

Annual Report 2016

THE UNIVERSITY OF
TENNESSEE
KNOXVILLE 

COLLEGE OF ENGINEERING



T ENGINEERING

The University of Tennessee College of Engineering

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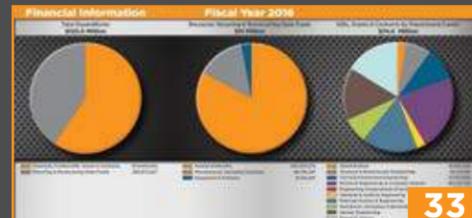
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Mission Statement

The mission of the University of Tennessee College of Engineering is:

To provide high quality education in the major engineering disciplines from the undergraduate through doctoral levels through a creative balance of academic, professional, and extracurricular programs;

To foster and maintain mutually beneficial partnerships with our alumni, friends, industry, and local, state, and federal governments through public services assistance and collaborative research; and

To be a major contributor to our nation's technology base through scholarship and research.

College of Engineering Annual Report 2016

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The information in this report reflects the time period from June 30, 2015 through July 1, 2016. The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA institution in the provision of its education and employment programs and services. All qualified applicants will receive equal consideration for employment without regard to race, color, national origin, religion, sex, pregnancy or marital status, sexual orientation, gender identity, age, physical or mental disability, or covered veteran status.

ENGINEERING

Dean's Message

Fiscal Year 2016, which ended on June 30, was another excellent year for our college! Our faculty, staff, and graduate teaching assistants were engaged in providing the best education to the largest number of undergraduate and graduate students that we have ever experienced—over 3,000 undergraduate and 1,000 graduate students. We also graduated a record number of almost 800 students. The good news is that 51% of our graduating undergraduates and 55% of our graduate students this past year were employed within the state while the remaining graduates were employed elsewhere—a very nice balance for a public college of engineering. The median starting salaries of our graduates in FY16 were \$60,000 (undergraduate), \$67,000 (MS), and \$81,000 (PhD). Interestingly enough, nearly the same percentage of our 27,250 alumni (50%) live in Tennessee today. The other half live in 49 states and 85+ countries. So, the impact of our college's efforts are felt both in state as well as around the globe as our students obtain their education; get involved in co-op programs with companies and agencies; participate in humanitarian outreach activities; conduct research with our faculty; and then move into the workforce where they continue to make the world a better place through innovation and development of technology. Our faculty, staff, students, and graduates, more than ever, are addressing the grand challenges that face the world today. In fact, an increasing number of our students are involved directly in programs such as the National Academy of Engineering's (NAE) Grand Challenge Programs, which are addressing the grand challenges that face our nation and the world.

Our enrollment trends continue to increase as shown in this year's annual report. As I write this message, we have just received information indicating that our UG enrollment for Fall 2016 has increased by 7% compared to last fall's class, and that the percentage of women in the freshman class for Fiscal Year 2016 and for Fall 2016 remains at an all-time high of 22%.

The number of women faculty is now at 27—far higher than in years past. We continue to offer programs starting at the pre-college level up to the faculty and administrative level to enhance the diversity

of our college and its departments and to provide a more diverse engineering workforce. These enrollment trends, particularly at the graduate level, are also enhanced by the outstanding ability of our faculty and staff to engage with federal agencies and with our corporate and state partners to provide the funding needed to provide research assistantships/stipends to our students.

The very strong support of our donors (both alumni and friends of the college) continues to provide funds for scholarships at the undergraduate level, fellowships, and top-off stipends at the graduate level, faculty fellow awards, and faculty professorships and chairs. It is the totality of this sustained team effort that has enhanced our programs and that has allowed our college to excel in its mission of "providing high quality education in the major engineering disciplines from the undergraduate through doctoral levels through a creative balance of academic, professional, and extracurricular programs."

We express our appreciation to the many people who have helped make an impact on the quality of the education provided to our students. In return, the college and the students that it graduates are committed to helping solve the grand challenges of the world—in turn creating a better and safer place to live.

It continues to be a great time to be a Vol and we hope that you will enjoy reading in this year's annual report about some of the many exciting things that happened in Fiscal Year 2016. We are even more excited about the future of the college as we begin the new 2017 Fiscal Year—so become engaged with us as we all invest in the education of our future engineering graduates.



Wayne T. Davis Endowed Dean's Chair in Engineering



College Profile

Board of Advisors for Fiscal Year 2016 (July 1, 2015- June 30, 2016)

Mr. Todd A. Apple
BS/ChE '87, JD '00
(Nashville School of Law)
Director, Channel Marketing-NA
Residential, Masonite International
Garnet Valley, Pennsylvania

Mr. Terry K. Begley
BS/ChE '69, MS/EA '74
Vice President, Global Supply Chain,
Chief Procurement Officer (retired)
Eastman Chemical Company
Kingsport, Tennessee

Mr. Thomas (Tom) J. Bryce
BS/IE '76,
Owner/President/Management (OPM)
Program '95
(Harvard Business School)
Chairman and CEO
Bryce Corporation
Memphis, Tennessee

Ms. Kathy J. Caldwell
BS/CE '84
President, Caldwell Cook & Associates
Gainesville, Florida

Dr. Wayne A. Coleman
BS/NE '63, MS/NE '65, PhD/NE '69
Corporate Vice President (retired)
Science Applications International
Corporation (SAIC)
Solana Beach, California

Mr. Joseph (Joe) C. Cook, Jr.
BS/IE '65
Founder and Principal,
Mountain Group Partners
Nashville, Tennessee

Mr. Mark K. Cox
BS/ChE '89, MBA '02 (Northwestern
University, Kellogg School of
Management)
Senior Vice President, Chief
Manufacturing and Engineering Officer
Eastman Chemical Company
Kingsport, Tennessee

Mr. Michael C. Crabtree
BS/EE '73, MS/EE '75, MBA '87
President, Crabtree Ventures, LLC
Franklin, Tennessee

Mr. Bennett Crowell
BS/ME '79, MBA/Aviation
(Embry Riddle Aeronautical University)
President, Military Engines,
Pratt & Whitney
East Hartford, Connecticut

Dr. William L. Eversole
BS/EE '73, PhD/EE
(Southern Methodist University)
CEO and President, Bandspeed, Inc.
Austin, Texas

Mr. Jim K. Flood
BS/CE '80
Vice President, Artic/Eastern Canada,
ExxonMobil Development Company
Spring, Texas

Ms. Kimberly S. Greene
BS/ES '88, MS/BioM '90
(University of Alabama-Birmingham),
MBA '96 (Samford)
Executive Vice President and Chief
Operating Officer, Southern Company
Birmingham, Alabama

Ms. Sharon S. Habibi
BS/Arch '75, MS/CE '77, EMBA '89
Former CEO/President,
Syscom Technologies, Inc.
Atlanta, Georgia

Mr. Ralph D. Heath
BS/EE '70, MBA '75
Executive Vice President (retired)
Lockheed Martin
Aledo, Texas

Mr. Pete Hoffman
BS/ME '82 (University of Tennessee-
Martin), MS/ME '84 (University
of Tennessee Space Insitute),
MS/Manufacturing Engineering
(Washington University-St. Louis),
Master of International Business
(St. Louis University)
Vice President of Intellectual
Property Management
The Boeing Company
St. Louis, Missouri

Mr. John Howanitz
BS/Psychology/Criminal Justice
(Dual Major) '81 (King's College,
Wilkes-Barre)
General Manager, Nuclear Security &
Operations
Bechtel National, Inc.
Reston, Virginia

Dr. Burkhard J. Huhnke
PhD '99 (Technical University of
Braunschweig, Germany)
Vice President, Product Innovation
VW Group of America Inc.
Chattanooga, Tennessee

Mr. Kenneth (Ken) Huntsman
BS/CompSci '74 (Pennsylvania State
University), MS/CompSci '77
Co-Founder (retired)
America Online (AOL)
Altavista, Virginia

Ms. Misty D. Mayes
BS/IE '88
President, Management Solutions, LLC
Knoxville, Tennessee

Mr. Cavanaugh Mims
BS/NE '86
President, Visionary Solutions, LLC
Knoxville, Tennessee

Mr. Ronald T. Morris
BS/EE '69
Senior Consultant (Contractor)
DuPont
Eads, Tennessee

Dr. Jeff Nichols
BA/Math '78, BA/Chem '78
(Malone College), PhD '83
(Texas A&M University)
Associate Laboratory Director,
Computing & Computational Sciences
Directorate, ORNL
Oak Ridge, Tennessee

Mr. J.D. "Spike" Tickle II
BS/IE '87, MBA '98 (University of
North Carolina-Chapel Hill)
Director, Strongwell Corporation,
Three Horse Investments, LLC
Bristol, Virginia

Mr. Ronald L. Turner
BS/Aero '68, MS/Aero '72
(University of Florida),
MS/Mgmt (MIT-Sloan Fellow) '77
Managing Director, Turner Aero, LLC
CEO, Ceridian Corporation (retired)
Amelia Island, Florida

Mr. Steven Welsh
BS/EE '87
General Manager, WW Infrastructure
Services Enablement
IBM Global Technology Services
Raleigh, North Carolina

Ms. Jacinda B. Woodward
BS/EE '88 Auburn University
Senior Vice President,
Transmissions & Power Supply
Tennessee Valley Authority
Chattanooga, Tennessee

Mr. Eric L. Zeanah
BS/IE '84
President/Owner
American Accessories International
Knoxville, Tennessee



THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

COLLEGE OF ENGINEERING

Leadership Team

Dr. Wayne T. Davis
Dean of Engineering

Dr. William Dunne
Associate Dean for Research
and Technology

Dr. Veerle Kappans
Associate Dean for Faculty
Affairs (to 10/16)

Dr. Masood Parang
Associate Dean for Academic
and Student Affairs

Dr. Richard Bennett
Director of the Engineering
Fundamentals Division

Dorothy Barkley Bryson
Executive Director of
Engineering Development

Kim Cowart
Director of Engineering
Communications

Travis Griffin
Director of Engineering
Diversity Programs

Dr. Kevin Kit
Director of Engineering
Honors Program

Kimberly McCulloch
Director of Finance and
Administrative Affairs

Dr. J. Roger Parsons
Director Engineering Outreach
(to 7/16)

Todd Reeves
Director of Engineering
Professional Practice

Margie Russell
Director of Engineering
Advising Services

Departments

Biosystems Engineering and
Soil Science**
**Dr. Eric C. Drumm/
Dr. Julie Carter (4/01/18)**
Department Head

Chemical and Biomolecular
Engineering
Dr. Bamin Khomami
Department Head

Civil and Environmental
Engineering
Dr. Chris Cox
Department Head

Electrical Engineering and
Computer Science
Dr. Leon Tolbert
Department Head

Industrial and Systems
Engineering
Dr. John E. Kobza
Department Head

Materials Science and
Engineering
Dr. Veerle Kappans
Department Head

Mechanical, Aerospace, and
Biomedical Engineering
Dr. Matthew M. Mench
Department Head

Nuclear Engineering
Dr. J. Wesley Hines
Department Head

University of Tennessee Space
Institute
**Dr. Robert Moore/
Dr. Mark Whorton (2/01/18)**
Executive Director

Degrees Offered

Bachelor of Science
Aerospace Engineering
Biomedical Engineering
*Biosystems Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Computer Science
Electrical Engineering
Industrial Engineering
Materials Science &
Engineering
Mechanical Engineering
Nuclear Engineering

Master of Science
Aerospace Engineering
Biomedical Engineering
*Biosystems Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Computer Science
Electrical Engineering
Engineering Science
Environmental Engineering
Industrial Engineering
Materials Science &
Engineering
Mechanical Engineering
Dual MS-MBA program
Nuclear Engineering
Reliability and
Maintainability Engineering

Doctor of Philosophy
Aerospace Engineering
Biomedical Engineering
*Biosystems Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Computer Science
Electrical Engineering
** Energy Science &
Engineering
Industrial Engineering
Materials Science &
Engineering
Mechanical Engineering
Nuclear Engineering

* In conjunction with the
College of Agricultural
Sciences and Natural
Resources.

** In conjunction with the
Bredesen Center.

Academic Support Programs and Diversity Initiatives

Distance Education Degrees and
Certificates in Engineering
The Jerry E. Stoneking *engage*™
Freshman Engineering Program
Engineering Advising Services
Engineering Diversity Programs
Engineering Honors Program
Engineering Outreach Office
Engineering Professional Practice
Tennessee Louis Stokes Alliance
for Minority Participation

Enrollment Figures

The origins of the College of
Engineering at the University of
Tennessee date back to 1838.

Total Enrollment Full-Time Programs Academic Year 2015

Undergraduate:	3,093
Graduate - MS:	330
Graduate - PhD:	678
Total:	4,101

Degrees Granted Academic Year 2015-2016

Bachelor of Science:	519
Master of Science:	181
Doctor of Philosophy:	90
Total:	790

Faculty - Fiscal Year 2015-2016

Professors:	90
Associate Professors:	49
Assistant Professors:	43
Total:	*182

*Including Biosystems Engineering
and UTSI

Accreditation

All engineering programs at
the University of Tennessee are
accredited by the Engineering
Accreditation Commission of
ABET, <http://www.abet.org>. The
computer science program at
the University of Tennessee is
accredited by the Computing
Accreditation commission of
ABET.

