab. The move, part of the relocation of several engineering programs into Perkins, should be complete by the beginning of August 2015.

"The center's reliability & maintainability (R&M) services and company memberships will continue to grow, but at a controlled pace to maintain a high quality program," said Blache. "It's important to offer the right balance of relevant training, networking and sharing best practices, having a sufficient number of student interns, and provide overall member-company support on their R&M journey."



Jason Tranter, with the Mobius Institute, presents the "Roadmap to Reliability" workshop during MARCON 2015.



Chad Crane, at left, of Nissan earned the RMC's first Reliability and Maintainability Implementation Certification (RMIC), presented at MARCON 2015 by Dr. Klaus Blache, at right.



Left to right: Christina Parsons, Kathleen Kim-Baker, Amy Johnston, Dorothy Bryson, Adlai Hurt, Juliette McClure, Brian Shupe, and Whitney Lee.

I don't usually focus on us in this newsletter because philanthropy is truly all about you. However, I want to be sure you all know the Engineering Development and Alumni Team because we are out on the road around the country visiting our graduates and corporate partners. Our office is located in Perkins Hall, right in the heart of "Engineering Country" and just down the hall from Dean Davis. This central position gives the college's leaders access to us and puts us in the middle of the action where we can know students and faculty.

In-state, we organize around the departments so that we have liaison relationships while out-of-state we cluster geographically to maximize travel dollars. We also work with centrally-based corporate & foundation relations officers and regional development officers, expanding our team with other great colleagues.

Dorothy Bryson, Executive Director
Overall vision and direction, campaign planning, board of advisors, events, donors around the country. Twenty-five years fundraising experience. In Engineering Development since 2008.

Brian Shupe, Director
Department of Mechanical, Aerospace, and Biomedical Engineering & Department of Chemical Engineering. Out-of-state: North

Western, Western, and Central United States, plus Alabama. In Engineering Development since 2009.

Adlai Hurt, Director
Department of Civil and Environmental Engineering & Department of Industrial & Systems Engineering. Out-of-state: South Western United States, Mid-Atlantic and Southern Coastal states. In Engineering Development since 2009.

Amy Johnston, Director
Electrical Engineering and Computer Science, Materials Science and Engineering, & Nuclear Engineering. Out-of-state: Southern United States. In Engineering Development since 2012.

Whitney Lee, Leadership Annual Giving Coordinator
Leadership level donors including coordinating the Dean's Circle. In charge of Senior Impact, our senior gift challenge. In Engineering Development since 2012.

Juliette McClure, Stewardship & Donor Relations Coordinator
Donor reports, scholarship luncheon, Homecoming, alumni events, social media, Telefund, and VolStarter (volstarter.utk.edu). In Engineering Development since 2012.

Christina Parsons, Development Assistant
Office coordination and support. In Engineering Development since 2008.

Kathleen Kim-Baker, Development Assistant
Office coordination and support. In Engineering Development since 2009.

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Diversity Update

Diversity Program Graduates Join Together to Celebrate as the University Dedicates Fred D. Brown Jr. Residence Hall



College of Engineering Executive Development of Director Dorothy Bryson (third from right) with special guests at the fundraising breakfast (left to right): Mea Reeves (BS/ChE '92); Bryan McBride (friend of a guest); Ted Dunnville (BS/EE '82); Artis Williams (BS/EE '79); Sonya Baskerville (BS/IE '89); Travis Griffin (Director of Engineering Diversity Programs); Rodney Brooks (BS/ME '85); Deborah Brown (BS/EE '82); Mark Drake (BS/EE '82); Cavanaugh Mims (BS/NE '86); Dwight Hutchins (BS/ChE '86); Lou Etta Burkins (BS/ChE '88, MBA '92); and Dr. Mark Dean (BS/EE '79).

On Friday, October 10, 2014, engineering alumni gathered to celebrate the legacy of the founder of the college's Engineering Diversity Programs (EDP) during a luncheon at the University Center ballroom and the dedication of UT's first new residence in nearly forty years, the Fred D. Brown Jr. Residence Hall. The facility is named after the first director of the college's diversity programs, established in 1973.

The day started with breakfast for a small group of volunteers in the Executive Dining Room of the University Center. Engineering alumni Dwight Hutchins (BS/ChE '86), Rodney Brooks (BS/ME '85) and Cavanaugh Mims (BS/NE '86) chaired the meeting, which focused on efforts to raise \$1 million for three specific EDP funds—the Engineering Diversity Excellence Endowment, the Fred D. Brown Jr. Minority Academic Endowment, and the James Pippin Pre-College Program Endowment (named for James Pippin, who succeeded Brown as director of diversity programs until 2006)—between December of 2011 and December of 2018. College of Engineering Dean Wayne Davis spoke enthusiastically about the progress that EDP has made in recent years and thanked the alumni volunteers for their leadership and help in communicating the fundraising initiative to their fellow alumni.

A luncheon featured heart-warming reunions between former participants in the college's diversity programs, and included remarks by UT Chancellor Jimmy G. Cheek, Dean Davis, current EDP director Travis Griffin, and Fred Brown Scholarship recipients

Andre Norfleet and Tina Anjonrin-Ohu. Hutchins, Mims, and Rodney Brooks (BS/ME '85) spoke passionately about Fred Brown's impact in their lives and the importance of alumni and friends joining them in investing in the UT funds that support today's diversity efforts to continue Brown's legacy of providing access, opportunity, and student support in pursuit of a UT engineering education. Approximately sixty alumni were in attendance, including around sixty of Fred Brown's family members, some from as far away as Massachusetts and California.

