



FAMU-FSU
Engineering

2019–2020
Research Report





FAMU-FSU College of Engineering

Research in 2018–19 Fiscal Year




\$28.3M
total annual research expenditures

196
total research awards


222
total proposals submitted

66
research laboratories

STUDENT PROFILE



2,532 students
2,206 undergraduate
326 graduate



27% female
28% undergraduate
24% graduate


22 patents
issued in FY 2018–19



2:1 Ph.D. student advising per faculty ratio

22 FACULTY FELLOWSHIPS

- > American Association for the Advancement of Science
- > American Institute of Chemical Engineers
- > American Physical Society
- > American Society of Civil Engineers
- > Institute of Electrical & Electronics Engineers
- > Institute of Physics (UK)
- > Materials Research Society
- > National Academy of Engineering
- > National Academy of Inventors
- > Royal Academy of Engineering (UK)
- > Royal Microscopical Society (UK)



NEW DEGREE in Biomedical Engineering

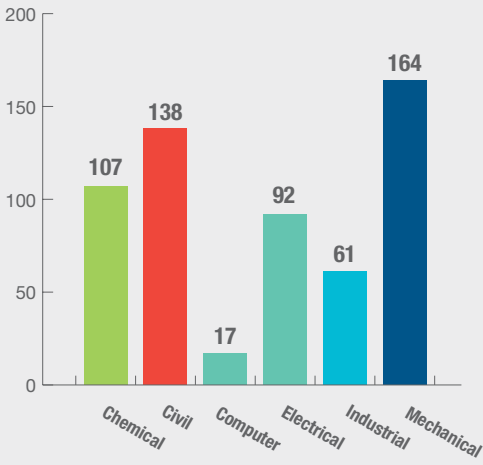
Bachelor of Science in Biomedical Engineering now rounds out our pathway of bio-engineering degrees:

BS | MS | Ph.D. | MS non-thesis

TOTAL ENGINEERING DEGREES AWARDED

BS **423** MS **111** PhD **48**

FY 2018–19
Total Degrees (BS, MS, PHD) Awarded by Degree Program



Program	Total Degrees
Chemical	107
Civil	138
Computer	17
Electrical	92
Industrial	61
Mechanical	164



CHRISTIAN HUBICKI (middle, pointing) researches animal locomotion and robotics to help improve the programming and abilities of the bipedal robot affectionately named “Tallahassee Cassie.”

Research that inspires

Research, innovation and graduate recruitment continues its upward trajectory—these notable gains position our program to be one of the leading doctoral institutions training a highly skilled and highly diverse workforce that will help engineer a better future.

The immersion of our graduate students in the study of challenging problems, both fundamental and applied, is a critical part of an engineering graduate education.

The relationship is highly symbiotic—stimulating research problems attract curious and motivated students who help discover solutions and produce insights that benefit society. And our undergraduates gain research experience and mentoring from engineering faculty at the cutting edge of their profession.

Notables

\$2.2 Million

SERDP (DOD-EPA-DOE) grant for a pioneering comprehensive and highly interdisciplinary study to understand wildfire dynamics and reduce its risks by engineering prescribed fires based on plume dynamics, smoke dispersion and quantifiable risk of ember-ignited spot fires.

45.5 T mini-mag

FAMU-FSU Engineering researchers at the National High Magnetic Field Laboratory developed a small, novel magnet that became the “world’s strongest magnetic field” producing 45.5 Tesla using a newer compound called REBCO (rare earth barium copper oxide).

\$3.3 Million

from the U.S. Department of Energy to develop innovations in power electronics, piezoelectric actuators and new insulation materials to make highly efficient, high-power DC circuit breakers feasible.



GRADUATE DEGREE PROGRAMS

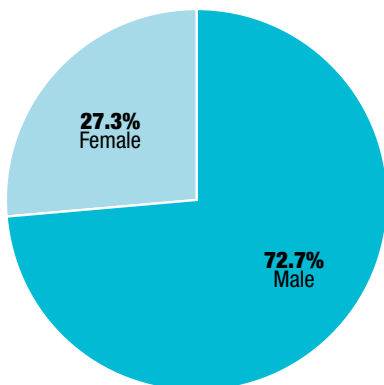
	MS Non-Thesis	MS	Ph.D.
Biomedical Engineering	✓	✓	✓
Chemical Engineering	✓	✓	✓
Civil Engineering	M.Eng.	✓	✓
Computer Engineering	MS Elec/Com	MS Elec/Com	Ph.D. Elec/Com
Electrical Engineering	✓	✓	✓
Industrial Engineering		✓	✓
Engineering Management	✓		
Systems Engineering	✓		
Mechanical Engineering	✓	✓	✓
Sustainable Energy		✓	

326 GRADUATE STUDENTS

96 FACULTY

3:1 FACULTY:STUDENTS

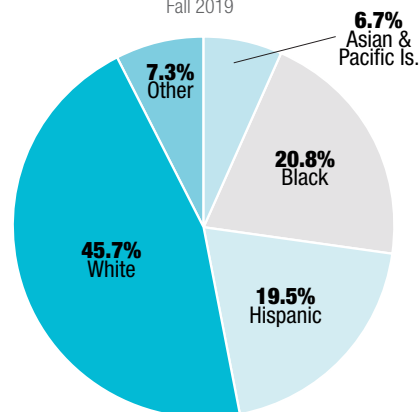
COMBINED STUDENT
Population by Gender
Fall 2019



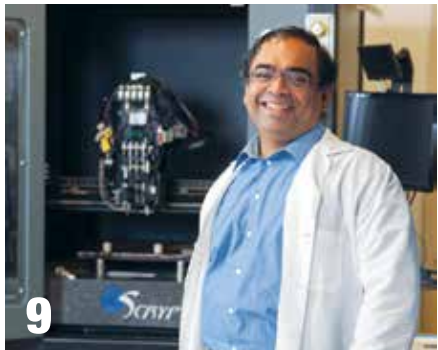
2019 Exemplar

#4 Producer
of African-American
PhDs in engineering
nationwide

COMBINED STUDENT
Population by Ethnicity
Fall 2019



CONTENTS



Dean's Message 5

CHEMICAL & BIOMEDICAL ENGINEERING

Exploring the Origins of Migraine 7

Remembering Teng Ma 10
Department programs 40

CIVIL & ENVIRONMENTAL ENGINEERING

Planning for the Worst 12
Department programs 40

ELECTRICAL & COMPUTER ENGINEERING

DC to AC 21
Department programs 41

INDUSTRIAL & MANUFACTURING ENGINEERING

Cradle of Innovation 25
Department programs 41

MECHANICAL ENGINEERING

Cold and Turbulent 32
Department programs 42

R&D BRIEFS

Engineering microscopic wearables 9

USAF additive manufacturing ... 9

Safer paratransit buses 14

Sustainable, low-cost landfill solutions 17

Smarter land use 18

A power center in an electric world 23

Nurturing new researchers 23

HPMI plays major role in deep space exploration 27

Blended TPU/PLA foams for longer stability 29

Personalized manufacturing engineering research 30

Robots on the move 35

Using network science in materials science 36

Quest for high fields for superconductors 37

From concept to Psyche 38

Peter Kapitza Award winner.... 38

ALUMNI PROFILES

Ryan Robertson 11

Charles Reed 19

Tim Lynch 24

Jacquay Henderson 31

FACULTY PROFILES

Clayton Clark, II, Ph.D..... 19

Rodney Roberts, Ph.D..... 24

Mischa Steurer, Ph.D. 24

Danny Georgiadis, Ph.D. 31

STUDENT PROFILES

Fehintola Sanusi. 19

Olumide Oboiye 19

Grant Steans 24

Abiodun Oluwalowo 31

Dean's Engineering Fellows 39

Diversity is in our DNA



Unique collaboration of a top HBCU and an R-1 university

The FAMU-FSU College of Engineering is the joint engineering institution for Florida A&M and Florida State universities, the only such shared college in the nation. We are located less than three miles from each campus. After satisfying prerequisites at their home university, students learn and research together at the central engineering campus with its eight adjacent, associated research centers and a national laboratory.