Student/Faculty Ratio

22.5:1

For FY 2016 (July 1, 2015-June 30, 2016)

The college has six National
Academy of Engineering
Members

Dr. Mark Dean, John Fisher
Distinguished Professor,
Department of Electrical
Engineering and Computer
Science

Dr. Robert Dodd, Research
Professor, Department of Civil
and Environmental Engineering

Dr. Jack Dongarra, Distinguished
Professor, Department of
Electrical Engineering and
Computer Science

Dr. Yilu Liu, Governor's Chair for
Power Electronics, Department
of Electrical Engineering and
Computer Science

Dr. George Pham, John and
Dorothy McKamey Professor,
Chancellor's Professor,
Department of Materials Science
and Engineering

Dr. Steven Zinkle, Governor's
Chair for Nuclear Materials,
Department of Nuclear
Engineering

One Distinguished Scientist

Dr. Takeshi Egami, Department
of Materials Science and
Engineering

Two University Distinguished Professors

Dr. Jack Dongarra, Department
of Electrical Engineering and
Computer Science

Dr. Bamin Khomami, Department
of Chemical and Biomolecular
Engineering

Eleven UT/ORNL Governor's Chairs

Dr. Suresh Babu, Governor's Chair
in Advanced Manufacturing

Dr. Howard Hall, Governor's Chair
in Global Nuclear Security

Dr. Terry Hazen, Governor's Chair
in Environmental Biotechnology

Dr. Yilu Liu, Governor's Chair in
Power Electronics

Dr. Frank Loeffler, Governor's
Chair in Microbiology and Civil
and Environmental Engineering

Dr. Arthur Papaioannou, Governor's
Chair for Biorefining, Department
of Chemical and Biomolecular
Engineering

Dr. Uday Vaidya, Governor's
Chair in Advanced Composites
Manufacturing, Department of
Mechanical, Aerospace, and
Biomedical Engineering

Dr. William Weber, Governor's
Chair in Radiation Effects on
Materials

Dr. Brian Wirth, Governor's
Chair in Computational Nuclear
Engineering

Dr. Thomas Zawodzinski,
Governor's Chair in Electrical
Energy Storage

Dr. Steven Zinkle, Governor's
Chair in Nuclear Materials

Nine Endowed Chairs of Excellence

**Robert M. Condra Chair of
Excellence in Computer
Integrated Engineering and
Manufacturing**

Dr. Matthew Mench, Department
of Mechanical, Aerospace and
Biomedical Engineering

**Robert M. Condra Chair of
Excellence in Power Electronics
Applications**
Dr. Fred Wang, Department
of Electrical Engineering and
Computer Science

**CTI Chair in Electrical and
Computer Engineering**
Dr. Kevin Tomsovic, Department
of Electrical Engineering and
Computer Science

**Wayne T. Davis Endowed Dean's
Chair in Engineering**
Dr. Wayne T. Davis, Dean of
Engineering

**Ericsson-Harlan D. Mills Chair of
Software Engineering**
Dr. Audris Mockus, Department
of Electrical Engineering and
Computer Science

Gibson Chair
Dr. Stephen Paddison,
Department of Chemical and
Biomolecular Engineering

**Henry Goodrich Chair of
Excellence in Civil and
Environmental Engineering**
Dr. Thanos Papanicolaou,
Department of Civil and
Environmental Engineering

Leonard Garfield Penland Chair
Dr. Phillip Back, Department
of Materials Science and
Engineering

**Ivan Racheff Chair in Materials
Science and Engineering**
Dr. Peter Liaw, Department
of Materials Science and
Engineering

Twenty-one Endowed Professorships

**Alvin and Sally Beaman
Professors**
Dr. Bamin Khomami, Department
of Chemical and Biomolecular
Engineering
Dr. Kurt Sickafus, Department
of Materials Science and
Engineering

**Blalock, Kennedy, Pierce Analog
Electronics Professor**
Dr. Ben Blalock, Department
of Electrical Engineering and
Computer Science

Dr. Edwin G. Burdette Professor
Dr. Baochun Huang, Department
of Civil and Environmental
Engineering

Robert M. Condra Professors
Dr. Chris Cox, Department of Civil
and Environmental Engineering
Dr. Lawrence Townsend,
Department of Nuclear
Engineering

Cook-Eversole Professor
Dr. Mongi Abid, Department
of Electrical Engineering and
Computer Science

**John Fisher Distinguished
Professor**
Dr. Mark Dean, Department
of Electrical Engineering and
Computer Science

John Fisher Professor
Dr. Peter Liaw, Department
of Materials Science and
Engineering

Weston Fulton Professor
Vacant

**Gonzalez Family Endowed
Professor**
Dr. Hailong Qi, Department
of Electrical Engineering and
Computer Science

**Armour T. Granger Memorial
Professor**
Dr. Bamin Khomami, Department
of Chemical and Biomolecular
Engineering

Jerry and Kay Henry Professor
Dr. David Mandrus, Department
of Materials Science and
Engineering

**Min H. Kao Electrical and
Computer Engineering Professor**
Dr. Leon Tolbert, Department
of Electrical Engineering and
Computer Science

Magnavox Professor
Dr. Ken Kilam, Department of
Mechanical, Aerospace, and
Biomedical Engineering

James McConnell Professors
Dr. Aly Fathy, Department of
Electrical Engineering and
Computer Science
Dr. S. Kamrul Islam, Department
of Electrical Engineering and
Computer Science

**Jack and Dorothy McKamey
Professor**
Dr. George Pham, Department
of Materials Science and
Engineering

Fred N. Peebles Professors
Dr. Edwin Burdette, Department
of Civil and Environmental
Engineering
Dr. Gayakar Penomadu,
Department of Civil and
Environmental Engineering

Leonard G. Penland Professor
Dr. Phillip Back, Department
of Materials Science and
Engineering

**Charles P. Postelle Distinguished
Professor in Nuclear Engineering**
Dr. Wesley Hines, Department of
Nuclear Engineering

**Dr. John Prados Chemical and
Biomedical Engineering Professor**
Vacant

**Fred Mason Roddy Professor in
Biomedical Engineering**
Dr. Richard Komstiek, Department
of Mechanical, Aerospace, and
Biomedical Engineering

**Richard Rosenberg Endowed
Professor in Mechaanical
Engineering**
Vacant

Three Endowed Faculty Fellows

Ferguson Faculty Fellow
Vacant

**UCOR Outstanding Faculty Fellow
in Nuclear Engineering**
Dr. Jason Hayward, Department
of Nuclear Engineering

**Heath Endowed Fellow in
Business and Engineering**
Dr. Rupy Sawhney, Department
of Industrial and Systems
Engineering

Four Professors of Practice

**Eastman Professor of Practice in
Chemical Engineering**
Dr. Sankar Baghavan, Department
of Chemical and Biomolecular
Engineering

**Eastman Professor of Practice in
Electrical Engineering**
Dr. Yan Xu, Department of
Electrical Engineering and
Computer Science

**Eastman Professor of Practice in
Mechanical Engineering**
Dr. Matthew Young, Department
of Mechanical Engineering

**Underwriters Laboratory
Professor of Practice**
Dr. David Icove, Department
of Electrical Engineering and
Computer Science

Additional Faculty Professorships

**Two COE CAREER Development
Professors**

Dr. Eric Bader, Department of
Chemical and Biomolecular
Engineering
Dr. Mohamed Mafouz,
Department of Mechanical,
Aerospace, and Biomedical
Engineering

Two Chancellor's Professors
Dr. George Pham, Department
of Materials Science and
Engineering
Dr. Lawrence Townsend,
Department of Nuclear
Engineering

Outstanding Undergraduate Student: Austin Saint-Vincent

Austin Saint-Vincent came to the College of Engineering (COE) from a career in the US Navy, where he started at age 17 and worked for almost seven years in the reactor controls division. He was a qualified senior reactor operator by age 21, and by 24 was a division supervisor—well-versed in standard maintenance and troubleshooting aspects of PWR instrumentation and controls.

“As one can surmise, I was essentially raised in the bosom of naval nuclear power,” said Saint-Vincent. “I decided to stick with it and pursue nuclear engineering for the intellectual challenge and rich job market for those of my background.”

He has made a strong impression during his time in the Department of Nuclear Engineering (NE), earning the department’s Outstanding Undergraduate Research Award and now being recognized as the COE Outstanding Undergraduate for 2016.

“Austin led our motor accelerated degradation research laboratory,” said Dr. Wes Hines, NE department head. “With his nuclear navy training, he was uniquely qualified to safely manage the experiments in which electrical failures were expected and did occur. Having a student who came from an organization with a mature safety culture was a definite plus.”

Saint-Vincent worked with Hines and Dr. Jamie Coble, an assistant professor in NE, in the prognostics group gathering data from industry-related equipment and systems to identify trends and modes of failure in those components.

“Austin was an outstanding researcher during his time working with me on component degradation data collection,” said Coble. “He fully committed to each task that I assigned him and consistently went above and beyond my expectations.”

Saint-Vincent worked closely with a private company that loaned testing equipment to the team for a brief

period. Through his efforts, the group was able to maximize usage of the test equipment and collect useful data to guide the experiment as research moves forward.

“He has been working with the Reliability and Maintainability Center since May, and I’m certain he’s been an asset to them,” added Coble.

Saint-Vincent was not familiar with the East Tennessee region before coming to UT, but quickly grew to appreciate the area.

“This is the third time I have packed all my things and moved to a place with no connections or foreknowledge of the area,” he said. “I hardly struggled in finding a place to live, getting the enrollment process done, and finding some work to do.”

He chalks up a lot of this success to the quality of people he has encountered as he has gotten settled in at UT.

“For the most part, I have yet to meet anyone who shoved me off, failed to respond, or did not go out of their way to ensure my success; from the professors and UT staff to the folks at city hall,” he said.

Saint-Vincent looks forward to engaging in new NE projects over the semester, and is on the lookout for opportunities to advance, either into graduate school or a career track. Along the way, he enjoys living so close to the Great Smoky Mountains.

“I escape to the mountains for physical and spiritual respite as often as possible,” he said. He also gets outdoors to tend his garden.

“I grow tomatoes, onions, spinach, sunflowers, and many weeds,” said Saint-Vincent. “Next year, I will try a much larger variety and possibly add some chickens or an aquaponics arrangement for meat. The goal is to see if I can subsist for one week on my own food.”



Outstanding Graduate Student: Hannah L. Woo

Hannah Woo, a PhD student in the Department of Civil and Environmental Engineering (CEE), is the 2016 Outstanding Graduate Student in the College of Engineering. Her studies focus on environmental issues while working with Dr. Terry Hazen, Governor's Chair for Environmental Biotechnology.

"Hannah has demonstrated an awesome ability to maximize her education and research experience at the University of Tennessee, taking every advantage of classes, student and faculty interactions, field studies, outreach, teaching, publications, presentations, colloquia, research and education proposals, and scientific meetings," said Hazen. "She has a resume that already rivals most post doctoral fellows and assistant professors."

Woo's interest in environmental engineering and science was originally sparked by curiosity about the bioremediation of radioactive waste.

"I wanted to learn more about the technology and new ideas in this field," she said. "My current PhD project doesn't involve bioremediation, but I still think it's fascinating."

The opportunity to work with Hazen led the San Francisco native to the University of Tennessee (UT).

"Dr. Hazen is always studying very unique environments all over the world, where the geochemistry, microbial diversity, and biological processes is going to be intrinsically fascinating," said Woo. "Right now, I'm studying samples from the eastern Mediterranean Sea."

She uses DNA sequencing technology to identify and investigate microbes with plant-degrading enzymes in the deep ocean. Those enzymes benefit biofuels research by helping break down the waste product—known as lignin—resulting from the manufacture of such fuels.

"My project is investigating the microbial ecology of the deep ocean, in particular identifying key bacteria responsible for terrestrial organic carbon degradation," said Woo. "It has been beneficial for me to learn how to do DNA sequencing using the Illumina Miseq in our lab."

In the spring of 2016, she was one of 90 students in the United States and Canada to receive a \$15,000 Scholar Award from the Philanthropic Educational Organization (PEO) Sisterhood.

"This award is an amazing honor," said Woo. The PEO Sisterhood was founded at Iowa Wesleyan College in 1869 to support higher education

for women. "I've been fortunate enough to have been awarded some grants and fellowships to support myself through graduate school and fund my research project."

Woo is also a National Science Foundation (NSF) Graduate Research Fellow, and was accepted into a unique NSF iGERT program called SCALEIT, an interdisciplinary program combining computer science and biology. Her participation in the NSF EAPSI program enabled her to visit northeast China to collect soil samples affected by high nitrogen deposition.

"I'm bringing those samples back to sequence and analyze," she said. "It's so great to be able to do this type of work independently and oversee the whole process from start to finish."

Woo has earned benefits from the Society for Applied Microbiology President's Fund, and also accolades for numerous presentations.

"I've received a few awards for several talks and posters given locally and regionally," she said. These include second place Best Poster at the first annual Women in STEM Research Symposium; first place Best Speaker at the second annual Southeastern Biogeochemistry Symposium; and winning the Sigma Xi Scientific Paper Presentation Award. She was nominated for the UT Extraordinary Professional Promise Citation, and was noted as a Quest Scholar.

Outside of her graduate studies, Woo enjoys playing guitar, salsa dancing, cooking, and learning new languages. She has also enriched her time on campus by working as a TA for Dr. Joseph Amoah.

"CEE has great undergraduate students that are inquisitive and sharp," she said. "Mentoring undergraduates in the Hazen lab has been an invaluable and rewarding experience as well."

For herself, Woo has appreciated the mentoring of faculty members like Dr. Chris Cox, Dr. Qiang He, and Dr. Nicole Labbe.

"These are some of the first professors I met my first year at UT," she said. "I really appreciate their guidance, both technically, and just their general career advice as well. Dr. Hazen, of course, has been a big support throughout this graduate school process. He always encourages me to try everything and do more."

Outreach Update

The College of Engineering (COE) offers two ways for students to experience engineering in international settings: service-oriented alternative class-break trips and faculty-led study abroad. Both options have grown in the last six years, allowing around 100 students to participate over the course of the year.