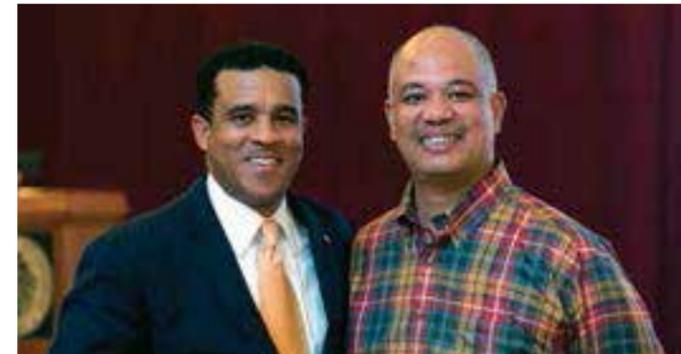
In the afternoon, UT President Joe DiPietro, Chancellor Cheek, Dean Davis, and Brown's family, friends, and former students, joined in celebrating Brown's life and legacy in a dedication ceremony that included live music, food, and tours of the residence hall.

Brown's son, Douglas Brown, delivered one of the most poignant of the day's speeches. As he recalled memories of his father—some of which sparked laughter and some of which highlighted his impact on the hundreds of former students who were mentored by his dad in attendance—the standing-room-only crowd gained insight to a man responsible for making great leaps in UT's diversity efforts.

Brown, who died in 1986, was the College of Engineering's first director of what was then called the Minority Engineering Scholarship Program, which started in 1973. Renamed the Engineering Diversity Programs office in 1999, the office serves to increase the number of underrepresented—African American,



The group gathered to cut the ribbon to dedicate the Fred D. Brown Jr. Residence Hall included (left to right) Assistant Director for Facilities and University Housing Rodney Combs; Anne Holt Blackburn; UT Trustee Spruell Driver (BS/IE '87); Thelma Brown; Douglas Brown; Vice Chancellor for Student Life Vincent Carilli; Chancellor Jimmy G. Cheek; UT President Joe DiPietro; Assistant Vice Chancellor for Student Life and Executive Director of Housing Frank Cuevas; President of the United Residence Hall Council Natalie Torres; Student Government Association President Kelsey Keny; and President of the Fred D. Brown Jr. Residence Hall Sherie Smith.



UT Board of Trustees member and luncheon emcee Spruell Driver (BS/IE '87, left) greets Dwight Hutchins (BS/ChE '86, right) at the College of Engineering Diversity Programs Luncheon.

Hispanic, Native American, Pacific Islander, Alaskan Native, and female—students. The EDP now offers successful summer recruitment and education programs for pre-college students, provides support and mentoring for underrepresented students during their time on campus, and encourages and facilitates enrollment of its participants in graduate school.

Brown was the first African American teacher at Oak Ridge High soon after it was integrated and became the first African American member of the Alcoa Board of Education. He is credited with laying the foundation for the UT College of Engineering's diversity program, one of the most successful college-based diversity recruiting programs in the nation.

"Fred Brown was an extremely important person in the lives of his students," said Dean Davis, who was a professor at UT when Brown arrived. "He was instrumental in making sure that students didn't just come to UT, but that they graduated."

Many former students who participated in the engineering diversity programs described how Brown took a "hands-on" approach to their education.

"He would come to dorms and check to make sure you were studying and he would make a point of walking with you to class to make sure you went," said Robert McKinney (BS/ME '86). "He made it clear that you were here to learn."



Engineering Development Office Leadership Annual Giving Coordinator Whitney Lee (center) with COE Board of Advisors member Cavanaugh Mims (BS/NE '86, left) and Rodney Brooks (BS/ME '85, right) at the EDP luncheon prior to the Fred Brown residence hall dedication.

Mims said Brown came to his house in Georgia to convince him to come to UT, something a number of his former students echoed. Mims said that at the time he didn't even know where UT's campus was located, but something about Brown's pitch convinced him to come.

Several students echoed the sentiment that Brown's guidance was key to them not only getting through college, but thriving.

"He would come to our dorm and see if we were playing cards or studying," said Spruell Driver Jr. (BS/IE '87), who emceed the EDP luncheon and is now on UT's Board of Trustees. "He did everything he could to make sure we were prepared for success."

The two hundred and fifty thousand square-foot residence hall houses about seven hundred undergraduates.

The building includes an art gallery, two restaurants, recreation and workout facilities, Internet and conference lounges on every floor—even its own post office.

The Fred D. Brown Jr. Residence Hall is the first building at the university named for an African American individual.

For more information and a look at the facility, visit: housing.utk.edu/students/halls/suite/#fred-d-brown-jr

For more information on the fundraising campaign for Engineering Diversity Programs, visit www.engr.utk.edu/give/diversity.



Engineering diversity programs alumni and guests pose for a photo in the lobby of the Fred D. Brown Jr. Residence Hall.



IBM Fellow and UT John Fisher Distinguished Professor in the Department of Electrical Engineering and Computer Science Mark Dean (BS/EE '79, far right) with his wife, Denise (right) and his parents, Barbara (left) and James (far left) Dean.



Fred Brown's son Douglas Brown speaks at the dedication of the Fred D. Brown Jr. Residence Hall.



Tiffany Sithiphone, UT engineering student and regional chairperson of the National Society of Black Engineers (NSBE) (left), and Diamond Wallace, UT NSBE chapter president (right), at the diversity programs luncheon.



Unveiling the plaque at the Fred D. Brown Jr. Residence Hall are (left to right) Vice Chancellor for Student Life Vincent Carilli; Assistant Vice Chancellor for Student Life and Executive Director of Housing Frank Cuevas; UT President Joe DiPietro; UT Chancellor Jimmy G. Cheek; Fred Brown's widow Thelma Brown; and Fred Brown's son Douglas Brown.