This unique collaboration between a top Historically Black University and a Tier-1 research institution make the FAMU-FSU College of Engineering a place to hone cutting-edge

engineering skills. Our researchers and graduate students benefit from the rich intellectual heritage of both universities. They also enjoy access to both nationally recognized institutions' assets and capabilities to enrich their work.

The college's racial, ethnic and gender diversity exemplifies the future engineering and high-tech workforce to a degree not found at most other engineering schools. Employers value our graduates for not only their engineering skill set, but also the soft skills that make them better employees to work in culturally diverse, modern teams.

Why the hyphen?

Migraine attacks may one day be something we can see coming and relieve before they start, thanks to our research (pg. 7). Other researchers are working to stop landfills from smelling and polluting (pg. 17); to make renewable energy viable (pg. 21); and to design materials for a mission to Mars (pg. 25). Enjoying the diversity and impact of engineering research is one of the most rewarding aspects of my job as an engineering dean.

Many top colleges of engineering can tell stories like this, and indeed the network of U.S. engineering schools plays a critical role in research and education that directly impacts the nation's economy. And while each college has a unique identity, ours comes from the hyphen in our name. That powerful punctuation symbolizes the partnership at our core: FAMU-FSU College of Engineering is integrally part of both Florida A&M and Florida State universities. Each of these great institutions brings something special to the table and the combination in not only unique, but powerful.

Faculty and staff from both universities enjoy shared expectations and joint rights at each institution, and they educate students in a unified academic environment on the engineering campus. Not only is the school the only partnered college of engineering in the country, but it also brings together two great institutions with overlapping, but distinct, missions.

Today the college has 2,500 students and 120 faculty—relatively small for the Top 25 public universities—yet we are the No. 4 producer of African American Ph.D.s in engineering (based on 2018 data). The college is the most highly ranked graduate school of engineering amongst HBCUs, made possible because of its connections

with Florida State's large research enterprise.

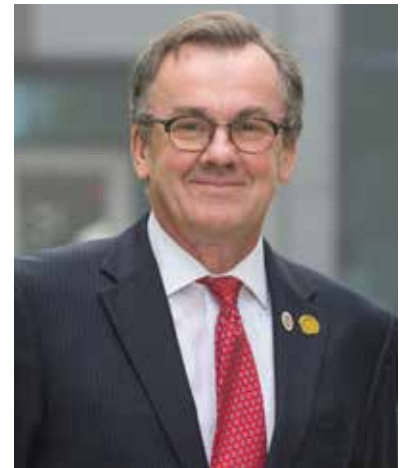
Georgia Tech, the University of Florida and other leading producers of African American engineering Ph.D.s are predominantly white institutions (PWI), which operate using a “feeder” type model. For example, the Atlanta University Center Consortium of Clark Atlanta, Morehouse and Spelman colleges, all undergraduate-intensive HBCUs, is very successful in placing students into graduate school at Georgia Tech. In such “feeder” models, the HBCU faculty deliver the undergraduate education, and the PWI faculty carry out the doctoral-level education.

While very effective in feeding the pipeline of graduates, rather than addressing the institutional disparities between HBCUs and PWIs, feeder models sustain them. There are several other HBCU engineering schools that grant doctorates, but none is in the Top 20 producers of AA engineering students, and no other has yet been able to achieve the Research I category and appear in the top 120 graduate engineering schools.

FAMU-FSU Engineering is the only highly research-intensive engineering model in the nation where the same faculty at an HBCU do both undergraduate and graduate education at the level of a Research I university. As such it is a truly integrated model that demonstrates the transformation that HBCUs must accomplish for them to realize their full potential, and advances the graduate education of underrepresented minorities.

Expanding on this could be critical to building the cadre of underrepresented minority faculty who will in turn provide role models to increase participation in the engineering profession, which our nation so badly needs.

Another positive consequence



J. Murray Gibson
Dean, FAMU-FSU Engineering

of our partnership is the diversity of the college's undergraduate population, which more closely mirrors the U.S. population than any other ranked engineering school in the country. This diversity means, whether minority or majority, all the undergraduates learn to work together in diverse teams. One of the biggest barriers to increasing representation in the workplace is inclusion—the need to ensure equity for all employees regardless of race, ethnic identity or gender. Young people who have worked together while learning engineering can be models for the workforce of the future.

Historically, HBCUs are often located in close proximity to PWIs. Our college points the way for stronger partnerships between these institutions that will address issues called out in the recent National Academy report entitled “Minority Serving Institutions—America's Underutilized Resource for Strengthening the STEM Workforce” and help strengthen these critically important institutions. Not blending or amalgamating—it is institutional bridging through partnerships that will accelerate the needed transformation.

I believe we have a unique and important model demonstrating how to capitalize on the strength of America's Minority Serving Institutions and change the equation for the engineering education of underrepresented minorities.

SAM GRANT uses the imaging power of a 21 Tesla magnet to see inside the brain during migraine. With the unique capabilities provided by magnetic resonance imaging (MRI) at the National High Magnetic Field Laboratory, Grant and his team have identified what may be an important component of migraine propagation through the human brain.





Exploring the Origins of Migraine

Could simple sodium be the secret to how migraine spreads through the human brain?

Despite migraine being the sixth-most-debilitating illness in the world—with healthcare and lost productivity costs estimated to be as much as \$36 billion in the U.S. alone—why it occurs and how it propagates in the brain has not been well understood.

With the help of a \$3.3 million, five-year National Institutes of Health (NIH) grant, chemical and biomedical engineering researchers from the FAMU-FSU College of Engineering are hoping to solve the riddle using the strongest MRI scanner in the world at the nearby National High Magnetic Field Laboratory (MagLab).

In research over the past five years, Samuel Grant, associate professor and graduate program coordinator in the Department of Chemical and Biomedical Engineering, and graduate student Nastaren Abad have identified a likely suspect—sodium.

Using the MagLab's powerful 21 Tesla magnet, the researchers are able to create high-resolution, dynamic images that target and follow sodium atoms that would be impossible to see with clinical MRIs.

"We can see things that other people can't see," he said. "That's why our collaborator, Mike Harrington, director of neurosciences at Huntington Medical Research Institute (HMRI) in Pasadena, California, came to us in the first place."