The COE's Global Initiatives program offered four international experiences to students in late 2015 and throughout 2016. Judith Mallory, COE International Coordinator, arranged and led the trips to Ecuador, Peru, Belize, and Cuba.

Students took advantage of faculty-led study-abroad courses to England, Germany, and the Czech Republic for studies in overall engineering, reliability and maintainability engineering, and nuclear engineering respectively. For 2016, the number of COE students studying abroad was 84, with 55 of them taking engineering coursework abroad.

Global Initiatives

Quito, Ecuador

Four students traveled to Quito, Ecuador, for an Alternative Fall Break in August 2015. A daycare center funded by the government and private donations, Semillas Esperanza, or Seeds of Hope, was the project location. About 100 children, ages four and below, use the center while their parents are at work.

Students installed protective netting along the stairways, so that children would not fall off while going up and down. Repairs were also made on playground equipment, and rooms were given new curtains, paint, and shelves. Landscaping surrounding the play area was tidied. The group also assisted the staff in moving one of the classrooms to another floor.

"Students had two conversational Spanish classes, as well as a Salsa dance class, all provided by local instructors," said Mallory.

Field trips included a visit to an art museum devoted to the works of Ecuadorian artist Oswaldo Guayasamin; the town of Otavalo, home of Ecuador's largest indigenous market; Cascada Peguche, a waterfall and park; and the Cruz Loma Mountain.

Cuzco, Peru

The Alternative Winter Break was one of the largest Global Initiatives trips so far, with 20 students traveling to Cuzco, Peru, in December 2015. Mallory led the trip along with Max Pridgen, a mechanical engineering masters student.

The trip was culture filled with tours of historic sites, as well as the chance to work with locals on a project. A "City Tour," exploring historic sections of Cuzco, included a variety of ancient Incan ruins and more recent, though still historic, art and architecture throughout the city. Students also toured the Sacred Valley, with a visit to the ruins of Pisac, an imposing mountainside structure with trails and steps leading to a fifteenth-century military installation. Some of the students traveled to Machu Picchu to visit the iconic mountain village.

For their service project, the UT students helped build safe cooking stoves for indigenous families in the area. A traditional regional practice of cooking on the floor presents an array of safety and health problems as well as deforestation to fuel this energy-inefficient practice.

San Ignacio, Belize

Alternative Spring Break took place in March 2016, in San Ignacio, Belize. This trip marked the first joint project between COE and the Chancellor's Honors Program. The 15 attendees included honors non-engineers along with the engineering majors.

This was the second trip by UT engineers to the ethnically, geographically, and culturally diverse Belize. The group visited the seventh-century Mayan archaeological site of Xunantunich and viewed Cahal Pech, the oldest known Mayan site in the Belize River valley.

The project site for the week was a sustainable farm, where the group continued a root cellar/earth bag construction project began in 2015 during a previous visit by UT students. The farm will eventually serve as home for orphan girls who age out of the foster system in Belize.

Students then took a trip into Guatemala to visit Tikal, the most significant Mayan archaeological site in Central America. A tour guide explained details about the site, trees and foliage, and the process involved in reclaiming the temples. Students observed a variety of wildlife.

The group's final full day began with visits to the Mennonite settlement of Springfield, founded in 1996, and St. Herman's Blue Hole National Park for a quick swim and visit to the St. Herman's Cave. The day ended with a horseback ride at a large ranch.

Cuba

The 2016 Alternative Summer Break in May was a trip to Cuba, the college's first outreach project to the island since the recent lifting of long-standing travel restrictions.

Dr. Ralph Gonzalez, former head of the Department of Electrical Engineering and Computer Science, was born in Cuba. He spoke with students before the trip to help them plan and



UT students traveled to Cuba in the spring of 2016 to absorb the culture and build a community kiosk. Pictured in the foreground from left, Cuban workers help Abigail Cooper and Aubrey Casey make adjustments to materials. In the background, from left, are UT students Reed Schneider and Evalynn Borrego.

prepare for their visit. Students also benefitted with scholarships from the Gonzalez Family Endowment, established a few years ago by Gonzalez and his wife, Connie.

For its service project, the UT group helped build a kiosk to be used as a venue for selling coconuts, along with benches for both customers and the community in general to use. All materials used for the construction were recycled, and nails were pulled from the lumber and straightened for re-use. Students brought tools for the project, as they are expensive and difficult to obtain in Cuba. The tools were then donated for future building projects.

Students toured Havana, the capital city, and other regions. They viewed Havana's Camera Obscura and visited the Rio Almendares Tunnel, the Fortress of San Carlos, and Cuba's Chinatown.

Faculty-led Study Abroad

Engineering in London

The Engineering in London program is the original and most popular of the College of Engineering's faculty-led study abroad programs. The five-week program is based in the Bloomsbury district of central London, near the British Museum and the University of London.

For 2016, 25 students took up the ambitious challenge of six credit hours of thermodynamics and circuits coursework during the day, enjoying London at night, and sightseeing travel on weekends. Field trips supplemented classroom learning, such as visits to the Kew Bridge Steam and Water Museum, the Royal Institute, and Bletchley Park.

"The Engineering in London program is amazingly unique in the way the itinerary complements the courses," said mechanical engineering student Chris Kelly. "London, England, was chosen because of its rich engineering history, and this program was cleverly crafted to take full advantage of that."

"Perhaps my favorite part of the trip was the lecture at the Royal Institute," said nuclear engineering major Chris Haseler. "We were lucky enough to watch one of the famous 'Christmas Lectures.' The speaker was incredible and her vast knowledge was evident through her demonstrations. She even took the time to talk to me and answer my questions at the end."

Bletchley Park, historically, is where Alan Turing and Gordon Welchman designed the Bombe machine that broke the Nazi enigma code in World War II.

"Other machines were also designed and built here for similar purposes," said mechanical engineering major Ben Terry. "Chief among them is the Colossus, the first true programmable digital computer, which was used to break the Lorenz Code. What was it like seeing these machines first hand? In short, amazing. These are the things that inspire and motivate people to become engineers."



College of Engineering students visited the London Museum of Water and Steam.

Reliability and Business Excellence in Hamburg, Germany

Dr. Klaus Blache led the Reliability and Business Excellence class in Hamburg, Germany for three weeks during the summer of 2016. Included were numerous learning excursions to production facilities such as Dow Chemical, Lufthansa Technical Training, Volkswagen, Mercedes, and Beck's. The students also took several cultural and educational trips, such as to Berlin and the University of Bremen.

The class consisted of students from biomedical, chemical, industrial, mechanical, and materials science and engineering. They learned about real-world reliability and maintainability concepts as related to attaining business excellence. This was accomplished through plant trips, lectures, discussion about observations, and studying Blache's book, *The Relativity of Continuous Improvement*.

Nuclear Engineering in Prague, Czech Republic

12 undergraduate students from the Department of Nuclear Engineering (NE) participated in a study-abroad Experimental Reactor Physics Laboratory class (NE427) during the 2016 summer mini-term. Dr. Ondřej Chvála, a research assistant professor in NE, led the class.

The students spent the first week visiting several sites in the Czech Republic, including a uranium mine and a yellow cake chemical factory, Temelín nuclear power plant, a research institute in Řež near Prague, and the Prague Castle. The group also visited sites in Vienna, including the Belvedere palace, the United Nations, the International Atomic Energy Agency, the Comprehensive Test Ban Treaty Organization, and St. Stephen's Cathedral.

During the second week, students worked with a nuclear reactor VR-1 at the Czech Technical University in Prague, performing reactor physics related measurements and working out lab reports.

The annual class is open to undergraduate and graduate students interested in nuclear reactor dynamics and hands on experimental work. Held in 2016 for the fourth time, this class has led to mutual student exchanges and research collaborations between UT and the Czech Technical University.



Dr. Ondřej Chvála, at far right, oversees UT nuclear engineering students as they perform measurements at experimental stations at the VR-1 reactor at the Czech Technical University in Prague.



Dr. Klaus Blache, at far left, led the Reliability and Business Excellence class in Hamburg, Germany, during the summer of 2016. The trip included a tour of a Volkswagen production facility.



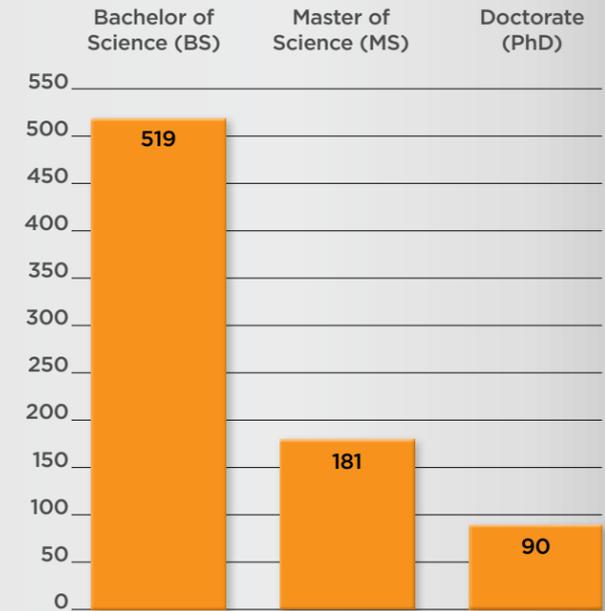
The 2016 Engineering Ambassadors (front row, from left): Samira Ibrahim, Leah Stephens, Alyssa Lindsey, Sierra Ellis, Mary McBride, Tina Anjonnin-Ohu, Kristen Miranda; (second row, from left): Camille Bergen, Gillian McGlothlin, Katie Gipson, Elliot Greenlee, MaryBeth Iannuzzi, Amanda Randolph, Abby Link, Amany Alshibli, Sarah Davis, Sarah Jacob; (third row, from left): Will Fredebeil, Drew Welch, Parker Tooley, Brandon Lowe, Braxton Brakefield, Jermaine Cheairs, John Dooley, Will Wheeler, and Stephen Kwan. Not pictured: Katelyn Luthi and Brooke McMurrer.

Engineering Enrollment Trends by Academic Year



Student Body 2015-2016

Degrees Granted Academic Year 2015-2016



College of Engineering 2016 Teaching Fellows

The COE Teaching Fellow Award is presented to faculty members who possess an exceptional record of graduate and undergraduate teaching and a strong performance in teaching-related service activities, and whose efforts clearly contribute to the overall mission of the college. The awards were established to award superior teaching.

The Teaching Fellow Awards were presented at the college's Faculty and Staff Awards Dinner in April.



Dr. Daniel Costinett (left), an assistant professor in the Department of Electrical Engineering and Computer Science, accepts the Teaching Fellow Award from Dean Wayne T. Davis (right).



Dean Davis (right) presents the Teaching Fellow Award to Dr. Paul Frymier, professor, Department of Chemical and Biomolecular Engineering



Dr. Aly Fathy (left), the James McConnell Professor in the Department of Electrical Engineering and Computer Science, is presented with the Teaching Fellow Award by Dean Davis (right).



Dean Davis (right) presents the Teaching Fellow Award to Dr. Xueping Li, associate professor, Department of Industrial and Systems Engineering.

College of Engineering 2016 Professional Promise in Research Award



Associate Dean for Research and Technology Bill Dunne (far right) and Dean Wayne Davis (far left) present the Professional Promise in Research Awards to (left to right): Dr. Jason Hayward; Dr. Cong Trinh; Dr. Kai Sun; and Dr. Wei Gao.

The COE Professional Promise in Research Award was established to award young faculty who are making significant contributions to the college's research mission. The 2016 award recipients include:

Dr. Wei Gao, Assistant Professor

Electrical Engineering and Computer Science

Dr. Wei Gao's research interests involve in the areas of mobile systems, wireless networking, cloud computing, cyber-physical systems, and smart grids. His research focuses on the design, analysis, measurement, and implementation of mobile computing and networking systems, which comprise various mobile platforms spanning smartphones, wearables, cognitive radios, and embedded sensors. Through analytical modeling and systematic designs of mobile system architectures and applications, his research seeks to improve the efficiency, adaptability, generality, and reliability of mobile system operations with respect to the heterogeneous environmental contexts and human factors.

Dr. Jason Hayward, Associate Professor, UCOR Faculty Fellow in Nuclear Engineering

Nuclear Engineering

Dr. Jason Hayward, UCOR Endowed Fellow, is jointly appointed as an associate professor in the Department of Nuclear Engineering at the University of Tennessee, Knoxville and in the Oak Ridge National Laboratory's Nuclear Materials Detection and Characterization group. His group does research on radiation instrumentation, especially for nuclear nonproliferation technologies. Mostly notably, he has been the Principal Investigator for three major Department of Homeland Security grants. Hayward is a DOE Science CAREER Awardee and has also been recognized for his research a few times by the American Society of Engineering Education, both as a "faculty under 40" highlight and with a New Faculty Research Award. He received his PhD in Nuclear Engineering and Radiological Sciences from the University of Michigan.

Dr. Kai Sun, Assistant Professor

Electrical Engineering and Computer Science

Dr. Kai Sun is currently an assistant professor in the Department of Electrical Engineering and Computer Science. He earned the PhD degree in Control Science and Engineering and the BS degree in Automation both from Tsinghua University in Beijing, China, in 2004 and 1999, respectively. Before coming to the UT in 2012, Sun worked for the Electric Power Research Institute (EPRI) for five years as a project manager in the areas of grid operations and planning. Since Sun joined the faculty at UT, he has been the PI of eight external research grants totaling \$1.2M, including the National Science Foundation (NSF) CAREER award for his proposal "Integrated Research and Education in Nonlinear Modal Decoupling and Control for Resilient Interconnected Power Systems." Additional supporters include the Department of Energy (DOE), EPRI, NEC, ORNL, and companies in the power industry. Sun received two best conference paper awards in 2014 and 2015 from the IEEE power and energy society. His research areas include dynamics, stability and control of power grids and other complex networked systems. Sun filed a US patent application with UT about a new real-time power system simulation method in 2015.