As a student entering the University of Tennessee, one of my main goals was to avoid financial debt. The Alcoa Outreach and Bennett Crosswell scholarships have played important roles in helping me accomplish this goal and avoid taking out student loans. Due to the generosity of these benefactors, I had the opportunity to study abroad and spend five weeks in London where I took two engineering classes while exploring the city and United Kingdom. Furthermore, as a student on campus I have not had to worry about finding a part-time job to pay for school or pay off student loans. This has allowed me to focus on my academic studies and getting involved on campus. My experience as an undergraduate student at UT would have been much harder financially if I had not received these two scholarships. I cannot express enough how grateful I am for this educational merit aid and how much of a positive impact it has had on my life.

William Fredebeil
Alcoa Outreach Scholarship
Bennett Crosswell Scholarship

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Alumni News

1960s

Dr. Donald B. Bivens (BS/ChE '62) was appointed Chair of the Research Administration Committee of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers for 2014-2015.

1980s



Randy Inklebarger

Randy Inklebarger (BS/CE '82, MS/CE '86) joined MS Technology Inc. (MSTI) as its new vice president and business-unit manager for engineering projects. In this role, he is responsible for the diversification and growth of MSTI's consulting and engineering business.

During Inklebarger's graduate work at UT, he led the hardened concrete research laboratory as a graduate research assistant for Dr. Edwin Burdette. He is a licensed Professional Engineer in Tennessee and a member of the American Society of Civil Engineers (ASCE).

Sheryl Ellison Ponds (BS/ME '87), was named the recipient of the 2014 CREW DC

Annual Achievement Award. The award recognizes CREW DC members who have accomplished success with a significant achievement/challenge in their individual career goals over the course of the past year. CREW (Commercial Real Estate Women) is the only organization in the United States that is dedicated to supporting the achievement of women in the commercial real estate industry. The Washington, DC, chapter is a founding member of the CREW Network and is the largest chapter in the country with approximately 400 members.

2000s



Isaac Mitchell

Isaac B. Mitchell (BS/IE '05) was elected to the Board of Directors for the Institute of Industrial Engineers Society for Health Systems Engineering. As a board member, Mitchell will be an advocate for the application of industrial engineering principles in healthcare

to improve processes and outcomes for patients. He currently serves as Director of Lean Continuous Improvement at East Tennessee Children's Hospital in Knoxville.



Jason Prince

Jason Prince (BS/ChE '00) was appointed to director of meat operations for Golden State Foods, Conyers, Georgia, in 2014. For 13 years previous to this appointment, Prince served in a variety of roles at Cargill, providing in-depth expertise and leadership throughout his career.



Joseph Tipton

Dr. Joseph B. Tipton Jr. (BS/AE '02, PhD/ME '09) joined Lipscomb University, Nashville, on January 1, 2015, as an associate professor of mechanical engineering in the Raymond B. Jones College of Engineering. Tipton is a former graduate student of Dr. Kenneth Kihm, Magnavox Professor in the MABE department. Previously, Tipton was an assistant professor for six years at the University of Evansville in Evansville, Indiana.



Edward Von Halle

Dr. Edward Von Halle (PhD/ChE '59) died on July 5, 2013, at age 87. He was a resident of Oak Ridge, Tennessee. Von Halle was an internationally renowned expert in the theory of isotope separation. His PhD dissertation at UT was on the subject of separation of species by thermal diffusion, and his later contributions covered isotope separation by gaseous diffusion, gas centrifuge and laser methods. He spent most of his career in the Operations Analysis and Planning Division at K25, where he became greatly respected as a mentor, writer, and expert on various methods for uranium enrichment. He spent a year at the Nuclear Energy Research Center in Karlsruhe, Germany, where he worked on uranium enrichment theory. He also taught a UT class on the theory of uranium enrichment as part of the Oak Ridge Resident Graduate Program. Von Halle was the author or coauthor of many papers and journal articles on the flow and separation theory for gas centrifuges. He also spent a semester at the University of Virginia at Charlottesville pursuing interests in this area. After his retirement, Von Halle consulted at Oak Ridge National Laboratory and continued to contribute his knowledge in his field.

Gregg Richard Beitel (MS/ME '85) died on September 29, 2014. He was a resident of Murfreesboro, Tennessee.

Harry Randall "Randy" Bivens (BS/CE '76) died on August 8, 2014. He was a resident of Charlotte, North Carolina.

Kenneth R. Bloomer (BS/CE '56) died on December 7, 2013. He was a resident of Knoxville.

George Archibald Bradfute Jr. (BS/EE '52, MS/EE '58) died on January 8, 2015. He was a resident of Memphis, Tennessee.

John Alfred Brown (BS/EE '60) died on August 26, 2014. He was a resident of Jefferson City, Tennessee.

Paul A. Clawser (BS/EE '75) died on August 6, 2014. He was a resident of Nashville, Tennessee.

John "Gavin" Duncan (BS/CE '14) died on August 24, 2014. He was a resident of Knoxville.

William M. "Bill" Giles (BS/ChE '60) died on October 6, 2014. He was a resident of Cherokee, Alabama.

Richard Weber Ham (BS/ME '79) died on September 28, 2014. He was a resident of Keyport, New Jersey.

Jerry Dan Hughes (MS/CE '73) died on October 14, 2014. He was a resident of Franklin, Tennessee.

Bryan Sewall Manley Jr. (BS/CE '44) died on January 27, 2015. He was a resident of Birmingham, Alabama.

John Roger Masters (BS/EPH '68) died on December 22, 2014. He was a resident of The Woodlands, Texas.

Dr. Herbert E. McCoy Jr. (BS/ChE '57, MS/MetE '58, PhD/Metallurgical Engineering '64) died on October 6, 2014. He was a resident of Clinton, Tennessee.

John McLemore Pelton (BS/ME '59, MS/ME '71) died on September 2, 2014. He was a resident of Tullahoma, Tennessee.