Many things can "trigger" migraine, said Grant, including light, sound, foods, odors and atmospheric changes.

"We think sodium isn't necessarily the trigger for migraine, but it seems to be, or has the potential to be, a common way that migraine is propagated," he said. "Sodium is the medium by which that initial trigger, whatever it might be, actually moves around the brain and institutes what we consider to be the full-blown migraine attack. We think it is actually somewhat ubiquitous in its role across different triggers. So, if we can interrupt that cascade of what happens with regards to sodium, then we might be able to stop the attack before it really begins."

When sodium floods into areas of the brain, the brain expends energy trying to correct the imbalance, causing pain.

“By that time, the cascade and the imbalances we’re talking about have already set in. You’re well down the path to migraine by that point, and now you’re dealing with how you’re going to manage the pain and other effects,” he explained. “Being able to have something that gives feedback to the person to say, ‘Hey, there’s a migraine attack coming’ before it starts is not easy. That’s one thing we’re trying to resolve.”

“There’s a lot happening before you physically feel it,” said Abad, who herself suffers from migraine triggered by thunderstorms. Her attacks usually last five or six hours. Statistically, women tend to get the painful, localized headaches—which can last from three to 72 hours in susceptible individuals—more than men.

The hypersensitivity to things like light, smell and touch that accompanies migraine means sufferers usually have to drop their daily routine and retreat to a quiet place or sleep it off. “Once I have it, I turn into a recluse,” Abad said.

The MRI imaging is done using rats—they’re the right size to fit into the magnet’s bore—and sodium in the brain is tracked while the animals are in the midst of a medication-induced migraine attack.

“We’ve mostly focused on acute migraine,” Grant said. “But the funding will allow us to start to look at chronic migraine, which may be even a better model in some respects for patients.”

Grant likens the physical harm caused by chronic migraine to a person with high blood pressure. A single spike in blood pressure after exertion isn’t cause for concern, but continuous high blood pressure can have an effect throughout the body.

“A single event or migraine attack has repercussions over the short term,” Grant explained. “But it’s the accumulation of such events that impacts the brain chronically.”

“We don’t think sodium is necessarily the trigger for migraine, but it seems to be—or has the potential to be—a common way that migraine is propagated.”

This series of events then remodels metabolism and blood flow in the brain, causing significant alteration over time.”

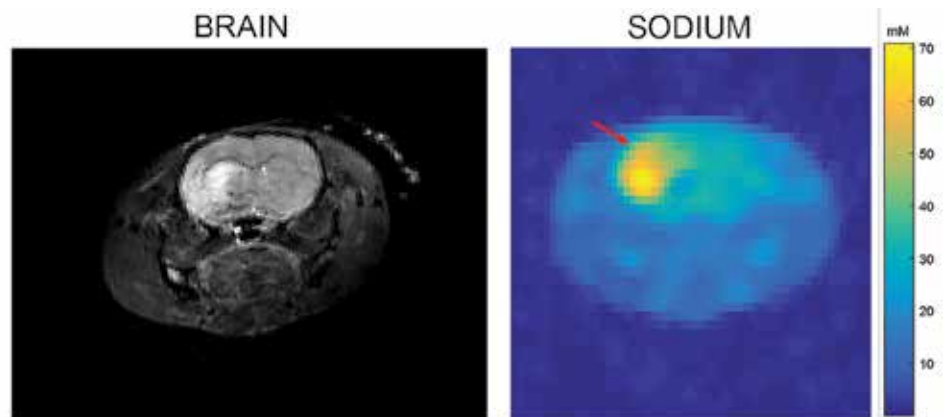
The group has been studying pain relievers such as the first-line treatment sumatriptan, and also plans to look at a new class of experimental medicines specifically targeting migraine—known as gepants—that are in clinical trials now.

Collaborators in the NIH grant include Harrington and Linda Petzold, a professor of computer science and mechanical engineering at the University of California Santa Barbara (UCSB).

Each institution is contributing in a unique way, according to Grant. The HMRI team is conducting behavioral and tissue studies using animal models; the UCSB group is developing computer models of sodium transport in the brain; and Grant’s team is running high-field sodium MRI and metabolic spectroscopy experiments. By combining these methods, they hope to understand how migraine is perpetuated via sodium.

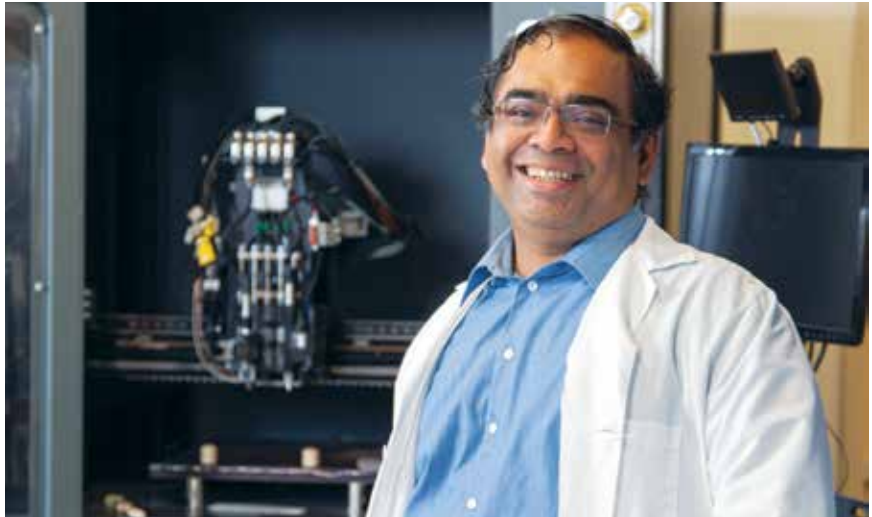
SODIUM IN THE BRAIN

Using the MagLab’s powerful 21 Tesla magnet, researchers are able to create high-resolution, dynamic images that target and monitor sodium atoms that would be impossible to see with clinical MRIs. When sodium floods into areas of the brain, the brain expends energy trying to correct the imbalance, depleting reserves, and causing pain.



Engineering microscopic wearables

Subramanian Ramakrishnan leads a group of engineering professors at the FAMU-FSU College of Engineering that recently received a \$435,000 grant from the U.S. Army to purchase a custom-designed 3D printer from nScrypt. The equipment will allow them to develop microscopic electronic sensors and other devices. With this technology, the group of six researchers aim to develop new forms of flexible polymer electrolyte batteries (such as lithium batteries) and thin-film transistors. They will also design direct-print electrodes for wearable devices and other applications, and ceramics and polymers for toughened composites that will enable better ballistic protection materials for the military.



“This acquisition of a unique printing/vision system coupled with laser annealing facility is expected to enhance the capabilities of FAMU-FSU Engineering researchers to work in areas that are of great interest to DOD, such as flexible electronics and sensors,” said Pani (Chakrapani) Varanasi, Ph.D., chief of the Materials Science Division of the Army Research Office. “At the same time, we expect they will play a critical role in the education and training of minority undergraduate and graduate students in emerging technologies.”