Dr. Cong Trinh, Assistant Professor

Chemical and Biomolecular Engineering

Dr. Trinh's research focuses on fundamentally understanding and engineering cellular metabolism with the ultimate goal to design, construct, and characterize cells with optimized metabolic functionalities. These engineered cells are utilized as efficient and robust whole-cell biocatalysts exhibiting only desirable properties specifically tailored for biotechnological applications related to health, food, energy, and environment. To pursue this goal, he is interested in applying and developing both theoretical and experimental tools in the interdisciplinary fields of systems and synthetic biology together with metabolic and biochemical engineering. As the recipient of a funded National Science Foundation (NSF) CAREER grant, Trinh's research team is developing an innovative technology to engineer modular (chassis) cells. By combining a modular cell with specific exchangeable production modules (metabolic pathways designed to synthesize targeted molecules), optimized microbial cell factories can be rapidly built in a plug-and-play fashion to produce targeted molecules with high efficacy without undergoing multiple iterative strain optimization steps. This technology can significantly speed up how microbial biocatalysts are created, from the production of commodity to specialty chemicals, as well as fuel molecules from renewable and sustainable feedstocks.

College of Engineering Research Achievement Awards

The COE Research Achievement Award was established to reward senior faculty members whose work is recognized nationally and internationally and who make notable contributions to the college's research mission. The 2016 award recipients include:

Dr. Fred Wang, Professor and R.M. Condra Chair of Excellence

Electrical Engineering and Computer Science

Dr. Fred Wang's research focuses on power electronics for applications in electric vehicle, and electric airplane renewable energy systems, and the smart grid. One of the main themes of his research is to utilize the emerging wide bandgap power semiconductors for high-efficiency, high-density power converters, which are critical for future transportation systems. He is also leading the research activities in CURENT on power electronics integration technologies for renewable energy systems in future power grid. Since joining UT in 2009, Wang has led or participated in over 25 sponsored projects as PI or co-PI, with total funding over \$40 million and a personal share of more than \$10 million. In a few short years, Wang and his colleagues have built the UT power electronics and power systems into one of the top programs in the world.

Dr. Baoshan Huang, Edwin G. Burdette Professor

Civil and Environmental Engineering

Dr. Baoshan Huang is the Edwin G Burdette Endowed Professor of Civil Engineering at the University of Tennessee, Knoxville, where he has been a faculty member since January 2002. His areas of research include infrastructure materials, pavement engineering, and infrastructural asset management. Over the last 15 years of his professional career, Huang has secured over \$8 million dollars of research funding to support his research activities. He has been actively involved in many professional committees, including the Transportation Research Board (TRB), Association of Asphalt Paving Technologists (AAPT), American Society of Civil Engineers (ASCE), and the International Society of Asphalt Pavement (ISAP). He was the chair of the ASCE Bituminous Materials Committee (BMC) during 2010–2012, and has been an associate editor and editorial board members of numerous academic journals. Huang has published 115 (SCI indexed) journal papers and holds three US patents (one pending) on innovative infrastructure materials design and characterization.

Dr. Joshua Fu, Professor

Civil and Environmental Engineering

Dr. Joshua Fu's research work includes atmosphere model development for earth systems models and analyses of climatic changes; air quality model development and air pollution modeling; air quality impact assessments; the impacts of extreme events on agriculture, energy, health, transportation, water resources and their infrastructure; the impacts of transportation planning and energy usages on air quality; land use (satellite applications) and emissions; diesel track emission effects; and energy optimization planning. Fu has served as modeling lead for the Model Intercomparison Study in Asia, a consortium of the air quality community bridging scientists from the US, Europe, and Asia and it involves the United Nations TF Hemispheric Transport of Air Pollution and climate change effects. Fu has published more than 95 SCI journal papers and more than 90 conference proceedings. He also has been invited for more than 100 keynotes, lectures, and speaking engagements with local, national, and international universities, agencies, and government agencies.



Dean Wayne Davis (far left) and Associate Dean Bill Dunne (far right) present the Research Achievement Award to (left to right) Dr. Fred Wang; Dr. Philip Rack; Dr. Hairong Qi; Dr. Joshua Fu; and Dr. Baoshan Huang.

Dr. Hairong Qi, Gonzalez Family Professor

Electrical Engineering and Computer Science

Dr. Hairong Qi received BS and MS degrees in computer science from Northern JiaoTong University, Beijing, China, in 1992 and 1995 respectively, and the PhD degree in computer engineering from North Carolina State University, Raleigh, in 1999. She is currently the Gonzalez Family Professor with the Department of Electrical Engineering and Computer Science at the University of Tennessee, Knoxville. Her current research interests are in advanced imaging and collaborative processing in resource-constrained distributed environment, hyperspectral image analysis, and automatic target recognition. Qi's research is supported by the National Science Foundation (NSF), DARPA, Office of Naval Research (ONR), Department of Homeland Security (DHS), the US Army Space and Missile Defense Command, and the US Army Medical Research and Materiel Command. Qi is the recipient of the National Science Foundation (NSF) CAREER Award. She also received the Best Paper Awards at the 18th International Conference on Pattern Recognition (ICPR) in 2006, the third ACM/IEEE International Conference on Distributed Smart Cameras (ICDSC) in 2009, and the IEEE Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensor (WHISPERS) in 2015. She was awarded the Highest Impact Paper from the IEEE Geoscience and Remote Sensing Society in 2012.

Dr. Philip Rack, Professor and Leonard G. Penland Chair

Materials Science and Engineering

Dr. Rack earned his bachelor's degree in materials science and engineering from the Georgia Institute of Technology in 1993, and his PhD in materials science and engineering from the University of Florida in 1997. In 1997, Rack joined Advanced Vision Technologies Inc. (AVT) as a Senior Research Scientist where he led the company's research on luminescent and field emitter materials and contributed to process development of their vacuum microelectronic devices. In 1999, he joined the faculty in the Microelectronic Engineering Department at the Rochester Institute of Technology and in 2001 he joined the faculty in the Department of Materials Science and Engineering at the University of Tennessee, Knoxville. Rack's research broadly studies emergent properties of nanoscale materials and devices which currently has four focus areas: 1) combinatorial thin film processing for rapid materials discovery, 2) complex oxide and 2D material nanoscale devices, 3) nanoscale focused electron, ion and photon beam induced processing, and 4) self and directed assembly via pulsed laser induced dewetting. Rack has authored or co-authored over 175 refereed journal articles, three book chapters, and five invited review articles.

The Dean's Faculty Research Excellence Award



COE Dean Wayne Davis (right) presents the Dean's Faculty Research Excellence Award to Dr. Steven Skutnik (left).

The Dean's Faculty Research Excellence Award recognizes junior engineering faculty who, at the assistant professor level and during their first three years of service to the college, achieve extraordinary success in grantsmanship by having received externally funded awards equal to or in excess of \$300,000 per year. Due to the fact that these faculty typically have not developed their programs to a level of having graduated MS/PhD students or of having established publication levels commensurate with that of more senior faculty, these individuals, while achieving success in their research programs, are limited in their ability to be recognized through other awards avenues.

The 2016 recipient of the Dean's Faculty Research Excellence Award is Dr. Steven Skutnik, assistant professor in the Department of Nuclear Engineering.

Dr. Skutnik's research focuses primarily on the intersection of nuclear fuel cycles and nuclear security, employing advanced modeling and simulation tools to the end of developing more sustainable and secure nuclear fuel cycle systems. A particular area of

focus in his work is in the characterization of used nuclear fuel management systems. This encompasses both work to understand characteristics of the transition to advanced nuclear fuel cycles capable of using long-lived nuclear waste materials as fuel sources in advanced reactors as well as developing more sophisticated techniques for characterizing used nuclear fuel inventories currently held in long-term storage at reactor sites.

In tandem with this research, Skutnik's work also focuses on high-fidelity modeling and simulation of safeguards for nuclear fuel cycle processes to ensure the peaceful use of nuclear technology. Examples of this area include cutting-edge work to develop new processes for identifying trace samples of nuclear materials utilizing short-lived fission product "fingerprints" using reactors like the High Flux Isotope Reactor (HFIR) at ORNL, understanding how the radiation signatures in used nuclear fuel assemblies can be used to uniquely identify characteristics of an irradiated fuel assembly's operating history, and other non-destructive techniques for assessing in-situ nuclear material inventories to verify non-diversion of sensitive materials (such as plutonium) throughout the fuel cycle.

College of Engineering Award for Translational Research



Dean Wayne Davis (left) presents the Translational Research Award to Dr. Matthew Mench (center) and Dr. Thomas Zawodzinski (right).

The purpose of the College of Engineering Award for Translational Research is to recognize faculty members whose research has achieved societal benefit through the development of intellectual property via licensing agreements, patents, and/or business startups.

The 2016 recipients of the COE Award for Translational Research are Dr. Matthew Mench, Robert M. Condra Chair of Excellence in Computer Integrated Engineering and Manufacturing and head of the Department of Mechanical, Aerospace, and Biomedical Engineering and Dr. Thomas Zawodzinski, Governor's Chair in Electrical Energy Storage from the Department of Chemical and Biomolecular Engineering.

Dr. Mench's research group works at the intersection of transport and electrochemical power generation. His group has established an international reputation for innovation in diagnostics and modeling applied to inform and guide development of advanced electrochemical power storage and conversion systems including fuel cells and flow batteries. His work has been continually supported for over 15 years through numerous government agencies and both domestic and international industrial partners.

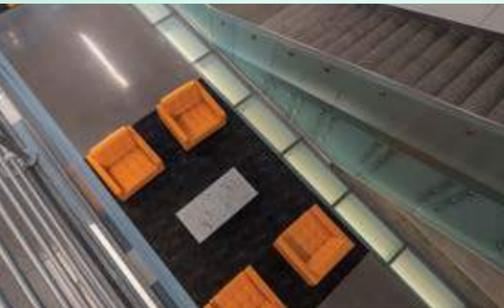
Research in Dr. Zawodzinski's lab focuses on using fundamental understanding to make electrochemical processes and devices more effective. Over the years, this work has included studies of fuel cells, batteries, electro-synthesis, sensors, artificial muscles, and a variety of other devices. Generally, his team works on components of the electrochemical cell, especially polymer (or other) electrolytes and electrodes. If needed, they synthesize new compounds or polymers or prepare new materials to move the technology forward. The team also probes the fundamental behavior of those components from the molecular to device scale. They employ innovative experimental methods, including electrochemical studies, advanced nuclear magnetic resonance, and MRI-related studies, other spectroscopic studies and a host of other physical techniques to understand structure, dynamics, and thermodynamics in ways and at depth and breadth that no other lab in the world provides in a comprehensive way. Computational models are also used. This fundamental information is used to isolate and address problems that we believe are the limiting aspects of given technologies. At present, Zawodzinski's team is involved in six different technologies with commercial application (including spin-out companies and partnering with small and large businesses). At the request of several Fortune 100 companies, they are in the process of developing several new relationships to provide additional unique solutions to industry based on the groups' innovative approaches.



A new faculty office in the JIAM Building.



A stairway area features contemporary design in the new JIAM Building.



An overhead view of the JIAM main lobby.



The third floor study area overlooking the Tennessee River.

The JIAM Building on the UT Cherokee Farm Research Campus.



Facilities Update

Progress continues on campus construction and renovation projects on and around the UT campus. The College of Engineering's Associate Dean for Research and Technology Bill Dunne has provided an update on specific projects related to the College of Engineering.

The JIAM Building Opens

An exciting new era in materials science research has begun with the opening of the Joint Institute for Advanced Materials (JIAM) Building on the Cherokee Farm Innovation Campus.

The state-of-the-art contemporary building features a common area with an extensive view of the Tennessee River, designed to encourage interaction among faculty, staff, and students. Bus service is available from the main UT campus to JIAM, and Dunne said the facility is anticipated to be fully completed by December of this year. The building is now partially open and several MSE faculty moved into the building during the fall semester.

JIAM, the organization, was established in 2005, and consists of a multidisciplinary team of scientists from UT and Oak Ridge National Laboratory (ORNL).

The partnership between UT and ORNL spans more than 60 years, and UT-Battelle assumed management of the national laboratory in 2000. UT and ORNL researchers have maintained international prominence in the field of advanced materials synthesis and characterization. This broad research realm directly engages physicists, chemists, microscopists, computer scientists, and engineers, while involving numerous other areas of scientific investigation. Many of JIAM's scientists hold joint appointments at UT and ORNL.

The JIAM building was initially supported by \$20 million from the federal government. The university and the State of Tennessee provided additional support to cover the \$65 million for completing the building.



JIAM Director Veerle Keppens in her office in the new building.

Dr. Veerle Keppens, the head of the Department of Materials Science and Engineering (MSE), is the new director of JIAM.

"JIAM was established to encourage multi-disciplinary materials research projects with faculty members from different departments and colleges," Keppens said. "In addition to encouraging research initiatives, we plan to have seminars and lectures from faculty outside JIAM to generate discussion and ideas."

Located only five minutes from campus, the Cherokee Farm Innovation Campus' overall mission is to enhance the university's ability to promote economic development, maximize unique resources and partnerships, and take a national leadership position in innovation research.