William Roy "Bill" Price (BS/CE '49) died on October 12, 2014. He was a resident of Knoxville.

Ned Watts Rizzardi (BS/ChE '59) died on January 23, 2015. He was a resident of Maryville, Tennessee.

Henry Clay Russell (BS/EE '49) died on August 30, 2014. He was a resident of Knoxville.

Robert E. Scarbrough (BS/EE '53) died on September 29, 2014. He was a resident of Sarasota, Florida.

Barry Sheffield (BS/EE '49) died on June 10, 2014. He was a resident of Birmingham, Alabama.

Col. Jack Bates Stewart (BS/EE '41) died on October 12, 2014. He was a resident of Maryville, Tennessee.

William Richard "Bill" Straker (BS/ChE '56) died on January 11, 2015. He was a resident of Sandwich, Massachusetts.

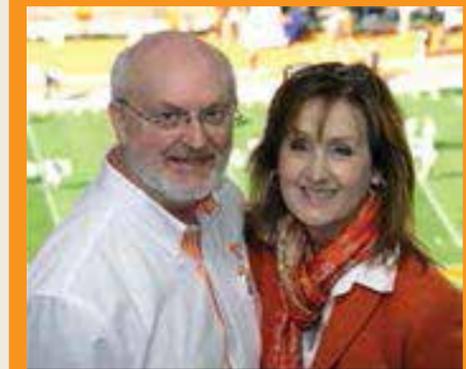
James M. "Jim" Strickland (BS/CE '59) died on December 7, 2014. He was a resident of Columbus, Missouri.

Charles K. Swan Jr. (BS/ME '50) died on February 23, 2015. He was a resident of Knoxville.

Charles Philip "Phil" Wehman (BS/IE '52) died on December 25, 2013. He was a resident of Chattanooga, Tennessee.

Leroy Willis (BS/ME '71) died on June 26, 2014. He was a resident of Knoxville.

Special Tribute: Bob Bryson

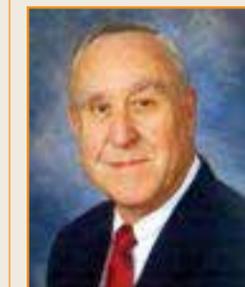


Bob and Dorothy Bryson

Robert William "Bob" Bryson, husband of COE Executive Director of Development Dorothy Bryson, passed away on November 13, 2014. Bob worked for thirty-three years at Y-12 in computer electronics and repairs, before he retired in April 2012. Although Bob was not officially a staff member of the College of

Engineering, he was a loyal Volunteer, offering much-appreciated assistance with college events and activities. Always genuine and welcoming, he represented UT well. Bob was an avid supporter of the UT Pride of the Southland Marching Band and engineering. Tom (BS/ME '72, *Pride Alumnus*) and Elaine Edwards, friends of the Brysons, established an endowed scholarship in Bob's name. The Bob Bryson Memorial Band Scholarship will be awarded to students who are members of the Pride with preference to those majoring in computer engineering. Secondary preference will be to students who are majoring in music theory with an emphasis on music technology. Contributions to the Bob Bryson Memorial Scholarship Endowment may be made c/o College of Engineering Development, 1506 Middle Drive, 118 Perkins Hall, Knoxville, TN 37996. For more information, you may also contact the Engineering Development Office at 865-974-2779.

Corrections



John F. Germ

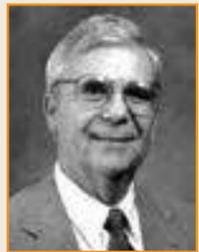
An incorrect photo was featured on page 33 of the fall 2014 edition of Tennessee Engineer. In the Board of Advisors Emeritus listings, this photo should have been listed for Mr. John F. Germ:

John F. Germ (ME '61) Soddy Daisy, TN Campbell & Associates, Inc. Chairman of the Board (Retired)

We apologize for the error.

Memorials

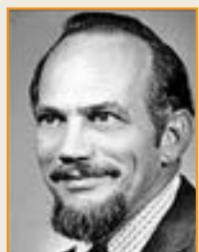
Faculty



William Goodwin

Dr. William "Bill" Goodwin died on December 1, 2014. A resident of Franklin, Tennessee, Goodwin was a former professor of civil engineering at UT. He served as associate dean and director of the Engineering Experiment Station in the College of Engineering, and the dean of research in the UT Office of Graduate Studies and Research. He initiated the Transportation Center at the University of Tennessee, started the Economic Development Center, and served as the executive director of the UT Research Corporation, a patent holding

office. He was active on numerous professional committees and boards, including Region Four of the US Department of Transportation in Tennessee, and was chairman of Tennessee's Governor's Energy Advisory Board. He also served in many community organizations.



Harry Lee Johnson

Dr. Harry Lee Johnson (BS/CE '62, MS/CE '70) died on August 22, 2014, at age 84. A resident of Rutledge, Tennessee, Johnson was a former professor of civil engineering at UT. He enjoyed working as a consultant with Allen and Hoshall Engineering in Memphis from 1973 to 1979 and was a proud veteran of the US Army.

Staff

Jewell Johnson, longtime College of Engineering staff member, died on December 6, 2014, at age 68. Johnson had recently retired from her position as administrative assistant with the COE's Center for Materials Processing. She was a resident of Corryton, Tennessee.

Alumni



Clint and Elaine Boyd

Clint C. Boyd Jr. (BS/IE '85) died on September 8, 2014. Boyd was a member of UT's Parents Council, serving as the Student and Academic Success Assistant Committee Chair with his wife, Elaine. He was a faithful Big Orange volunteer and was awarded UT's Accomplished Alumni Award in 2010 for his time spent giving back to students, faculty, and fellow alumni. A member of Group 8 of the Minority Engineering Scholarship Program in the college, Boyd was a strong

supporter of the minority education. In 2008, he started Higher Ground Training, Inc., a personal and professional training company in Nashville with his wife. Boyd was a member of Omega Psi Phi Fraternity, Inc. where he served as chaplain for the Nashville graduate chapter.