The grant will not only enable new research at the college, but it dovetails with other federally-funded grant work currently underway at the college. For instance, the Centers of Research Excellence in Science and Technology (CREST) Complex Materials Design for Multidimensional Additive Processing (CoManD) center is funded by the National Science Foundation to further research in advanced additive manufacturing by underrepresented minority graduate students. This equipment will open new lines of innovation for the CREST participants and their engineering colleagues at both Florida State and Florida A&M universities.

USAF additive manufacturing

During the summer of 2019, chemical engineering doctoral candidate Roneisha Haney (FAMU) and her faculty advisor Subramanian Ramakrishnan, Ph.D., received a unique opportunity through the National Science Foundation to work at Wright-Patterson Air Force Research Laboratory. The two focused their efforts on additively manufacturing light-weight nanocomposites for the USAF with enhanced strength and electrical/thermal properties.





His **dedication** to the department, his profession, and his students and colleagues was **exemplary**, and he will be sorely missed by all who knew him.

Remembering a colleague, leader and friend

Department of Chemical & Biomedical Engineering Chair and Professor Teng Ma passed away suddenly in the summer of 2019, leaving a void in the college and his family. Colleagues Bruce Locke, Sam Grant and Yan Li reflect on the importance of Ma's work.

As chair of the Department of Chemical & Biomedical Engineering, Teng Ma was as a talented professor and mentor, trusted leader and friend, vigorous and curious researcher. But he was first a father, husband and friend. His sudden passing at a young age was a shock to us all.

Teng Ma earned his B.S. in Chemical Engineering from Tianjin University, People's Republic of China in 1989, his M.S. in Biosystems Engineering from the University of Hawaii in 1994, and his Ph.D. in Chemical Engineering from Ohio

State University in 1999. Following a postdoctoral position at the Ohio State University Medical Center OB/GYN Department, he joined the Department of Chemical & Biomedical Engineering at the FAMU-FSU College of Engineering.

Ma progressed through the ranks as an Assistant Professor (2000–2006), Associate Professor (2006–2011), and Professor (2011–2019). He was a member of the Molecular Biophysics Graduate Faculty at Florida State University from 2001 until his passing. In 2008, Professor Ma was recipient of the Developing Scholar Award at FSU. Research in Ma's group focused on understanding the cellular, physiological and biomechanical processes of tissue regeneration using adult mesenchymal stem cells and on developing enabling technology in cell therapy and tissue regeneration.

Ma was the first professor hired into the Department of Chemical & Biomedical Engineering at the FAMU-FSU College of Engineering who had specific graduate and postdoctoral training and research experience in biomedical engineering. During the late 1990s, the department developed plans to expand research and education in this field with the specific goal to build upon the strengths and foundation of chemical engineering. With degrees in chemical engineering and advanced training and research foci in the areas of human cell and tissue growth, Ma was an ideal fit. He was a pioneering biomedical engineering researcher in the field of tissue engineering, which seeks to develop techniques for replacing tissue such as bone, skin, muscle and cartilage, as well as more complex organs.

Ma's research focus was on developing engineering approaches to tissue, and more broadly cellular, engineering by studying the growth of a variety of human cell types within highly controlled and defined environments, termed bioreactors. He focused the majority of his efforts on the study and optimization of adult mesenchymal stem cells, which are

harvested from bone marrow or adipose and used to make a variety of other types of cells through a process called differentiation.

He and his team made seminal contributions to bioreactor development for mesenchymal stem cell production focusing on the engineering of polymeric matrices (scaffolds) and the analysis of the microenvironment for cell growth, including such factors as oxygen supply (hypoxia), fluid shear forces, compaction and three dimensional culture on cell growth and differentiation. His research provided key contributions to the development of perfusion bioreactors that optimize and control not only growth but the conditioning of cells for use in different pathological environments.

He also worked in bone tissue engineering including analysis of chondrocytes. He and colleagues pioneered magnetic resonance methods to analyze these bioreactors and their products, and his recent research included the exploration of cell therapy applied to stroke treatment using individual mesenchymal stem cells and 3D aggregates. His recent research also focused on the metabolic reconfiguration and analysis of mesenchymal stem cell physiology to reverse senescence in aged cells as a means of recovering therapeutic efficacy and expanding clinical utility.

With degrees in **chemical engineering** and advanced training and research foci in the areas of **human cell and tissue growth**, Professor Ma was an **ideal fit** to begin the **biomedical** engineering program.

Ma was awarded four U.S. patents for his innovative bioreactor design and regenerative technology, and published over 100 high quality and highly cited journal papers with support from the National Science Foundation, National Institutes of Health, Department of Defense, American Heart Association and Florida Biomedical Research Program. He was an alumnus of the US Frontiers of Engineering (2006) and German and US Frontiers of Engineering (2010) by the US National Academy of Engineering. In 2017, he was elected as a Fellow of the American Institute for Medical and Biological Engineering for “seminal contributions to metabolic characterization, bioengineering innovations, and bioreactor design for human mesenchymal stem cells.”

In addition, Ma was an excellent mentor to graduate and undergraduate students as well as postdoctoral associates. Many of his students and postdoctoral scholars are now faculty members at major universities including Johns Hopkins University, Florida State University and Michigan Technological University, while others have gone on to positions in industry (e.g., Amgen, Merck) and government.

A leader in the development of the biomedical engineering program in the department, he developed many new courses in biomedical engineering and was a strong advocate. As chair, he led efforts to establish the undergraduate degree in biomedical engineering and expand graduate programs. His dedication to the department, his profession, and his students and colleagues was exemplary, and he will be sorely missed by all who knew him.



Ryan Robertson

Alumni Success

Ryan Robertson graduated in spring 2019 with a degree in chemical engineering and specific interest in petroleum processing. As a new engineer, he is determined to use his momentum and skills to make a difference in the petroleum engineering industry. As an engineer at Shell, he's on his way to that goal.

Robertson gained an affinity for the field from classes and projects during his senior year, including one where he designed a small crude-to-gasoline oil refinery.

In the phenol/acetone unit at Shell's Deer Park refinery and chemical plant in Houston, Robertson works on long-term projects to increase process efficiency. His job as associate processing engineer will prepare him to become an operational support engineer, where he will focus on day-to-day procedures and safety operations throughout the refinery.

Robertson said his experience at FAMU-FSU Engineering has given him an advantage over many of the newer employees.

“Petroleum engineering is often overlooked as a career path for chemical engineers,” Robertson said. “Because of my time at FAMU-FSU Engineering, I was well-prepared for the transition into the field after getting my bachelor's degree.”



EREN OZGUVEN AND HIS ENGINEERING COLLEAGUES use the data from Hurricane Michael that hit the Florida Panhandle in October 2018, and other storms affecting the state, to design better algorithms for sheltering, evacuation, building design, port resilience and more. It's an issue that hits very close to home—literally.



Planning *for the* Worst

Civil and environmental engineering researchers are working together to discover the best methods to deal with hurricanes before, during and after they strike

Weather forecasting is best left to the meteorologists, but other aspects of these destructive storms—such as wind damage, storm surge, evacuation, resilience, recovery and more—fall under the purview of engineering.