"Renovation work that is now finishing will make the Dougherty Engineering Building—formerly the home of the MSE department—primarily the home of two departments—the Department of Chemical and Biomolecular Engineering and the Department of Mechanical, Aerospace, and Biomedical Engineering," Dunne said. "With the completion of this work and the opening of the JIAM building, the MSE department will still have its new instructional laboratories in Dougherty, but its faculty will be based in Ferris Hall and JIAM with laboratories in SERF and the JIAM building. The MSE administrative offices will remain in Ferris Hall."

For more information on JIAM, visit <http://jiam.utk.edu/index.php>

For more information on the Cherokee Farm Innovation and JIAM Campus, visit <http://www.cherokeefarm.org/welcome/>

Progress on the New Engineering Complex



The College of Engineering and the Department of Nuclear Engineering (NE) continue to work with UT administrators and the officials with the State of Tennessee to finalize financing and plans for a new engineering complex. Programming for the facility has been completed.

"A Request for Proposals (RFP) was sent out at the end of September," Dunne said. "The design team for the building should be confirmed during the fall, and we should be well into the design process for the new building by January, 2017."

During his final State of the University presentation to the Faculty Senate on Monday, September 19, Chancellor Jimmy G. Cheek told faculty his top funding priority is the \$129 million, 228,000-square-foot engineering building that will house the freshman engineering programs, the NE department, undergraduate design and project space, and flexible research laboratories.

The university has received donations for the project from Min Kao and John Tickle, each of whom already have an engineering building named in their honor on campus.

Dunne anticipates that if State funding is approved, construction activities for the building would begin fiscal year 2018.

The building will be sited in the area where Pasqua, Berry, and Estabrook Halls are located, but the exact configuration has yet to be determined.

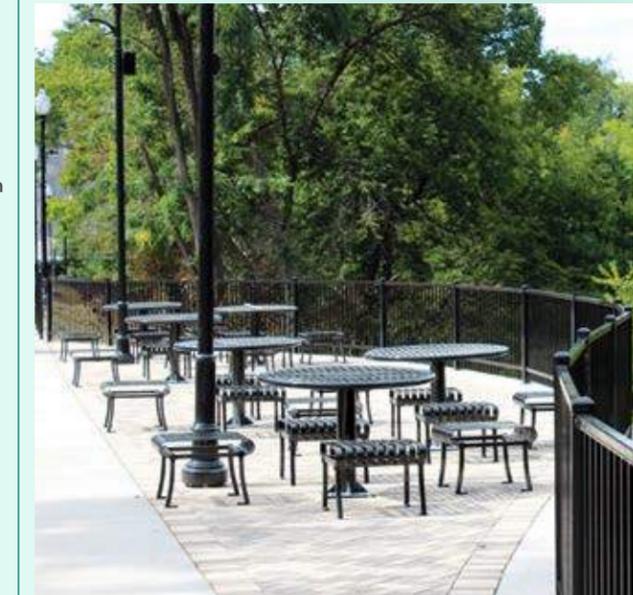
"We're also finalizing our plans for moving the NE labs and administrative and faculty offices," said Dunne. "It looks as though we will be able to move their laboratories into SERF until the new building is completed, and we are planning with the campus and the College of Arts & Sciences to locate office space in the building presently known as Earth & Planetary Sciences that would keep the NE department close to the other engineering buildings. The completion of Strong Hall, the new home for Earth & Planetary Sciences, makes their existing building available for the NE department."

The engineering occupants of Estabrook were previously relocated, with the Jerry E. Stoneking *engage*tm Program administrators, faculty, and teaching spaces now in Perkins Hall. The Engineering Diversity Programs Office and the Engineering Advising Office also relocated to Perkins. In its new home, the *engage*tm program collaborated with several departments to establish the Innovation & Collaboration studio to support student design projects with a maker space. The studio is located in the newly remodeled basement of Perkins Hall and will become a feature facility in the new engineering complex when it opens.

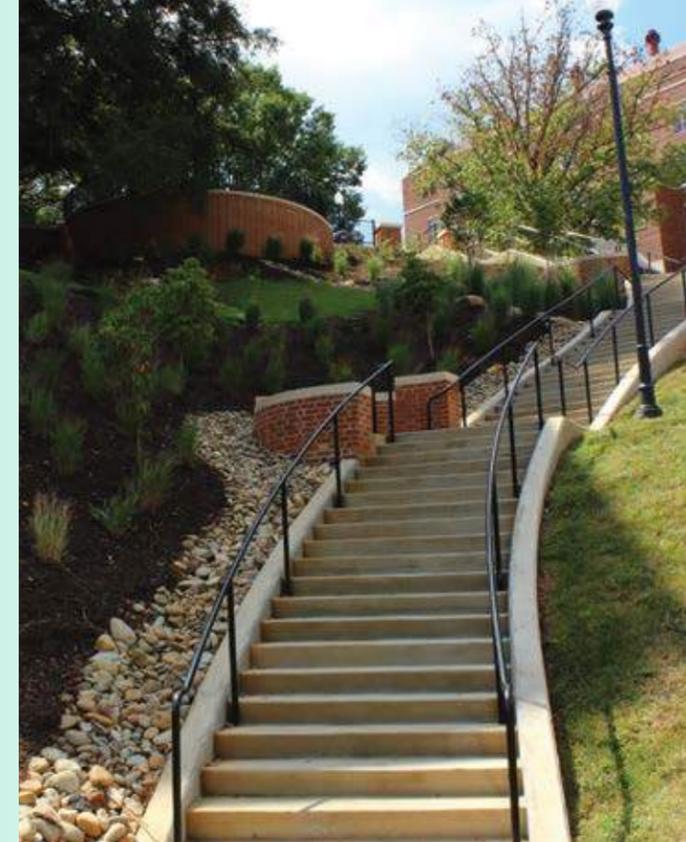
Estabrook Road Projects Completed

The Estabrook Road project along the Second Creek that is the eastern boundary of campus behind Ferris Hall and the Dougherty Engineering Building was recently completed. The capital landscape project involved Barge Waggoner Sumner & Cannon Inc. (BWSC), Facilities Planning and Facilities Services. The old chain link fence was torn down and the road support improved. Sidewalks and railings consistent with the campus standards were installed. The project was a visually and functionally positive upgrade of the engineering campus along the road between the John D. Tickle Engineering Building and Cumberland Avenue, with new trees, lighting, seating, and fresh paving to enhance the appearance and accessibility for this part of campus. Wireless access was also improved.

"The retaining wall beneath the sidewalk in this area was a particularly challenging job," Dunne said. "The team chose to use man-made block to emulate limestone and other natural stone that is in the area to support the sidewalk. These cast pieces of concrete weigh 6,000 pounds and add a lot of stability to the steep slope beneath the sidewalk and road."



The new terrace on Estabrook Road overlooking Second Creek.



The new stairway between Ferris Hall and the Dougherty Engineering Building.



Bench seating, a new fence, and lighting were all part of the Estabrook Road renovations that took place this summer.

Renovations for Perkins and Ferris Halls

Another ongoing improvement project is the replacement of windows and new roofs for both Perkins and Ferris Halls.

"The university received maintenance funds to replace the roofs and windows of these two buildings, improvements which were very much needed," Dunne said. "This is a very serious and important commitment from the university to the engineering campus and this will help greatly with the weather-proofing and energy efficiency of these two older buildings."

Diversity Update

Office of Diversity Welcomes Two New Staff Members



John Hoffschneider, Travis Griffin, and Jalonda Thompson (from left to right) in the courtyard in front of Perkin Hall, the new location of the office of Engineering Diversity Programs.

The office of Engineering Diversity Programs (EDP) has played an active role and been successful through the years in recruiting, retaining, educating, and graduating African American, Hispanic, Native American, Alaskan Native, Pacific Islanders, and women engineering students. To facilitate these relationships, the office of EDP was able to bring in two new staff members.

“The staff expansion will allow the College of Engineering to have more administrative support to focus on recruitment programming, analyzing data patterns, and making improvements on the retention of underrepresented students,” said Travis Griffin, EDP Director.

Jalonda Thompson joins the university as the first assistant director for the diversity office. She comes from the University of North Carolina, Greensboro, where she was the primary advisor for exploratory majors and undergraduates. One of Thompson’s primary duties will be to focus on women in engineering.

“Since joining the department, I have worked with members of the College of Engineering’s Board of Advisors to establish the WomEngineer’s Leadership Council in April 2016,” Thompson said. “The mission of the council is to facilitate professional development and personal growth of women engineers at the University of Tennessee, Knoxville. We have already made some great strides in this area.”

Thompson will also manage the summer pre-college programs and coordinate with the Engineering Career and Academic Preparation (ECAP) Living & Learning Community. The ECAP program is designed to provide strategic programming for non-admitted engineering students, including engineering awareness, improved academic performance, and program retention. She has already coordinated with the faculty to add a new class to the program.

“New this year, I worked with faculty in Engineering Fundamentals to establish a First Year Studies (FYS) 101 course for students in the ECAP LLC,” she said. “They are being equipped with the skills needed to be successful as a future engineering student at UT.”

In addition to Thompson, John Hoffschneider took on the role of coordinator of diversity programs. He came to the university after working in undergraduate admissions for 14 years at Michigan State University (MSU). Hoffschneider’s primary responsibilities will include the development and management of enrichment programming, including the Tennessee LSAMP and Intercollegiate Summer Bridge Program, and will focus on areas of recruitment and retention for underrepresented students within the College of Engineering. Hoffschneider looks forward to this opportunity to build long-term relationships with the students, something he did not get the opportunity to do at MSU.

“Working in undergraduate admissions was a wonderful experience, but in that particular field of higher education you don’t work with students very long,” Hoffschneider said. “As I continued working in higher education I found that my passion is seeing the results of long-term investment into developing undergraduate students academically and pre-professionally.”

In addition to adding two members, the Office of Diversity Programs also saw a change in address. The office moved from their old location on the second floor of Estabrook Hall to the third floor of Perkins Hall in Room 301.

Tennessee Louis Stokes Alliance for Minority Participation Research Conference



Lonnie Sharpe, Sherry Painter, Howard Adams, and Masood Parang (from left to right) at the TLSAMP Research Conference.



TLSAMP Scholars participating in the Undergraduate Research and Graduate School Networking Fair.

The office of diversity hosted the 13th Annual Tennessee Louis Stokes Alliance for Minority Participation (TLSAMP) research conference February 25-26, 2016. The theme of the conference was “Education and Research: Parallel Paths to Excellence.” The purpose of the conference was to bring together students, faculty, staff, administrators, and professionals in the areas of science, technology, engineering, and mathematics (STEM).

The conference featured a networking dinner, an undergraduate research poster competition, an undergraduate research oral competition, and a keynote address from Howard Adams, founder and president of H.G. Adams & Associates, Inc. Other speakers for the conference included Lonnie Sharpe, John Hopkins, Desmond Stubbs, Gladys Alexandre, Kelly Bockelman, and Carolyn Hodges.

The conference was able to provide students the opportunity to learn about undergraduate research and gain information about graduate school preparation through speakers, research presentations, and a networking fair. The conference also provided students with information about international research experience. Plans for future conferences may include corporate representatives to offer summer internship opportunities, Research Experiences for Undergraduates (REU) representatives to offer summer research experiences, Bridge to Doctorate graduate schools to recruit TLSAMP scholars, joint institutional participation in hosting the conference, and recognition of graduating seniors at the conference.

The TLSAMP program is a National Science Foundation (NSF) funded grant geared towards increasing the pool of underrepresented students majoring in science, technology, engineering, and mathematics (STEM). The specific goal is to double the number of degrees awarded to these students over a five-year period.

University Hosts Intercollegiate Summer Bridge Program



Intercollegiate Summer Bridge undergraduate counselors included (from left to right) Wynton Phillips, Justin Mack, Donovan Coates, Diamond Wallace, Ametria Russell, and Autumn White.



Participants in the Intercollegiate Summer Bridge program enjoyed team building activities as part of the program.

The University of Tennessee, Knoxville, hosted the 2016 Intercollegiate Summer Bridge (ISB) Program June 10-July 1, 2016. The third year residential summer program seeks to increase retention for underrepresented student populations studying in areas of science, technology, engineering, and mathematics (STEM). 28 students attended the program to prepare for the college environment through academic classes, college life workshops, and STEM-related field trips.

“I gained more knowledge there about the subjects we were learning than anywhere else,” said Adiany Cartagena, an incoming freshman biomedical engineering major with a pre-med concentration. “It also gave me a good idea on how much work I would have to do in order to succeed in college.”

ISB is a collaboration with the College of Engineering, the College of Agriculture and Natural Resources, and the College of Arts & Sciences. The program uses a model established by the Tennessee Louis Stokes Alliance for Minority Participation (TLSAMP) to provide an overview of fundamental academic subjects for STEM majors, particularly in math and chemistry.

“The new experience that stood out to me in this program were the classes and the coursework,” said Frenando Blevins, who plans to pursue an industrial engineering major, with a potential double minor in entrepreneurship and Spanish. “Had it not been for the ISB, I definitely would not have been prepared to take on all this work.”

ISB included several college life workshops focusing on various campus departments. Presenters came from offices such as the Center for Career Development, Office of Greek Life, Student Leadership, and various others. The workshops’ emphasis are to provide students with a glimpse of the many resources available at UT as well as demonstrating the benefits of fostering experiences outside of the classroom to complement what they study inside the classroom.

“I have always known that being an engineering major was going to be hard,” said Cartagena. “But now I know that I have resources at my disposal that will help me succeed. The College of Engineering does not play around when it comes to helping students, and I couldn’t be more grateful.”

As part of the program, students are taken on several STEM site visits. At ORNL, students were able to view the Additive Manufacturing Integrated Energy Demonstration Project with Dr. Roderick Jackson as well as tour the Oak Ridge Leadership Computer Facility that provided an opportunity to view several supercomputers. DENSO Manufacturing allowed students to tour their facilities, meet staff, and provided students the opportunity to see how various disciplines of engineering play a role in auto parts manufacturing.