Events & Awards

UTSI Celebrates 50th Anniversary



The UTSI Celebration Banquet



UTSI Alum and Boeing Vice President Pete Hoffman speaks at the historical and technical session.



UTSI Professor John Schmisser and UT Chancellor Jimmy Cheek at the celebration banquet.



UTSI Exec Director Buddy Moore and Professor Ahmad Vakili at the UTSI 50th anniversary picnic celebration.

The University of Tennessee Space Institute (UTSI) marked its fiftieth anniversary with a two-day celebration September 11-12, 2014.

Almost three hundred people gathered to celebrate this milestone of the institute.

The celebration events included a picnic, games, concerts, comedy show with well-known comedian Henry Cho, fireworks, a historical and technical session, student poster presentations, and a banquet.

Several UTSI alumni and professors participated in the historical and technical session. Notable guest speakers included: David Hiebert, retired Arnold Engineering Development Center (AEDC) historian; Wesley Harris, first UT/UTSI Vice President; Dr. James Wu, UTSI Professor Emeritus; Dr. Roger Crawford, UTSI alum and Professor Emeritus; John Rampy, UTSI alum and retired AEDC Exec Director; Pete Hoffman, UTSI alum and Boeing Vice President; and Winfried (Wimp) Goethert, son of UTSI founder.

UTSI, located on Woods Reservoir in rural Tullahoma, was founded in 1964 to support AEDC at Arnold Air Force Base as an education and research facility.

The campus is adjacent to AEDC and the air force base on 365 acres made available by the US Air Force and granted to UTSI by the Department of Health, Education, and Welfare.

Discussions about opening space technology institute began as early as 1949.

In 1956, the Air Force made contractual arrangements with the University of Tennessee to establish an AEDC graduate study program for center employees, using office and classroom space provided by the Air Force.

Joel Bailey was the first director of the UT initiative, followed by Robert Young.

When the National Aeronautics and Space Administration (NASA) was established in 1958, the need for space education was noticeable at AEDC and NASA. At that time, there were very few academic institutions offering engineering courses in space technology. Dr. B.H. Goethert seized upon this national need and proposed to both the Air Force and Tennessee state government that a space institute be built in Tullahoma near AEDC. As a result of Goethert's proposal, UTSI was established and Goethert was appointed first dean of the institute.

UTSI has become an internationally recognized institution for graduate study and research in engineering, physics, mathematics, and aviation systems and has made remarkable contributions at the local, state, national, and global levels.

In its fifty years, UTSI has had more than two thousand graduates, including two hundred and fifty doctorates and nine astronauts.

"Our graduates stand as a testament to our contributions to both aerospace and the defense of the country," UTSI Executive Director Robert "Buddy" Moore said. "We're also focused on making scientific and technical advances, not only in issues surrounding flight but in the automotive industry as well."

The next fifty years look promising for UTSI.

With the recent plans to go hypersonic under the direction of Dr. John Schmisser, UTSI will continue to make noteworthy contributions to space technology.

For more information, visit utsi.edu.

COE Graduates Receive Recognitions at 2014 Alumni Awards Dinner

On Friday, October 24, 2014, the University of Tennessee Alumni Board of Directors presented the 2014 Alumni Awards Dinner at the Knoxville Convention Center. The event is designed to recognize and honor outstanding alumni.

Three College of Engineering alumni received awards at the event.

Alumni Professional Achievement Award: Harold T. Conner Jr., PhD, PE

For the past seven years, Harold Conner has been the associate director of Facilities and Infrastructure for the Lawrence Livermore National Laboratory in Livermore, California. In this role, he provides emergency management capabilities and leads continuous improvement in other key areas of operations.

For more than forty years, Conner has epitomized leadership, achievement, and accountability in supporting and maintaining the nation's nuclear deterrent through his work as deputy director and vice president of Environmental Management and Enrichment Facilities at Lockheed Martin Gaseous Diffusion plants in Oak Ridge, Tennessee; Paducah, Kentucky; and Portsmouth, Ohio. He has served as manager and vice president of the Oak Ridge site, chief operations officer at the Idaho National Laboratory, director of the Enriched Uranium Operations at the Y-12 Plant in Oak Ridge, chief operations officer at the Savannah River Site in South Carolina, and in his present position now at Livermore National Laboratory.

In 1968, Conner was UT's first African American to earn a bachelor's degree in chemical engineering; he also received a master's degree in chemical engineering from the university in 1978. He received a PhD in industrial and systems engineering and engineering management from the University of Alabama in 2013.

The Alumni Professional Achievement Award recognizes alumni who have achieved a high level of success in their chosen field of endeavor. The trademark of this recipient is a record of notable career accomplishments and a history of outstanding contributions to their profession. The award acknowledges their success, which brings honor and credit to the University of Tennessee.



Harold T. Conner Jr.

Distinguished Alumnus Award: Terry D. Douglass

Terry Douglass has shaped an industry, transformed medical diagnostics internationally, and impacted hundreds of thousands of lives.

When Douglass entered UT as a freshman, the emerging field of nuclear engineering interested him deeply, but he had to work to put himself through school. With no nuclear engineering co-op possibilities in his hometown of Jackson, Tennessee, he chose electrical engineering instead, completing his bachelor's (1965), master's (1966), and PhD (1968) at the university.

After the remarkable achievement of earning his PhD just three years after his BS, Terry joined EG&G Ortec in Oak Ridge, Tennessee, and worked his way up in his fifteen years to serve as president for his last three. He was instrumental in the development of positron emission tomography (PET) for medical imaging.