Florida was impacted by four hurricanes four years in a row—Hermine, Irma, Michael and Dorian. While devastating, these events provided a data-rich environment that researchers are mining for information.

“That’s part of the research: collect the data on what happened So that in the future, the communities become a lot more resilient,” said Sungmoon Jung, Ph.D., an associate professor at the college who studies the wind’s effect on structures such as buildings, bridges and trees. “Our training enables us to design solutions based on what we learn.” >>



SUNGMOON JUNG studies “cutaway” bus design and crash data to help prescribe Florida safety standards for the industry.

Making paratransit buses safer

Paratransit or “cutaway” buses are modified to transport passengers with disabilities. The buses’ unique design and features make access much easier for those that need it, but concerns have emerged about their safety due to the necessary structural changes. Two FAMU-FSU Engineering civil faculty are working to define safety standards for this critical industry.

The Florida Department of Transportation (FDOT) acquires over 300 cutaway buses every year. These “minibuses” usually carry between 16 and 24 passengers. Because construction of these vehicles is unique, their crashworthiness and safety assessment is complex. However, some bus designs are better than others in terms of providing a safe environment for passengers during road accidents.

The transit office of FDOT established the crashworthiness evaluation of cutaway buses program in 1999 with the mission to ensure safe paratransit services throughout Florida.

Researchers at the Crashworthiness and Impact Analysis Laboratory (CIAL) at the FAMU-FSU College of Engineering

have been using computational mechanics and modern experimental techniques to assess these vehicles for over two decades. During that time, CIAL has developed a process, known as the Florida Standard, that is currently used by FDOT.

This successful program was established by Jerry Wekezer, an emeritus professor at the college, and is now led by Sungmoon Jung, an associate professor in the Department of Civil and Environmental Engineering. In addition to benefiting bus passengers in Florida and other states, the lab also is instrumental in advancing transportation research and supports a significant number of masters and doctoral students each year.

CIAL research interests include applied computational mechanics and numerical analysis; non-linear, dynamic finite element methods; computer modeling; contact, impact and penetration problems; full-scale crash tests; crashworthiness; safety, vulnerability and survivability.



RECOVERY IS STILL UNDERWAY in the storm-ravaged Florida Panhandle, which saw entire communities erased from the landscape. Civil and environmental engineers at the FAMU-FSU College of Engineering are studying evacuation, resilience, recovery and sheltering practices and outcomes in the state to help inform disaster policy and planning nationwide. This photo shows initial disaster cleanup from Hurricane Michael on October 16, 2018 in Mexico Beach, Florida. Many students, faculty and staff volunteers helped clean up.

Using satellite imagery, Jung studies which types of trees are located where, how strong they would be when hit by wind and which roadways could be impacted by falling trees. After Hurricane Hermine in 2016, the first hurricane to hit Tallahassee in more than 30 years, researchers worked closely with officials from the city-owned utility to provide prevention and solutions for restoring power after a hurricane.

“After Hermine, power crews would try to go somewhere to fix the power,” said Eren Ozguven, Ph.D., an associate professor at the college. “If there’s a tree on the road, they had to go back because they couldn’t pass. They didn’t have the necessary tools.”

When Hurricanes Irma and Michael came along, the city sent

public works crews along with the power crews to work together. “This is just a small example,” Ozguven said. “There are, of course, a lot of things to be solved. But what we learned here actually helped.”

Assistant Professor Maxim Dulebenets, Ph.D. researches operations systems, specifically creating solution algorithms relating to emergency mitigation. Most recently, he studied which characteristics influence evacuation when a hurricane or other disaster threatens. A diverse group of over 100 participants aged “20-something to 89” used a driving simulator, which presented them with scenarios they might encounter during an evacuation.

“It’s not a typical (traffic study) based on ... traffic volumes and

roadway capacity,” Dulebenets explained. “We actually have more complicated travel-time functions designed specifically for emergency evacuation and consider a wide range of driver characteristics. They are more realistic and we believe these types of models will be helpful in planning for emergency evacuation.”

Professor Wenrui Huang, Ph.D. has studied coastal and estuarine environments since he arrived at the college in 1997.

“We use the data from the National Hurricane Center—what they predict, the hurricane conditions, hurricane wind, hurricane track,” Huang said. “Based on that, I have computer models for the Gulf of Mexico and part of the Atlantic Ocean to predict where the storm surge

may occur.” He also has models to predict the effects of rainfall-related runoff.

Huang recently received funding for two studies on hurricane impacts. One focuses on integrated hazard and traffic modeling during massive evacuations and the other the combined coastal and inland hazards from high-impact hurricanes.

To complicate the research, hurricanes are fickle things that don’t necessarily follow a predicted track. In 2017 Irma, for example, was initially thought to be bringing Category 5 winds to South Florida and many people evacuated the urban area in anticipation. Many headed upstate, only to discover that the storm switched to a more westerly track, bringing hurricane-force winds over most of the state’s peninsula.

In 2018, Hurricane Michael quickly revved up from a Category 3 to a Category 5 storm, devastating the area between Panama City

and Mexico Beach in Florida and bringing hurricane-force winds well inland.

The aftermath of Michael highlighted the need for plans to change based on the demographics of the area where a hurricane hits.

Unlike urban South Florida, many of the Panhandle counties in Michael’s track were rural, sparsely populated, and had limited roadways. Also, many people, particularly the older population, were isolated and didn’t have access to communication tools that would provide up-to-the-minute information.

“Some people relied on radio. They stayed, they sheltered in place,” said Ozguven. Then, after the storm, their accessibility was so limited, “in Bay County they had an airplane drop flyers with information on food distribution and other information.”

While scientists within in FAMU-FSU Engineering work across departments on different