At the culmination of the program, an awards luncheon was provided for participants, family, friends, and various university faculty and staff. Gifts were presented to the deans of each sponsoring college (engineering; arts & sciences; and agriculture and natural resources), instructors, ISB student counselors, and staff members. Several students were honored for top performance and being most improved for the math and chemistry courses.

Outstanding Faculty: Dayakar Penumadu

Dr. Dayakar Penumadu, a Fred N. Peebles Professor in the Department of Civil and Environmental Engineering (CEE), came to the US from India to pursue opportunities in engineering, and is now a leader in one of the University of Tennessee's most high-profile research initiatives.

Penumadu was born in Nellore, India, in the South-Central State of Andhra Pradesh. He grew up in that country until he completed his undergraduate degree and moved to United States for graduate school and has since become a US citizen.

Penumadu's early interest in engineering resulted from his site visits to water retaining structures as a young boy with his father, who was a civil engineer.

"My dad was a civil engineer and was a senior member handling the Major Irrigation Works for the state," Penumadu said. "He used to take me on site trips where I was exposed to the miracles of engineering associated with hydraulic structures and materials engineering early on as a child. I quickly realized the impact of materials, engineers, and civil infrastructure on humankind. It is hard to imagine what all we take for granted in United States related to clean air, water, well laid out sewer systems, transportation, and most importantly reliable infrastructure of buildings and bridges. A majority of the world still lacks completely in these basic essentials. I was fascinated with the interdisciplinary nature of many engineering projects where simply one discipline is not adequate to solve the real problem at hand. It requires a good understanding of physics, chemistry, materials, math, and mechanics, and integrating this understanding for applications to solve real world problems."

After completing his high-school degree at the Kurnool Public School, Penumadu went on to receive a bachelor's degree from the Birla Institute of Technology, Pilani, India; master's degrees from the University of Kentucky in Lexington, Kentucky, and Purdue University in West Lafayette, Indiana; and his doctoral degree from the Georgia Institute of Technology, in Atlanta, Georgia.

He taught for eight years as an assistant and associate professor at Clarkson University, Postdam, New York, prior to joining the faculty in the CEE department at UT.

"My research interests revolve around mechanics and deformation response of multi-phase materials," Penumadu commented. "In 2001, there was strong interest initiated within the colleges of arts & sciences and engineering at UT for pursuing research in material sciences and engineering while leveraging projects with Oak Ridge National Laboratory (ORNL) resources. I was interested in going to a university with a strong national laboratory connection and one that had focus in advanced structural and functional materials, and the choice to join UT was obvious."

Penumadu said the structure-process-property relationship of complex materials is a very interesting area, and he has pursued a number of projects over the years that involve materials that are highly scale dependent, heterogeneous, anisotropic, rate dependent, and their mechanical response is inherently scale dependent. He is fascinated with developing a mechanistic understanding of complex natural and advanced materials.

In 2014, Penumadu became a co-Principal Investigator (PI) for the Institute for Advanced Composites Manufacturing Innovation (IACMI), a \$259 million public-private partnership developed to facilitate breakthroughs in manufacturing and materials.

"I was involved with the core team, which was led by the Vice Chancellor for Research Taylor Eighmy, that developed the pre and full proposal for establishing IACMI after the funding opportunity was released through the Department of Energy Advanced Manufacturing Office," Penumadu said. "The entire process took more than a year and was a rigorous and valuable experience. During this proposal preparation process, I served as a chief scientist for representing the capabilities of the University of Tennessee, working closely with amazing collaborators from ORNL, and the various collaborating institutions and organizations. Since its award, I serve as a PI and act as a Characterization Technical Fellow for the Institute through its Materials and Processing Directorate."

IACMI is the single largest research award ever received by the University of Tennessee in its history. The impact of this institute to integrate carbon fiber composites into automotive, wind, and compressed gas storage markets will be enormous. Due to the formation of IACMI, resources were made available to attract Governor's Chair in Advanced Composites Manufacturing Uday Vaidya, who has already established a very fast-paced manufacturing facility related to fibers and composites. Penumadu said IACMI will bring the UT-ORNL partnership much closer in the coming years. Given the potential for making lower cost carbon fiber composites quickly at lower energy and with promise to recycle scrap, the impact on the state and the nation will be enormous in terms of new manufacturing infrastructure and employment opportunities for this evolving multi-disciplinary field of reinforced polymers and related engineering for structural and multi-functional applications.

Penumadu also enjoys teaching and interacting with students on research projects.

"I see the tremendous need for teaching students basics, the importance of rigorous research, and mentoring them to understand the importance of scholarship," Penumadu said. "I find the diversity of students critical to success of my research. I need students who are good with machine shop skills; some need to be very well learned in advanced mathematics and physical sciences, and others in integrating mechanics and materials science with passion. I thoroughly enjoy teaching undergraduates. When I walk into a classroom, regardless of what material I am teaching, I realize the fact that every student in that classroom will pursue a direction that is not predictable and the most important thing I can teach them is the excitement that comes from being a student of knowledge and the importance of work ethic and integrity in their long-term success."

Penumadu has been married to his wife, Marie, for more than two decades and the couple has two children, Rachel and Neil.

"We love going to church and growing in our faith to serve others," Penumadu commented. "I am also an avid fan of sports, I like watching basketball, football, soccer, and cricket, but most of all I love March Madness! I can't wait for the Vols to get back to the Elite Eight and beyond soon."

While Penumadu is now very much at home in the US, his parents and the rest of his immediate family still live in India.

"Our favorite activity is to travel to visit them as often as feasible, and when we do visit, they spoil us! We can't wait to go back and see them again soon," Penumadu said.



Outstanding Faculty: Uday Vaidya

Dr. Uday Vaidya, the College of Engineering's Governor's Chair in Advanced Composites Manufacturing, was attracted to the University of Tennessee by the new Institute for Advanced Composites Manufacturing Innovation (IACMI) initiative and the opportunity to do real-world research that will enhance economic opportunities for the State of Tennessee, the southeast region, and the nation.

Vaidya was born and grew up in Kolhapur, Maharashtra, India. He received his high school degree from Kendriya Vidyalaya, Malleswaram, Bangalore, India and attended pre-college at M.E.S. College, Malleswaram, India.

Vaidya's brother was a civil engineer, and growing up Vaidya admired his brother's T-square, engineering kit, and blue overall uniforms.

"It was all very impressive to me," Vaidya said.

He decided to study mechanical engineering, and went on to receive his bachelor's degree in mechanical engineering from Karnataka University, Dharwad, India, and his master's degree in mechanical design engineering from Shivaji University, India.

Vaidya worked as a project engineer at the Indian Institute of Science and a Scientist-B at the National Aeronautical Laboratory, both in Bangalore, before coming to the US in 1989 as a PhD student at Auburn University in Auburn, Alabama.

Vaidya's career in academia began as an instructor at Tuskegee University in Alabama, where he was eventually promoted to assistant and then associate professor. He was also an associate professor at North Dakota State University in Fargo prior to joining the faculty at the University of Alabama-Birmingham (UAB). At UAB, Vaidya was named a Distinguished Professor and served as department head for materials science and engineering and as the center director for the Materials Processing and Applications Development Center.

In 2015, the University of Tennessee announced its leadership of IACMI, a \$259 million public-private partnership funded by \$70 million from the US Department of Energy and \$189 million in commitments from IACMI's partners.

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

Vaidya accepted the opportunity to join the Department of Mechanical, Aerospace, and Biomedical Engineering (MABE) as a professor and Governor's Chair, the Chief Technical Officer of IACMI, and recently, as the director of the new Fibers and Composite Manufacturing Facility (FCMF) and Engineering Annex. The FCMF is located in the former TANDEC building on White Avenue, and a ribbon-cutting event was held on August 22, 2016.

"The unique opportunity offered by The Composites Institute—IACMI, a presidential initiative, was the primary reason to come to the University of Tennessee," Vaidya said "IACMI, led by UT-ORNL, the overall international reach of the institute in shaping and executing state-of-the-art industry relevant projects, the experiential learning for the excellent students in advanced composites manufacturing, and the growth plans of the university in the advanced manufacturing eco-systems were a major draw for me to come to UT."

The key focus of the FCMF is to support the needs of the fibers and composites industries within Tennessee and nationally in research and development, training, and education. The work at FCMF complements the Manufacturing Demonstration Facility (MDF), where Vaidya is working with advancing composite applications in collaboration with researchers in additive manufacturing.

The FCMF will provide turnkey solutions to industry partners in advanced fibers and composites, going from concept to product development, materials and process trials, testing and characterization, design, modeling and simulation, and nondestructive evaluation. The FCFM assets are at industrial relevant scale and the experiential learning and involvement of the undergraduate and graduate students will makes them very attractive to industry as they progress in their professional careers. The university is involved with several National Network of Manufacturing Institutes (NINMIs), and the FCMF will serve the research and development and work force development needs of IACMI, the Fibers Institute, and the Smart Manufacturing Institute.

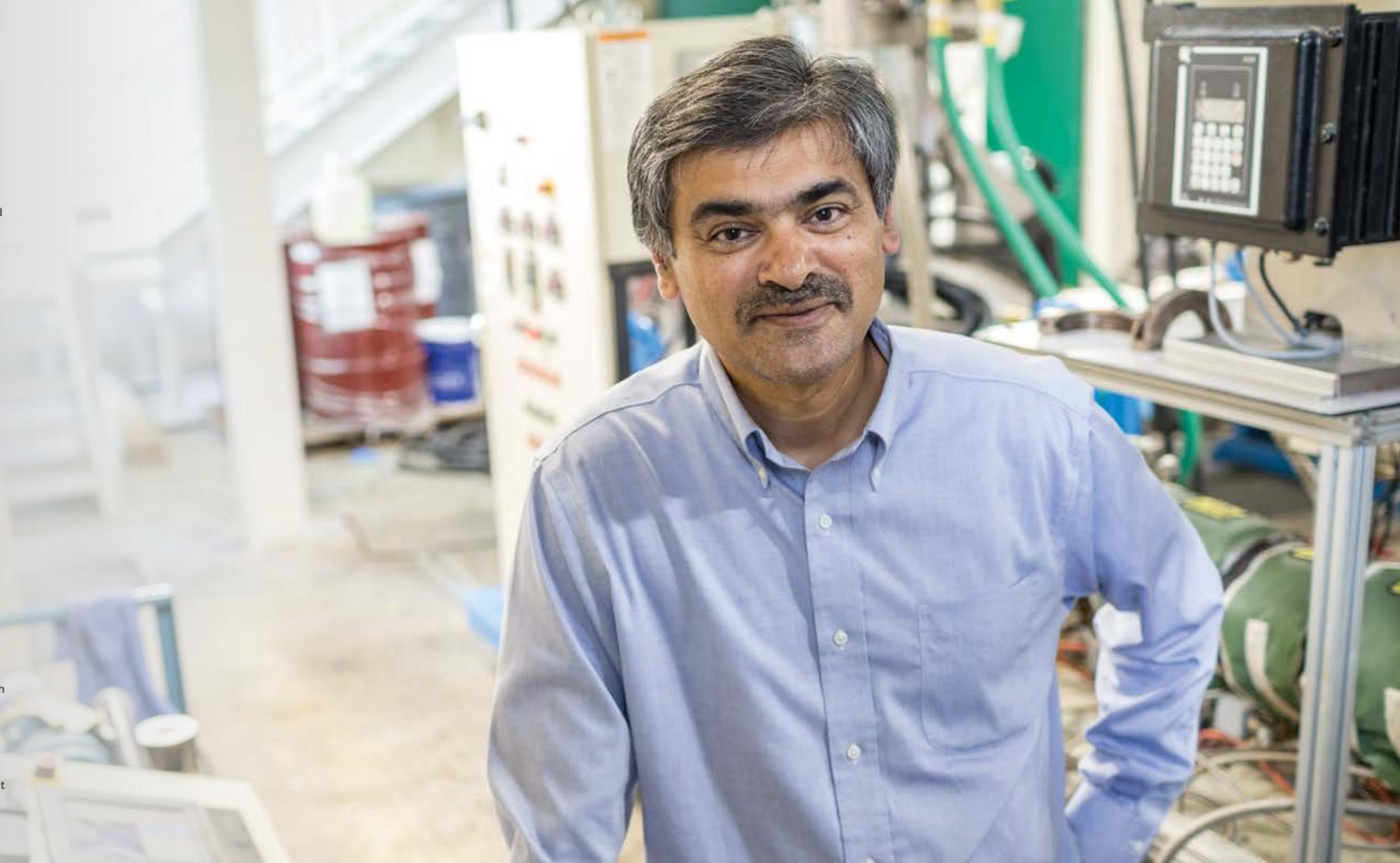
Vaidya is excited about the opportunities that IACMI and other composite manufacturing initiatives offer for the future.