In 1983, Douglass and several other colleagues formed Computer Technology and Imaging Inc., later renamed CTI Molecular Imaging



Terry Douglass

Inc., which was headquartered in Knoxville. Douglass and his team led the worldwide transition of PET from experimental use to FDA approval. His team at CTI also revolutionized diagnostic medicine by combining PET with computer-assisted tomography (CT) scans to create a leading tool for early cancer detection. In 2005, CTI was sold to Siemens for more than \$1 billion.

Douglass has served on numerous business and charitable boards. After the sale of CTI, Douglass founded ProVision Foundation to provide faith-based leadership, relational support, and financial resources to encourage and enable Christian ministries around the world. He and three other CTI founders also established the CTI Chair in Electrical and Computer Engineering in the Department of Electrical Engineering and Computer Science at UT. In 2011, he received the College of Engineering's Nathan W. Dougherty Award—the college's highest accolade recognizing alumni or other outstanding engineers whose professional accomplishments have enhanced the prestige of the engineering profession and/or brought honor and distinction to the college and the university.

Douglass is currently developing Provision Health Alliance at Dowell Springs in Knoxville, a world-class comprehensive clinical outpatient center for cancer care with a wellness focus. The core is the Proton Therapy Center, using an innovative form of radiation therapy that focuses beams on tumors and results in less damage to adjacent tissue. Along with this effort, Douglass' firm, ProNova, could make proton therapy more accessible worldwide.

Distinguished Alumnus Award: Kimberly Scheibe Greene

As executive vice president and chief operating officer for the Southern Company, Kim Greene is responsible for overseeing all of Southern Company's system operations throughout the company's multi-state region. Power generation, transmission, engineering and construction services, system planning, and research and environmental affairs are all under Greene's direction, along with Southern Power and Southern Wholesale Energy divisions.

A Knoxville native, Greene earned her BS in engineering science and mechanics from UT in 1988 and her BS in biomedical engineering from the University of Alabama at Birmingham in 1990. She began her career at Southern Company Services in 1991 as a mechanical engineer and progressed through various areas of engineering, operations, and finance.

She spent eight years at a Southern Company subsidiary, Southern Energy Inc., now NGR, and worked in the areas of finance, structuring, trading, and asset management. In 1996, she earned her MBA in finance from Samford University.

In 2007, Greene joined TVA as the organization's chief financial officer, and then served as TVA's group president of strategy and external relations; later, she was the chief generation officer, responsible for more than 30,000 megawatts of coal, natural gas, hydro, and renewable power generation. In 2011, she completed the Advanced Management Program at Harvard Business School. Greene returned to Southern Company in 2013.

Greene is on the board of the Electric Power Research Institute (EPRI) and recently served as the EPRI Board chair; she also serves on the advisory boards for the UT College of Engineering and the University of Alabama at Birmingham Master of Safety Engineering Program. She is also a member of the board of the Alliance to Save Energy and the Georgia Aquarium.

Greene is a member of the UT Alliance of Women Philanthropists, the Georgia Chapter of the International Women's Forum, and the Executive Women in Energy organization. She was inducted into the Alabama Engineering Hall of Fame in February 2014.

The Distinguished Alumnus Award is the single highest alumni award given and is reserved for alumni who have excelled at the national or international level. Award winners have attained extraordinary distinction and success and his/her field of endeavor. The achievements of these award recipients have brought credit and acclaim to the university and have benefitted society at large.



Kimberly Scheibe Greene

CEE puts together Best Meal for CANstruction



The CEE CANstruction team poses with their sculpture. From left, back row: Liam Weaver, Matt McCarter, and Seth Gilliland; front row: Zach Schneider (student team leader), Matthew Brunton, and Dr. Jenny Retherford.

Students in the Department of Civil and Environmental Engineering (CEE) earned the Best Meal Award and a respectable third place in the People's Choice voting for the 2014 CANstruction competition. This year, the CEE team constructed a Grinch-themed sculpture, pictured below, titled "Maybe Christmas Doesn't Come From a Can or a Store." CANstruction engages organizations in a competition to create sculptures using canned-food items. The canned food is donated to Second Harvest food bank after the contest. Messer Construction is the corporate sponsor for the student-led team, as well as the overall sponsor for the event.

For more information, visit www.facebook.com/knoxcan.



The CEE CANstruction 2014 sculpture entry at the Knoxville Convention Center.

Office of Engineering Professional Practice Hosts Record Number of Businesses at Expo



An engineering co-op student discusses employment possibilities with a representative from Kimberly-Clark at the Engineering Professional Practice Expo.

One of the key experiences for students in the College of Engineering is the opportunity to take part in a paid co-op or internship education experience.

The college's Office of Engineering Professional Practice (EPP) helps match students with potential companies, making sure the pairing is educationally relevant to the students' future goals and current academic interests.

Each year, the EPP office hosts a pair of expos during the year, giving companies and students a chance to interact and see if they are a good fit of working together.

This fall, the number of companies that came to UT was large, with seventy-seven businesses setting up booths in the concourse of Thompson-Boling Arena, interviewing more than six hundred and fifty students about co-ops and internships. All told, nearly one thousand four hundred interviews took place between students and businesses.



ExxonMobil was one of the international corporations represented at the EPP Expo.

The companies ranged from East Tennessee giants such as DENSO Manufacturing, and Eastman Chemical to international conglomerates like BMW, ExxonMobil, DuPont, and Nissan.

"This year was not only our largest expo in program history, but the number and variety of companies in attendance gave our young students unprecedented exposure," said EPP Director Todd Reeves. "The possible co-op or internship assignments that come out of this give them the experiences they need to better prepare for their future."

Over five hundred businesses have relationships with the EPP and the university.