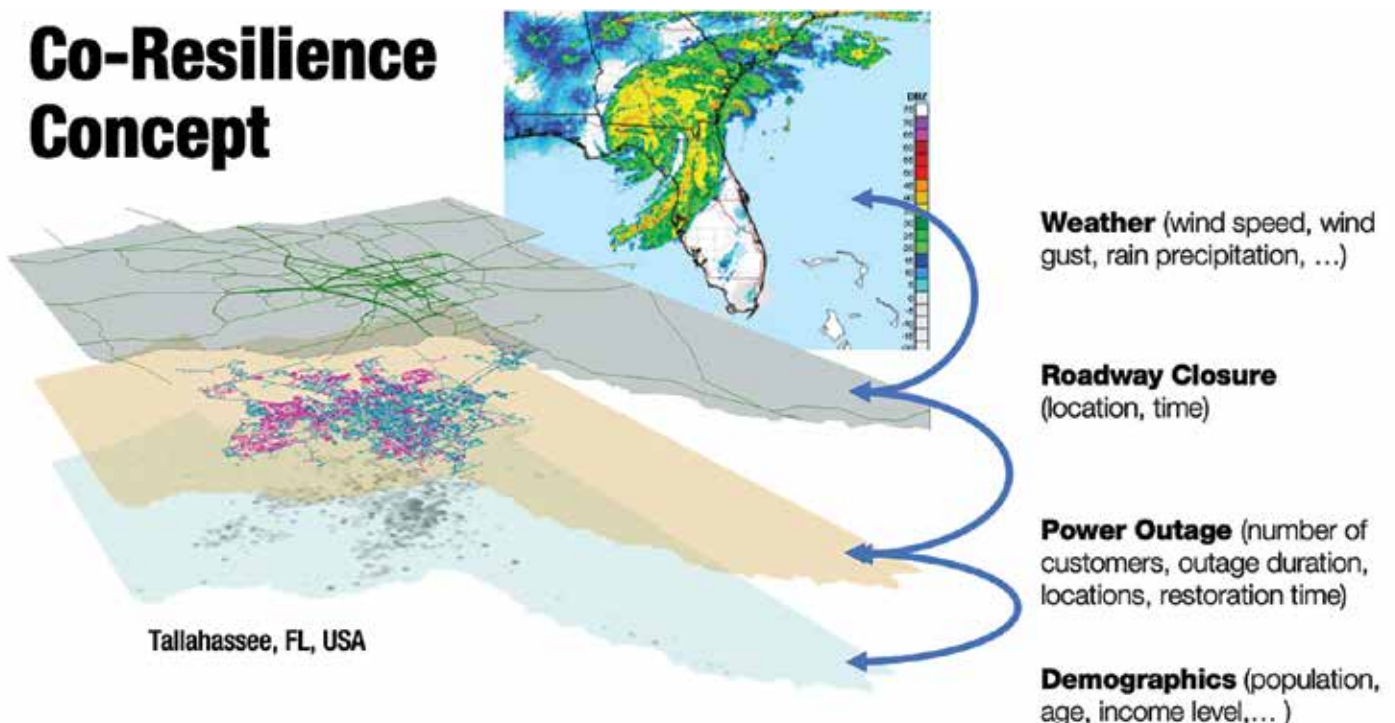
aspects of storm-related issues, the interdisciplinary study of hurricanes also reaches throughout the parent universities.

“You need to study the infrastructure itself,” Ozguven explained. “There are a lot of engineering questions that you have to answer, but on the other hand, you have to study the organizations and agencies and how they work with each other. And then ... you need to reach out to communities to share what you have found so that they can make informed decisions. We basically go into psychology, sociology, communications and social work aspects. We have a huge group here, and everybody is kind of into working together to solve these multi-faceted problems. I love it!”

OZGUVEN'S CO-RESILIENCE

CONCEPT depends on multiple data sets on environment, infrastructure and demographics/socioeconomics.

Co-Resilience Concept





TANG AND ABICHOU

Sustainable, low-cost solutions in managing landfills

Researchers at the FAMU-FSU College of Engineering are looking at new methods to improve the environmental sustainability and the economics of landfill design and operation.

Youneng Tang, a professor of civil and environmental engineering, is developing techniques to recover selenium from landfill leachate and wastewater, a method that could be used for commercial purposes. Selenium is a rare element with diverse uses in glass, electronics and printers, to name a few. If allowed to contaminate groundwater, selenium can be toxic to both humans and animals.

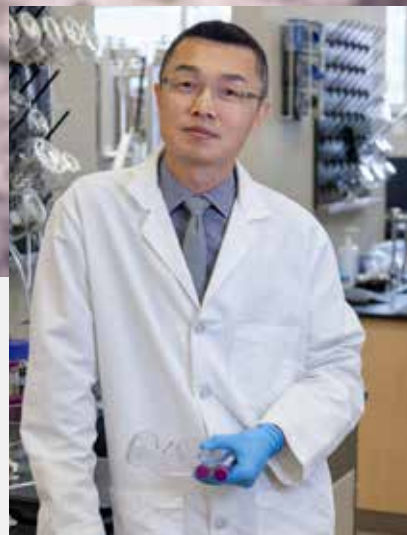
Selenium contamination is caused by discharge from petroleum refineries, erosion of natural deposits and discharge from mines. Tang's group recovers selenium from contaminated water using microbes to convert the dissolved selenium contaminants into elemental selenium nanoparticles.

Tarek Abichou, a professor of civil and environmental engineering, has established a national and international reputation in sustainable solid waste management research. Some of his research activities include designing, analyzing

and testing different components of landfills and other waste containment structures to reduce their environmental impact.

The methods Abichou has developed can turn old landfills into community parks and wildlife preserves by using alternative methods of covering solid waste facilities with vegetative layers. These innovative covers exploit the water capacity of fine soils and utilize vegetation to help with the water removal, reducing infiltration into the underlying waste. He is also investigating the mitigation of greenhouse gas emissions from landfills using bio-oxidation of methane via bio-cells, bio-covers and biofilters.

Currently, Abichou is testing the long-term performance of Geosynthetic Clay Liners (GCLs)—widely used as bottom barriers in Florida's landfills—under different geochemical environments. His team developed new clay-polymer combinations that can be used in the manufacture of future-generation GCLs more compatible with a wider-range of more aggressive leachates.



Smarter land use — a response to climate change

Gang Chen, Ph.D., a professor of civil and environmental engineering at the FAMU-FSU College of Engineering, is leading a team of investigators to study the effects of farming and land development on the environment.

Chen received a \$1.2 million grant from the U.S. Department of Agriculture to study the issue. This group seeks to provide solutions to increase the resiliency of food production while reducing the negative environmental, economic and social consequences of agriculture.

The study, “Land-use Changes in Response to Climate Change: A Vulnerability Analysis,” is a collaborative effort with research scientists from the USDA Forest Service, Washington State University, Florida A&M University and the FAMU-FSU College of Engineering.

The group’s focus is the impact of climate-induced temperature increases and altered precipitation patterns.

They are looking at effects on water quantity and quality, food production and energy consumption.

“We are proposing targeted land-use changes to mitigate the diverse impact on water, food and energy, and on the economy and society,” said Chen, who is also a professional engineer. “These changes should eventually reduce the vulnerability of the agroecosystem.”

The findings of this project will advance strategies to sustain food production while conserving water and energy. By looking at the multifaceted impacts of land-use changes due to climate change, the researchers can provide guidelines to aid local and regional policy and decision-making.



Clayton Clark, II

Civil & environmental engineering faculty

Civil and environmental engineering professor Clayton J. Clark II, P.E. was awarded the 2018 Research Excellence Award by Florida A&M University in honor of the grants he has acquired for FAMU-FSU Engineering. In 2018 and 2019 Clark received \$4.3 million in grants from organizations including the National Science Foundation and the U.S. Department of Education. The dollars from the grants will be utilized both to conduct environmental research and to increase the number and productivity of under-represented minority students in engineering research.



Fehintola Sanusi

Civil graduate student

Fehintola Sanusi, a Ph.D. student in civil engineering at the FAMU-FSU College of Engineering, was selected for Florida State University's 2019 Leadership Award. She works with Juyeong Choi, Ph.D., a professor in the department. Sanusi has won multiple student competitions, produced conference papers and an extended abstract in a high-impact journal in her field. She is highly active with professional, academic and student opportunities in civil engineering, and chaired the student chapter of the Institute of Transportation Engineers.