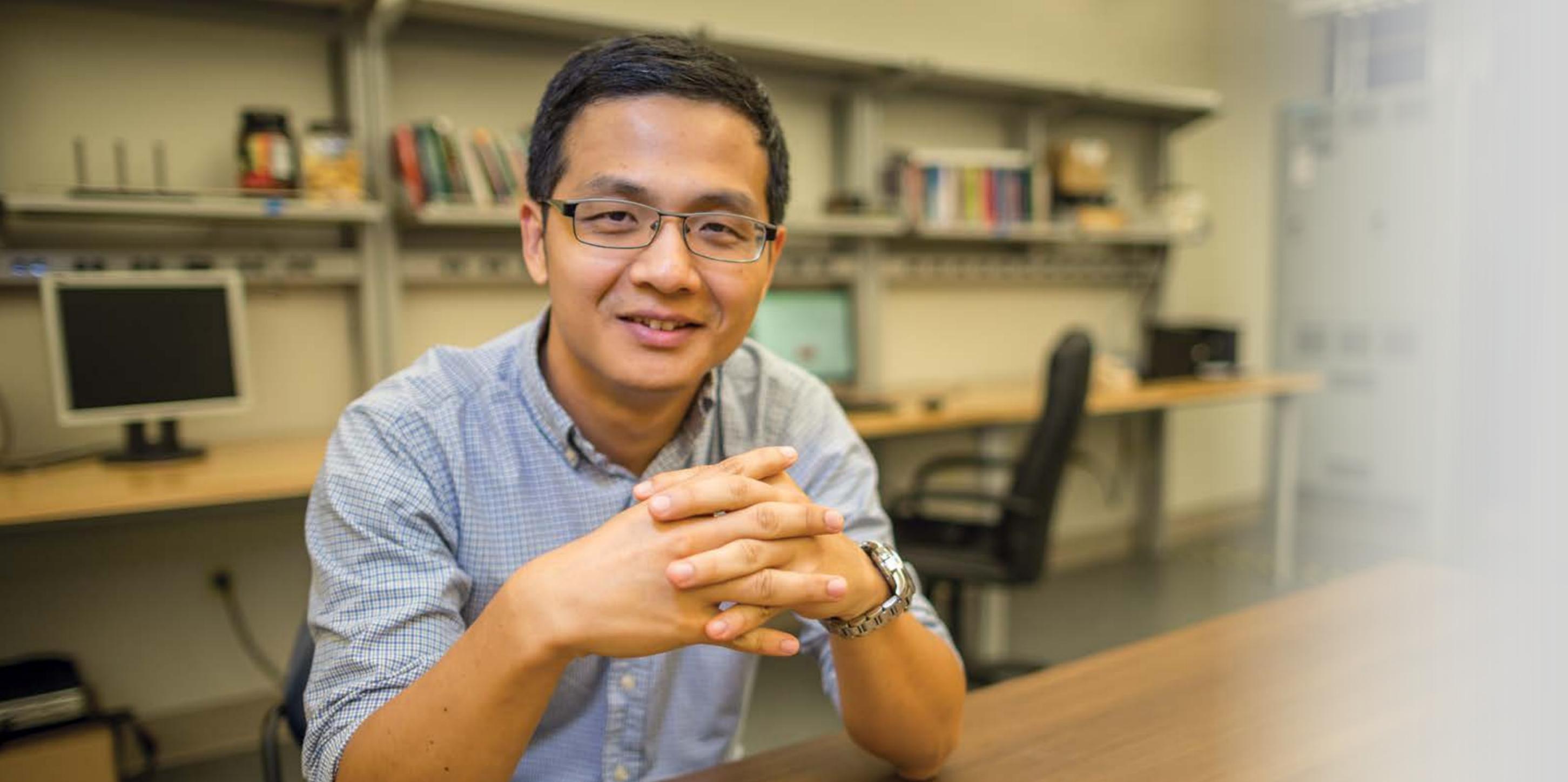
"The goals of IACMI are very tangible and quantitative, including: reducing cost of carbon fiber composites; reducing the embodied energy of materials and manufacturing of composite productions; and enhancing the recyclability of all types of composites and fiber waste into useful products," Vaidya commented. "The long range effect of the team effort through an effort of this magnitude will advance the state of the art in composites globally. There are major advances in technologies to reduce cycle time, scrap, low cost carbon fibers, lighter weight designs, energy efficient manufacturing, etc. that are enabling technologies for the future of automotive, wind, compressed gas storage, marine, aerospace, and commercial applications. The institutes are creating the work force of the future and meeting a great need by producing engineers, technicians, and technologists to enable continuous innovations."

Vaidya currently has 30 students (10 graduate and 20 undergraduate) presently involved with the FCMF in various projects and applications development for automotive, defense, mass transit, compression gas, and commercial applications. These students are being trained in the design, modeling, equipment operations, experiments, process, and product development and characterization across length scales. They receive highly practical and industrially relevant experience. The students also interface with high school students in STEM events and training activities.

In his free time away from the university, Vaidya enjoys tennis, graphic design and watching football, soccer, cricket, and lots of movies. He is also an entrepreneur with his spin-off company, Innovative Composite Solutions, which produces composite tornado-resistant panels.

"My wife Manisha has a MS degree in dietetics and nutrition, and she is a Registered Dietitian at the UAB hospital," Vaidya said. "We have two sons, Ameya and Avirath, both born in Auburn. Ameya is a chemical engineer and works for 3M in Decatur, Alabama, and Avirath is a freshman in pre-med/chemical engineering at Auburn University."





Research Feature: Wei Gao

Dr. Wei Gao, an assistant professor in the Department of Electrical Engineering and Computer Science, is one of several College of Engineering recipients of the National Science Foundation's (NSF) prestigious CAREER Awards in 2016. The NSF recognition is presented to promising young faculty members as a way to support specific areas of research. It is considered the highest honor a midlevel faculty member can receive, and is given as a way to support and develop the new ideas of those researchers. NSF CAREER Awards include over \$500,000 in NSF funding for research efforts over five years.

Gao received his bachelor's degree from the University of Science and Technology in China in 2005, and his PhD in computer science from Pennsylvania State University in 2012.

"I was attracted to the University of Tennessee's Department of Electrical Engineering and Computer Science because of the group of world-class researchers in a collection of different research areas including power systems, high-performance computing, and computer systems," Gao said. "It is a great honor for me to work with this group of faculty and I received a lot of help from them in the beginning years of my career."

Gao's research focuses on the design, analysis, measurement, and implementation of mobile computing and networking systems. Through analytical modeling and systematic designs of mobile system architectures and applications, Gao's research seeks to improve the efficiency, adaptability, generality, and reliability of mobile system operations with respect to the heterogeneous environmental contexts. He finds this area to be interesting because researchers can be always at the very frontier of the mobile technologies' evolution, and the research outcome can be synergistically integrated into industry products.

Gao involves both undergraduate and graduate students in his research projects, and is currently mentoring six PhD students.

"I try to create a variety of outreach opportunities to undergraduate students by allowing them to get in touch with the most pioneering mobile computing devices, including smartwatches and mobile VR devices," Gao said.

Gao also stays involved with professional organizations in his field. He is the Student Travel Grant Chair for the upcoming Institute of Electrical and Electronics Engineers (IEEE) International Conference on Computer Communications (INFOCOM) in 2017 and served as the Symposium Chair, Cloud Computing and Big Data, International Conference on Computing, Networking and Communications (ICNC) in 2016. He has also been on the program committee for several other IEEE conferences and has had numerous papers published with IEEE and other professional organizations.

When not working in the lab or teaching in the classroom, Gao enjoys hiking and soccer. He and his wife recently welcomed a baby girl to their family in June of this year.



INVESTING IN THE
JOURNEY
TO THE **TOP 25**
CAMPAIGN

Development Update

Journey to the Top 25 and Senior Impact Campaigns Power Philanthropic Year

Philanthropy in fiscal 2016 was defined by the energy of our October 2015 Campaign Launch that announced the College of Engineering's \$150,000,000 goal—and the exciting reality that we are well on our way! By the close of FY16 \$109,000,000 was committed towards college priorities which includes endowments for professorships, graduate fellowships, and undergraduate scholarships.

"Endowments to support, develop, and encourage our people are first and foremost in our priorities," asserted Dean Wayne Davis.

When donors endow and name a professorship the benefits are multiple—the faculty member receives a monetary stipend and the college's reputation is developed. Most of all, our students gain from the expertise of the excellent scholars who are in the lab and in the classroom.

Investments in scholarships and fellowships help students realize their academic aspirations by giving them financial encouragement.

"Every gift—of every size—from our donors has impact far beyond the measure of the dollars," noted Dorothy Bryson, Executive Director of Development. "These gifts literally empower students' futures."

Senior Impact, the UT senior class gift program, was inaugurated several years ago but the class of 2016 took this to a new level. With participation the goal, an organized and enthusiastic senior class committee rallied with pizza, banners, and presentations in senior design classes. Result: 35% participation (up from 15% in 2015). Students were asked to give \$20.16, a symbolic amount, beginning what we hope will become a lifelong habit of giving. As an added incentive and to create a sense of fun, Dean Davis personally matches each gift to any engineering fund. This year he wrote a check for over \$2,300. And the class of 2017 is already planning, with a goal to increase not only their percentage participation, but also the amount that the dean has to match. Go Vols takes on a whole new meaning here!



College of Engineering Development Office

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T ENGINEERING



COE Dean Wayne Davis speaks at the launch of the new UT Capitol Campaign.

Outstanding Alumnus: Paul Bunch

Imagine developing a passion for engineering early in life, then overcoming financial constraints to earn a mechanical engineering degree from UT that empowers a successful and rewarding career where you are renowned as an expert in your field. This is the journey of alumnus Paul Bunch (*BS/ME '72*). Bunch, along with his wife, Madeline, now actively joins UT on its journey to the Top 25 both monetarily and as an engaged volunteer.

“My education has helped me in every aspect of my career,” Bunch said, as a testimonial to the quality and value of his UT degree. “I have always applied the knowledge I gained in my engineering education and it has provided a foundation for many years of learning and building on that knowledge. As an engineer, you never stop learning and I have been fortunate to continue applying and developing knowledge my entire career.”

In 2010, Bunch retired from Cameron International as Director of Worldwide Technical Services. As an expert in the development of high pressure, high temperature (HPHT) equipment for the oil and gas industry, he then founded Bunch Technical Services, Inc., a consulting company that provides HPHT technical support for divisions of Cameron/Schlumberger and focuses on writing HPHT industry specifications for the American Petroleum Institute.

While Bunch had long thought about providing support to UT, it was Madeline’s Houston-based philanthropic activities and his subsequent involvement that further inspired him. As Madeline then became familiar with UT and what the institution means to Paul, they discovered philanthropic opportunities to drive outcomes on campus that are meaningful to them and the college. As Bunch says, “I know first-hand how much of a struggle it can be financially to complete a college degree and if Madeline and I can give that opportunity to students who might not otherwise be able to afford it, that would be of great satisfaction to both of us.”

The Bunches recently established the Paul and Madeline Bunch Fellowship, which provides student-aid for a graduate student pursuing a research topic related to fracture mechanics. Dr. Matthew Mench, head of the Department of Mechanical, Aerospace and Biomedical Engineering, (MABE) Condra Chair of Excellence Professor, and Joint Faculty at ORNL is grateful for this form of support.

“The Paul and Madeline Bunch Fellowship empowers me and a faculty member to recruit and retain a graduate student that likely would not attend UT if not for the Bunch Fellowship. Graduate recruiting is a competitive national marketplace and fellowships drive our ability to recruit top-tier students who will assist in advancing UT’s research and thought leadership, which is vital in our journey to become a Top 25 public research institution,” said Mench.

In addition to their fellowship, Paul and Madeline have documented their plan to establish the Paul and Madeline Bunch Endowed Scholarship through their estate. This deferred gift addresses the strategic fundraising priority of endowed undergraduate scholarships. Not only will their generosity provide a wonderful legacy at UT, but it will impact the lives of students as long as there is a University of Tennessee.

In addition to their financial contributions, Paul and Madeline met a group of UT students in Belize this spring during an Alternative Spring Break service experience led by Judith Mallory, Engineering International Coordinator. Mallory led 15 students on the first joint project between the College of Engineering and the Chancellor’s Honors Program to the town of San Ignacio, Belize. It was there that the team completed building a root cellar for a future small dormitory with earth-filled bags—a project initiated in 2015 by another UT Engineering group—on a farm that will eventually serve as a home for girls who have aged out of the country’s foster system. Paul and Madeline, who were in Belize at the time, visited the worksite. They treated the UT student team to a picnic complete with homemade

Belizean tamales, tropical fruit, roast chicken prepared by Paul, cupcakes bearing the Power T, and UT napkins. Paul even grabbed a pitchfork and a shovel on the project—fully embodying the Volunteer spirit!

Born in Chattanooga and raised in Red Bank, Tennessee, Paul Bunch grew up tinkering on motorcycles and cars, which came to dominate his childhood interests. His interest in engineering was also stoked by his uncle who worked for the Coca-Cola Bottling Company in Chattanooga.

“He gave me a tour of the operations at a very early age. I was fascinated by the equipment and thought the engineers who designed that equipment must have one of the best jobs there is,” Paul recalled fondly.

Bunch began his studies at UT Chattanooga before transferring to the Knoxville campus. He worked part-time while attending classes in order to support himself and pay for school.

“UT was such a friendly environment with a lot of comradery among fellow students as well as the professors, which instilled a confidence in learning and getting a degree,” Bunch recounted. “Even though it seemed difficult balancing work and study at the time, I always look back on it with great appreciation for what I learned and what I experienced while I was there.”

Upon graduation, Bunch entered a tough job market, but enthusiastically accepted a position as Design Engineer and Structural Analyst with Pratt and Whitney Aircraft in West Palm Beach, Florida. After four years, he joined Cameron Iron Works in Houston, Texas, which later became Cameron International.

“I was the first University of Tennessee graduate to be hired at Cameron,” recalled Bunch. “The significance to that was, over time, the company management recognized the quality of engineers graduating from UT and began recruiting on campus. I reached a level of management where I could personally recruit engineers from UT. I think that is a good example to show the quality of engineers that graduate from UT and it validates the level of education provided by the professors and staff.”