Founded in 1926, the EPP office is one of the oldest of its kind in the south. EPP-sponsored expos of this type that showcase engineering students early in their academic career continue prove that UT is a significant resource for the business and technology community.



The Expo facilitated more than 1,400 interviews between students and corporate representatives.

COE 2014 Engineers Day Features Keynote Address from International Space Station



Engineers Day attendees listen to keynote speaker Barry Wilmore speaking from the International Space Station.



UT alumnus Barry Wilmore (left) and fellow Astronaut Reid Wiseman (right) set up their space suits and tools in the equipment lock of the Quest Airlock aboard the International Space Station on October 1. Wilmore received his master's in aviation systems from UT and was the keynote speaker for the 2014 Engineers Day.



Students participate in an experiment day during Engineers Day.



Enjoying Engineers Day 2014 are (left to right) Dean Davis, Joshua Lin, Brandon Hong, Collin McLeod and Brandon Hotsinpiller, the Tau Beta Pi Engineers Day co-chair. The three students in the center are from Houston High School.

Competition, fun, and lots of information about engineering was featured as some of the top high school students in Tennessee arrived on campus on October for the College of Engineering's annual Engineers Day.

All undergraduate classes were dismissed for the day so that UT faculty, staff, and students could interact with the more than one thousand seven hundred visitors who attended this year.

As part of the event, attendees will receive a keynote address from out of this world—literally.

UT alumnus and current NASA astronaut Barry Wilmore prepared a special message for the event from his spot aboard the International Space Station. Wilmore earned his master's in aviation systems from the UT Space Institute, administered as part of the UT Knoxville College of Engineering.

In his address, Wilmore, who was the commander of the space station from November 2014 to March 2015, told students that he's a "Tennessee boy" and that he wouldn't have considered any other institution than UT for his engineering education.



High school students from across the state participated in the 2014 Engineers Day.

He also gives students a tour of the space station while showing off some zero gravity football skills before closing with a dramatic view of Africa from two hundred and twenty miles above Earth.

The college has held Engineers Day each October for more than one hundred years as a way for students to learn about the different types of engineering and experience examples of the way engineering affects the modern world.

This year, contests included everything from constructing balsa wood bridges to making food-powered batteries to help expose students to some of the fundamental concepts of engineering. Engineering professional societies also had exhibits and tables with information on specific disciplines.

Student teams also took part in a series of quiz bowls, culminating with a grand finale to end the day.

For more information and competition results for Engineers Day, visit www.engr.utk.edu/ed/.

COE Hosts Student and Donor Appreciation Luncheon in October



Associate Dean for Academic and Student Affairs Masood Parang (left) and COE Dean Wayne Davis (right) with Bennett Croswell, keynote speaker for the COE 2014 Student and Donor Appreciation Luncheon.



COE alumnus and Prados Chemical Engineering Co-op Scholarship donor Mike Stone (center) with student recipients Jonathan Jones (left) and Travis Keever (right).



UT development staff member Whitney Lee (left) chats with former Engineering Diversity Programs Director and scholarship donor Jim Pippin (right) at the luncheon.



COE Dean Wayne Davis (left) presents a plaque to donor and engineering alumnus Mike Stone (right) in honor of Stone's establishment of the J. Michael Stone Engineering Professional Practice Leadership Program in the College of Engineering's Engineering Professional Practice Program.



ETEBA Freshman Engineering Scholarship representatives Angela Shilling (standing) and Stephanie Long Neu (seated, left) with recipient Brad Bennett (seated, right).

On Thursday, October 2, 2014, College of Engineering students, faculty, staff, and alumni, donors, and special friends of the college gathered at The Foundry for the Student and Donor Appreciation Luncheon.

This annual event provides an opportunity to recognize outstanding students and to thank the donors who have generously provided support for scholarships. Both department and college level scholarship donors and recipients are included in the event.

Associate Dean for Academic and Student Affairs Masood Parang welcomed one hundred and eighty-one guests and then introduced COE Dean Wayne Davis. After his remarks, Davis then presented an award to donor J. Michael Stone, who recently created the J. Michael Stone Engineering Professional Practice Leadership Program. Named for Stone, a 1963 alumnus of the college, the program is set up to facilitate growth in leadership skills for students participating in the engineering cooperative education program.

The program is run through the Office of Engineering Professional Practice, which helps students find paid co-op and internship positions. The funding will provide tools and resources for students to use while they are out on co-op assignments in addition to leadership development activities that will be available once they return to campus.

Davis then introduced the keynote speaker, COE alumnus Bennett Croswell, President, Military Engines for Pratt & Whitney and a COE board member, who provided interesting commentary on his student years at UT and his professional experience as a leader in the organization responsible for providing and sustaining propulsion power for the US services and the country's foreign allies—approximately six thousand engines operated by more than thirty nations. After his remarks, Croswell showed off his "Go Vols Beat Florida" tee shirt and was presented with a special gift in recognition of his role as speaker at the event.

Parang concluded the luncheon by thanking the attending donors and congratulating the outstanding students at the event.



Scholarship donors Gloria and Dwight Kessel (left to right, seated) with their scholarship recipients at the Student & Donor Appreciation Luncheon (left to right) Will Price, Sierra Frech, Brandon Hotsinpieler, Parker McCullough, and Kylie White



Scholarship donor Leonard Murray, Jr. (left) and Karen Lowe (right) with student recipient Derek Lusby (center) at the Student and Donor Appreciation Luncheon.

Engineering Alumni Enjoy the College of Engineering 2014 Alumni Barbeque on The Hill



COE Dean Wayne Davis (second from right) talks with engineering alumni at the 2014 Homecoming Alumni Barbeque.