Olumide Oboiye

Civil graduate student

FAMU-FSU Engineering and Florida A&M University graduate student Olumide Abioye was recognized for his outstanding student paper at the 44th Annual Natural Hazards Research and Applications Workshop. Abioye's paper titled, "A Novel Model for Emergency Evacuation Planning," focused on presenting a mixed-integer programming model that assigns individuals to emergency shelters through evacuation routes during available time periods. The research was based on emergency evacuation in Broward County, Florida, an area often hard hit by natural disasters.



Charles Reed

Alumni Success

Charles Reed II is an alumnus of the FAMU-FSU College of Engineering, a double graduate with B.S. (2001) and M.S. (2002) degrees in civil engineering. He is founder and president of Asset Engineering, Inc., a Bartow, Florida-based company specializing in project management, contract support and training services for federally-funded local and state projects. Since its founding in 2009, Asset Engineering has built parks, offices, boutiques, sidewalks and more throughout the state.

After graduation, Reed began his career in the transportation industry and gained more than 12 years of experience in transportation design, construction management and cost estimating. He facilitated widescale projects as the associate project manager at The PBSJ Corp. in 2006 and advanced to District 1 project manager in 2007.

Asset Engineering—an entirely minority-owned business—placed No. 8 in FSU's 2019 Seminole 100, a list of the fastest growing businesses started by Florida State University alumni.

HELEN LI is focused on bridging the world's solar energy capacity with its conventional energy needs through new photovoltaic converters and other novel electric technologies.



DC *to* AC

Professor **Helen Li** believes high-power inverters will expand renewable and mobile power



Photovoltaic converters are a thing of the present.

Those looking toward the future want solar photovoltaic (PV) converters that are smaller, lighter, cheaper, smarter and higher performing than what exists today.

Hui “Helen” Li, Ph.D. and her team at the Center for Advanced Power Systems are up for the challenge. As part of a newly created

federal Department of Energy Next Generation Power Electronics Innovation Institute, her research is focused on developing PV converters based on Wide Bandgap (WBG) semiconductor technology. Semiconductors are key to the guts of inverters, which take the DC output of PV cells and convert them to the AC used in most power applications. Wide bandgap

semiconductors can deal with more power in a smaller package, but are not yet as well developed as more conventional silicon electronics.

The wider bandgap allows devices to function at much higher temperatures, so they can be operated at much higher voltages and currents. This allows power conversion technology to be scaled up from smaller uses like cars and

houses to power grids, ships and airplanes.

But, like any innovation, creating solutions can generate a whole new set of problems to solve.

Li illustrates with an example of an electric car:

“You use a new device that makes the whole vehicle much lighter and more efficient. But when you turn on the radio you cannot hear the signal, because of the electromagnetic interference,” she explained. “Definitely you can solve it. But when you solve it you must add more components to this converter, which may offset the advantage.”

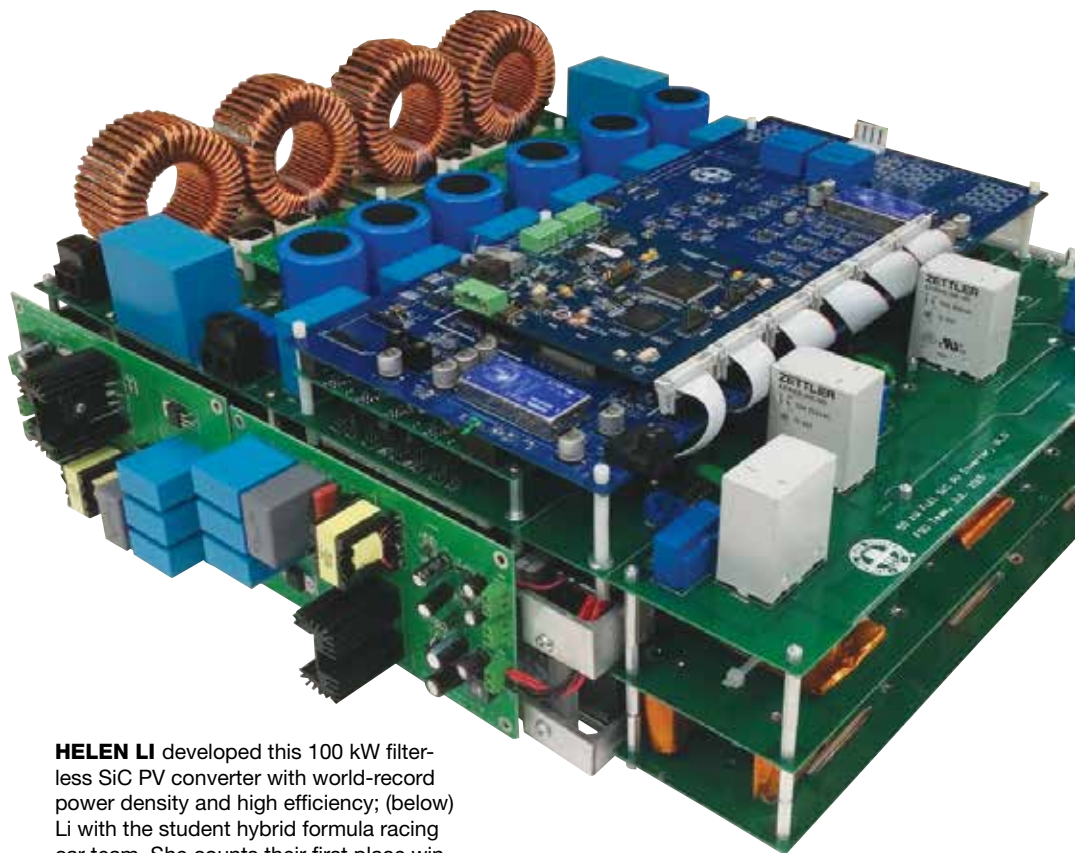
While the new technology has broad applications, much of her research focuses on electrified transportation, which has specific needs for energy storage elements such as lithium-ion batteries and super-capacitors.

Li’s group has developed a regenerative motor drive that interfaces with an energy storage element to absorb the brake energy and re-use it during acceleration. This regenerative motor drive can be applied in electric vehicles, electric ships and even electric aircraft.

Li’s lab has workstations full of the pieces and parts used to create innovative electronics—circuit boards, resistors, capacitors, wires and fans—and includes a high-voltage area that thrums with the sound of power. She attempts to describe each work in progress, but the intricacies baffle the layperson. However, her fast talking, gesticulations and boundless energy telegraph that whatever research is going on here, it’s something worth getting excited about.

Li came to the college in 2002 and is currently a professor of electrical and computer engineering.

Li’s group developed a regenerative motor drive that interfaces with an energy storage element to absorb the brake energy and re-use it during the acceleration. This can be applied in electric vehicles, electric ships and even electric aircraft.



HELEN LI developed this 100 kW filterless SiC PV converter with world-record power density and high efficiency; (below) Li with the student hybrid formula racing car team. She counts their first place win as one of her best accomplishments: “I’m so very, very proud of them.”



She was awarded a prestigious National Science Foundation Career Award in 2007. The conference room at the Center for Advanced Power Systems (CAPS) is lined with plaques highlighting the patents that have been earned over the years, many of them including Li's name as a contributor.