Prior to retiring from Cameron International, Bunch managed the departments of Engineering Structural Analysis, Metallurgy, Welding Engineering, CAD Systems, and Reliability Engineering. Since founding Bunch Technical Services, Inc., his focus has been on high pressure, high temperature (HPHT) equipment for the oil and gas industry.

“I was part of the Cameron management team to develop the highest pressure drilling and production equipment in existence today,” he stated. “I am currently focused on the development of material environmental testing programs for Cameron/Schlumberger in addition to providing HPHT technical support for Cameron/Schlumberger divisions of Surface, OneSubsea and Drilling Engineering departments.

Bunch traveled the globe as part of his work-related activities and enjoyed many years of running marathons when not working. While he has scaled back on both activities, he still enjoys running and spending time at his home in Belize where he is still active in fishing and diving as well as traveling the country. He also enjoys visiting his family in Chattanooga. Paul and Madeline are also true dog lovers, with seven dogs in total.

Bunch recognized throughout his career the transformational impact of his UT Engineering education. Now, Paul and Madeline Bunch are serving as torchbearers in philanthropy through their support of the college.



Paul Bunch and Madeline Bunch enjoying a UT football game.

Dougherty Award Winner: Dr. H.M. Hashemian

The College of Engineering honored nuclear engineering alumnus Dr. Hash Hashemian (MS/NE '77) with its most prestigious recognition, the Nathan W. Dougherty Award, at the Faculty and Staff Awards Dinner on Thursday, April 21, 2016.

The award has been given annually in honor of Dougherty, who served as dean of the college from 1940 to 1956 and was a captain of UT's football and basketball teams as a student athlete in the early 1900s. He was inducted into the College Football Hall of Fame in 1967.

Recognizing Dougherty's success in engineering and education, the award singles out those who have "brought honor and distinction to the college through their achievements or who have made significant contributions to the engineering profession in Tennessee through their professional activities."

"I feel honored, humbled, and delighted to be receiving this award," Hashemian said. "I have known about this award for many years and have admired those who have received the award in the past. I am truly honored to be among the people who have been given the Nathan Dougherty Award. Many thanks to the UT College of Engineering for bestowing this award on me. I will do my best going forward to be deserving of this recognition."

Hashemian, who was born and grew up in Tehran, Iran, came to the US in 1974 when he was 24 years old to attend Lamar University in Texas where his brother was enrolled. He began his graduate studies in engineering and became intrigued with nuclear engineering after taking a course in the subject at Lamar. The university did not offer a degree program in nuclear engineering, so Hashemian decided to enroll in the graduate program at the University of Tennessee, Knoxville.

"I chose UT because it was known for its strong nuclear engineering program and connection to Oak Ridge National Laboratory (ORNL) and the Tennessee Valley Authority (TVA)," Hashemian said. "I also had a relative in the area; my aunt, Dr. Rondi Jamasbi, was working as a cancer researcher at ORNL."

When Hashemian, then a recent nuclear engineering graduate, and then NE department head Tom Kerlin co-founded Analysis and Measurement Services (AMS) in 1977, their main goal was to provide the nuclear energy industry with a reliable source of testing and problem solving.

In the years since, AMS has become a globally recognized leader in nuclear energy and safety, establishing a connection with every nuclear plant in the United States as well as in several other countries. The company is headquartered in Knoxville with two locations in the United States and representative offices in Australia, Spain, South Korea, and Switzerland. The company is the leading supplier of equipment, training, and services for in-situation response time testing and online calibration of temperature and pressure instrumentation in nuclear power plants. AMS has a worldwide list of clientele, and has worked closely with a number of international organizations such as the International Atomic Energy Agency and the International Electrotechnical Commission.

"My plan is to grow AMS over the next five years to 150 employees and to double our revenues," Hashemian commented. "We have completed over \$20 million dollars of research over the last 10 years and are currently working to commercialize the

results of these research projects. We already have had much success in our R&D commercialization effort and hope to continue this success. I personally am looking to turn the day-to-day affairs of AMS to the four managers that I have been grooming for nearly a year to run the company. I am also grooming my son, Alex, to move up to the top of the company and have a major role in both the business side and technical side of AMS. I will continue to work on big picture needs of AMS such as facility and workforce development, and expansion of our market overseas, especially in China."

In addition to his busy schedule with AMS, Hashemian has also written three books, with translations into Chinese, Japanese, Korean, and Russian; he has spoken at almost 100 conferences worldwide. In addition, he is the author or co-author of 20 US patents (14 awarded and six pending) and has written more than 300 papers and reports.

Hashemian is a Fellow of the American Nuclear Society (ANS), a Fellow of ISA, a Fellow of the International Society of Engineering Asset Management (ISEAM), a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), and a member of the European Nuclear Society (ENS). He received the ANS' Robert L. Long Training Excellence Award as well as a UT Alumni Professional Achievement Award.

Hashemian also provided financial support to help found the organization Systems: Women in Electrical Engineering and Computer Science, which serves to recruit, mentor, and retain women in those fields at UT.

Hashemian has three doctorate degrees: a PhD in nuclear engineering, a Doctor of Engineering degree in electrical engineering, and a PhD in engineering science.

He has also recently been named as an adjunct faculty member in the Department of Nuclear Engineering and stays actively involved with UT engineering.

"I have been connected and active with the Department of Electrical Engineering and Computer Science (EECS), the Department of Mechanical, Aerospace, and Biomedical Engineering (MABE), and the NE department, and have regular contacts with these departments," Hashemian said. "AMS has done joint R&D projects with NE and MABE and we are currently working on a new proposal with NE for a new R&D project for U.S. Department of Energy. I am in constant contact with Dr. Wes Hines, the nuclear engineering department head, and Dr. Belle Upadhyaya, and know many of the NE faculty members and have worked with them from time to time. We invite and host NE students and faculty to our AMS training courses, and recently had three people from UT nuclear engineering in our August 2016 class. I have lectured in Dr. Upadhyaya's reliability class and several of my engineers work with UT nuclear engineering on mentoring students, lecturing in classes, and assisting with academic endeavors."

Dr. Richard Wood, a new professor of nuclear engineering has invited Hashemian's son Alex to lecture in his class on small modular and advanced reactors in the fall 2016. Alex is a UT graduate with an MS degree in mechanical engineering and has worked for AMS for nearly three years. Hash Hashemian also plans to teach a few sessions of Dr. Wood's class.

Hashemian's wife, Nazzy, has an MBA degree and was a bank manager in her previous career. She now has her own business making architectural models for residential and commercial buildings. In addition to the Hashemians' son, Alex, they also have an adult daughter, Nikki.

COE Dean Wayne T. Davis (right) presents the Nathan W. Dougherty Award to Dr. H.M. "Hash" Hashemian at the college's Faculty and Staff Awards Dinner.



Vision Statement

The College of Engineering is resolved to become one of the country's Top 25 public engineering educational institutions. To bring this vision to reality, our college is committed to these five charges:

Attaining national and international recognition among peer institutions for excellence in both research and teaching;

Assembling a dynamic body of faculty who exemplify excellence and innovation in the pursuit and delivery of knowledge that will perpetuate the highest standards of engineering education for future generations;

Graduating students who are well educated in technical knowledge, with solid communication and teamwork skills, who can compete successfully in the global business world and contribute significantly to the national base of engineering education and technology;

Investing strategically in the college's most important resources—students, faculty, and programs—through the vigorous acquisition of private gifts from individuals, corporations, and foundations;

Partnering with academic, industrial, and government entities that share and enhance the mission of the College of Engineering so that our educational and collaborative efforts result in the maximum, positive, economic impact locally, regionally, nationally, and globally.

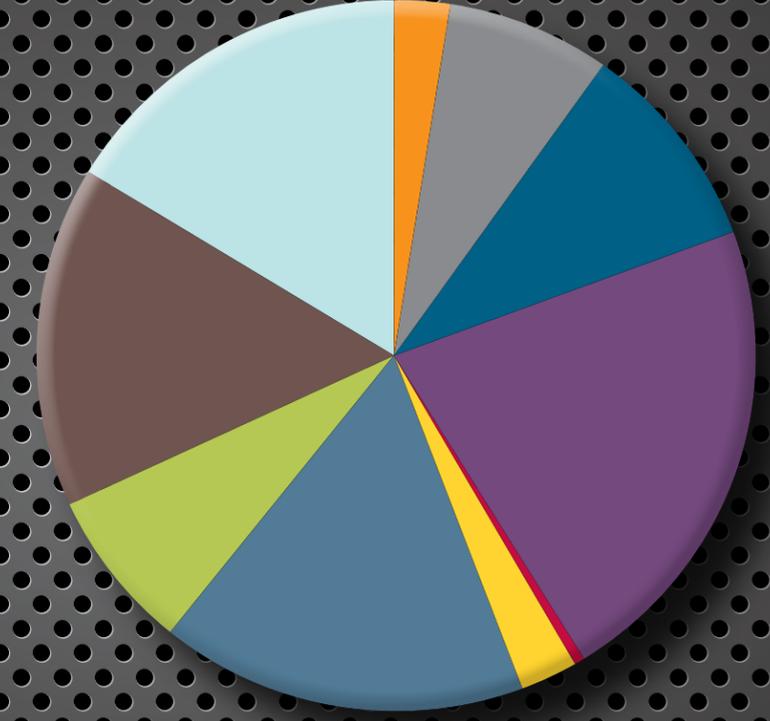
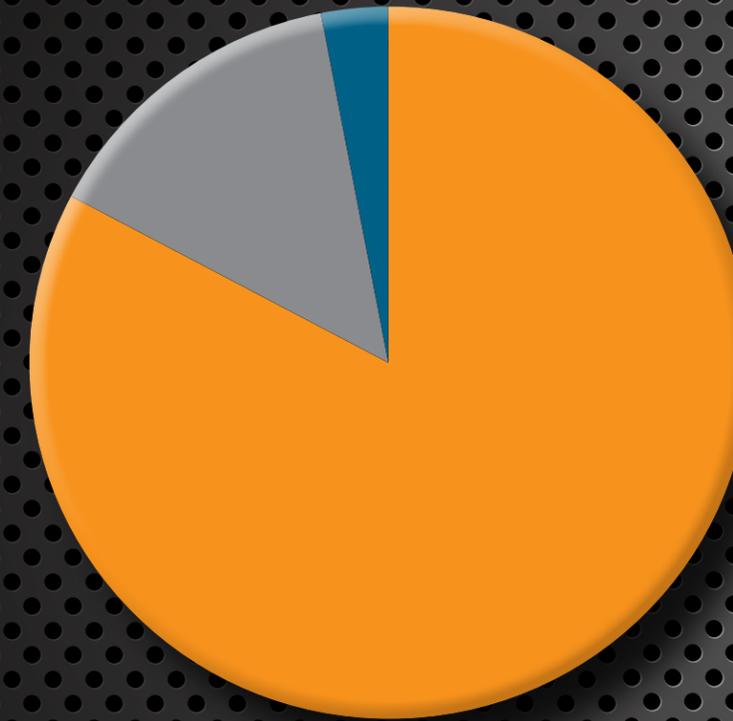
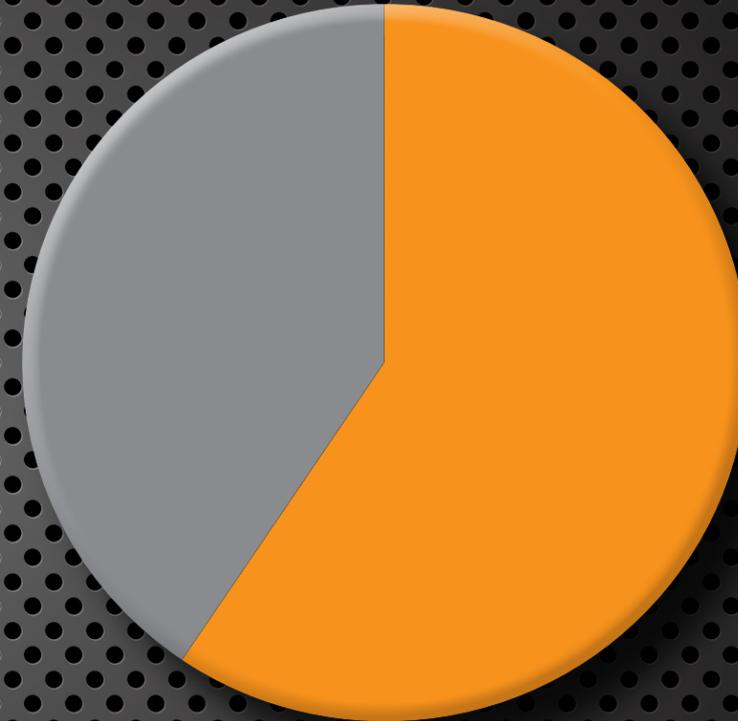
Financial Information

Fiscal Year 2016

Total Expenditures
\$125.6 Million

Resources: Recurring & Nonrecurring State Funds
\$51 Million

Gifts, Grants & Contracts by Department/Center
\$74.6 Million



Externally Funded Gifts, Grants & Contracts \$74,600,264
Recurring & Nonrecurring State Funds \$50,973,627

Salaries & Benefits \$42,325,072
Miscellaneous Operating Expenses \$6,736,257
Equipment & Software \$1,912,297

Administration \$1,885,524
Chemical & Biomolecular Engineering \$5,219,188
Civil & Environmental Engineering \$7,957,659
Electrical Engineering & Computer Science \$17,721,739
Engineering Fundamentals Division \$130,651
Industrial & Systems Engineering \$1,096,122
Materials Science & Engineering \$10,153,664
Mechanical, Aerospace & Biomedical Engineering \$7,807,165
Nuclear Engineering \$10,767,453
Research Centers \$11,861,099



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