The EcoCAR 3 drew a lot of interest from attendees at the 2014 Homecoming Alumni Barbeque



Representatives of the student chapter of the Institute of Industrial Engineers greet guests at the engineering Homecoming event.

The UT College of Engineering held its Annual Alumni Barbeque on the Hill on Saturday, October 11, 2014, with two hundred and thirty-two guests attending. The event included a barbeque lunch, catered by Dead End BBQ, and featured student and faculty exhibits and demonstrations, reunions with former classmates and faculty, and games for both adults and children. The UT Volunteers football team capped off the day with a resounding 45-10 victory over UT Chattanooga.

The College of Engineering 2014 Halloween Spirit Challenge

Departments Compete in Second Annual Engineering Halloween Spirit Challenge Competition

"Boo at the Bridge," the second annual College of Engineering Halloween Spirit Competition, brought out multiple COE departments in a range of costume themes to the Tickle building pedestrian bridge.

Winners of the costume contest were:

Overall: The Department of Civil and Environmental Engineering presented its version of "Thriller," dancing as zombies across the Tickle bridge.

Most Creative: Department of Nuclear Engineering faculty and staff dressed as "pro-nuclear" protesters, complete with nuclear energy encouraging picket signs.

Department Participation: Department of Chemical and Biomolecular Engineering faculty and staff were dressed as "Wizard of Oz" characters—including The Yellow Brick Road.

Other themes were: Department of Industrial and Systems Engineering faculty and staff as "Productivity Wizards," with Harry Potter-style costumes; Department of Materials Science and Engineering dressed as scarecrows; Department of Mechanical, Aerospace, and Biomedical Engineering dressed as characters from the *Despicable Me* movies.

To view more photos from the competition, visit tinyurl.com/ot4epyl.



The Department of Chemical and Biomedical Engineering selected *The Wizard of Oz* as their Halloween costume theme.



The "zombies" of the Department of Civil and Environmental Engineering were led in a dance across the bridge to Michael Jackson's *Thriller* by Interim Department Head Greg Reed (center).



The "Productivity Wizards" representing the Department of Industrial and Systems Engineering.



The "pro-nuclear protesters" from the Department of Nuclear Engineering at the COE Halloween Spirit Competition.



The characters in the *Despicable Me* movies were the Halloween theme for the Department of Mechanical, Aerospace and Biomedical Engineering, including MABE department head Matthew Mench (far left, with big nose) and former department head Bill Hamel (next to Mench with safety glasses).



The Department of Materials Science and Engineering dressed up as scarecrows for the competition.

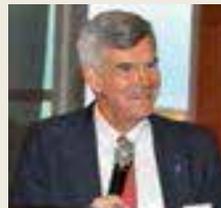
Calendar

Spring 2015		Fall 2015	
Classes Begin	Jan 7	Classes Begin	Aug 19
2nd Session Begins	Feb 26	Labor day	Sept 7
Spring Break	Mar 16-20	Fall Break	Oct 15-16
Classes End	Apr 24	Classes End	Dec 1
Study Day	Apr 27	Study Day	Dec 2
Exams	Apr 28-30, May 1, 4-5	Exams	Dec 3-4, 7-10
Graduate Hooding	May 7	Graduate Hooding	Dec 10
Commencement	May 6-9	Commencement	Dec 11
Official Graduation Date	May 9	Official Graduation Date	Dec 11

Contact Information

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		Development	974-2779
Dr. Bill Dunne, <i>Associate Dean for Research & Technology</i>		Engineering Advising Services	974-4008
		Engineering Diversity Programs	974-1931
Dr. Veerle Keppens, <i>Associate Dean for Faculty Affairs</i>		Engineering Fundamentals	974-9810
		Engineering Professional Practice	974-5323
Dr. Masood Parang, <i>Associate Dean for Academic & Student Affairs</i>		Engineering Research	974-8360
		Engineering Student Affairs	974-2454
Departments		Finance & Admin. Affairs	974-5279
Chemical & Biomolecular	974-2421	Research Centers	
Civil & Environmental	974-2503	Materials Processing	974-0816
Electrical & Computer Science	974-3461	Maintenance & Reliability	974-9625
Industrial & Information	974-3333	Scintillation Materials	974-0267
Materials Science	974-5336	Transportation Research	974-5255
Mechanical, Aerospace &		Intelligent Systems and	
Biomedical	974-2093	Machine Learning	974-5803
Nuclear	974-2525	CURRENT	974-9720
Administration & Programs		Innovative Computing Laboratory	974-8295

Reception Honors NAE Member George Pharr



Dr. George Pharr

An invitation-only reception was held on October 6 in the West Club of the Neyland Stadium Skybox to honor Dr. George Pharr, director of the Joint Institute for Advanced Materials (JIAM) for his election to the prestigious National Academy of Engineering. He is the fifth National Academy

member in the College of Engineering.

Pharr is also a Chancellor's Professor in the Department of Materials Science and Engineering and joint faculty scientist in the Materials Science and Technology Division at Oak Ridge National Laboratory.

The McKamey Professor of Engineering, Pharr directs the UT-ORNL Joint Institute for Advanced Materials (JIAM). The JIAM building is now under construction on the Cherokee Farms Innovation Campus, a joint project of UT and ORNL, along Alcoa Highway.

Election to the NAE is among the highest professional distinctions an engineer can receive. Academy membership honors those who are pioneering new and developing fields of technology, making major advancements in traditional fields of engineering, or developing and implementing innovative approaches to engineering education.

Pharr is among sixty-seven engineers nationwide elected in the 2014 NAE class and one of two thousand two hundred and fifty who belong to the academy.

Attendees at the event included UT Chancellor Jimmy G. Cheek, COE Dean Wayne Davis, COE Associate Deans Masood Parang, Bill Dunne, and Veerle Keppens, and Pharr's wife, Marilyn, and other family members.