In 2018 she was named an IEEE (Institute of Electrical and Electronics Engineers) Fellow for contributions to bidirectional converters for utility applications and high efficiency PV converters. Less than 0.1 percent of members are selected annually for this honor.

Before she came to the college, wind turbines were the focus of Li's research. But that quickly switched over to solar power "because Florida is the Sunshine State, right?" she quipped.

For all the accomplishments of CAPS over the years, one of the posters Li pointed to with great pride isn't a power converter. It is, in fact, a rather ugly hybrid electric race car created by FAMU-FSU Engineering students as part of an international formula racing car competition.

There were 33 teams in the 2010 competition, some of them well funded and from highly regarded universities. The FAMU-FSU Engineering team was one of only six teams to complete the race, earned a first place in the hybrid division and seventh place overall.

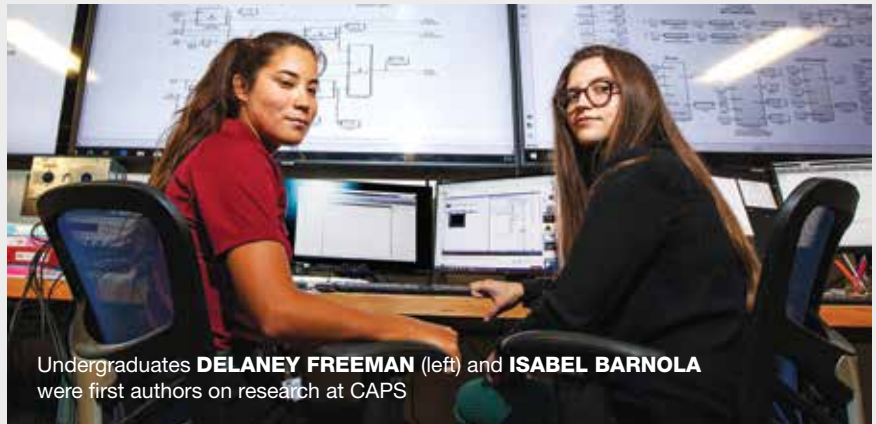
"Our design was not as fancy as most of other teams, but we were very robust—and reliable," Li said. "These kids are so good. I am so very, very proud of them."

A power center in the electric world

The Center for Advanced Power Systems (CAPS) is one of the renowned research centers affiliated with FAMU-FSU Engineering. The lab, currently under a major expansion with a new building underway, is part of Florida State University. The FAMU-FSU Engineering faculty in electrical and computer engineering are the main researchers and faculty at the center, which specializes in electric power systems modeling and simulation, power electronics and machines, control systems, thermal management, cyber-security for power systems, high temperature superconductor characterization and electrical insulation research. Cyber security was recently added as a theme.

With support from the U.S. Navy, Office of Naval Research (ONR) and the U.S. Department of Energy, CAPS has established a unique test and demonstration facility with one of the largest real-time digital power systems simulators along with 5 MW AC and DC test beds for hardware in the loop simulation.

CAPS is renowned in the electrical engineering research sector and provides a rich environment for the engineering faculty, graduate and undergraduate researchers, and industry-related users of the facility.



Undergraduates **DELANEY FREEMAN** (left) and **ISABEL BARNOLA** were first authors on research at CAPS

Nurturing new researchers

At CAPS, researchers like electrical and computer engineering chair Sastry Pamidi, Ph.D. and Peter Cheetham, Ph.D. provide undergraduate students quality research and other experimental learning opportunities with hands-on activities that complement what is taught in the classroom. These opportunities allow students to evolve into professional engineers by enhancing skills in problem-solving, communication and networking, as well as being part of a team.

Pamidi initiated an intensive, high-volume undergraduate research program at CAPS that has seen great success in producing advanced degree-seeking undergraduates. Since 2016 Cheetham has mentored 16 undergraduate researchers as they have conducted research at CAPS. Seven of these students have gone on to be a co-author on international conference or journal publications.



ROBERTS

Engineering researcher given IEEE award

Rodney Roberts, Ph.D., received the 2018 Outstanding Contribution Award from the Institute of Electrical and Electronics Engineers (IEEE) in recognition of his time, contributions and leadership in the organization, including positions as section vice president, secretary, associate editor and more. Specifically, Roberts is a leader in the organization's areas of robotics and automation.

He has published over 150 research articles and holds four patents. His research has been funded by the U.S. Air Force, the U.S. Navy, the Army Research Lab, the Missile Defense Agency, the National Image and Mapping Agency, NASA, and NSF. He was a 2015-2016 Fulbright U.S. Scholar at the University of Macau where he did research on spatial compliance and fault tolerant manipulator design. He has also spent several summers working at the NASA, U.S. Navy, and U.S. Air Force research laboratories.



STEURER

CAPS researcher honored with ASNE Solberg Award

Michael "Mischa" Steurer, Ph.D. received the prestigious Solberg Award from the American Society of Naval Engineers (ASNE) for his contributions to naval engineering. The award presentation was held at the ASNE Technology, Ships and Systems symposium in Washington, D.C. held in June 2019. Steurer is an electrical and computer engineering faculty member at FAMU-FSU Engineering.

The PHIL system Steurer developed allows power equipment to be tested to see how it responds to issues such as power surge or overload in a controlled environment. This model led CAPS to become the first university test site accredited by the U.S. Navy to perform high-powered simulations as the center develops next-generation shipboard power technology.



STEANS

Musician and graduate student define Grant Steans

During his undergraduate experience, Grant Steans balanced the worlds of band and coding. After joining Florida A&M's Marching 100 during fall 2014 playing the trombone, he spent the next four years performing and gaining leadership, becoming the section leader and, eventually, band president.

Now as a first year master's student, Steans' thesis is machine learning, which is the study of algorithms for artificial intelligence. He is testing different training models for AI applications to determine how the models are affected by data bias (different data inputs) which affects the most well-known AI such as Google's search engine.



LYNCH

Tim Lynch soars high at L3Harris

Tim Lynch is the Space Segment Executive Director and Chief Mission Architect of L3Harris Technologies. He earned his bachelor's and master's degree in electrical engineering at the FAMU-FSU College of Engineering through Florida State University in 2000 and graduated from the Pennsylvania-Wharton School of Business leadership program in 2017.

Lynch has been working at L3Harris for more than 19 years and began his career at the company as an electrical engineer. Over the years he has held positions of increasing responsibility in the areas of engineering, business development, program management, and mission architecture. He now works with customers and programs to develop new solutions and mission architectures to support major areas within the Space Systems sector. This includes small satellites, radiofrequency payloads, electro-optical payloads, and end-to-end mission solutions.

"When I was at college I appreciated the collaboration and openness of the professors. As a student and research assistant, I had the chance to work hand in hand with the professors." Lynch said. "The college provided the engineering skills I needed to be successful but I also learned about social interaction, team collaboration and how to develop a work/life structure while I was there."

His advice? "Pick a 'mission' that you truly believe in, and give it all you have."

Cradle of Innovation

From nanoparticles all the way to outer space, engineering faculty are developing the materials and manufacturing of the future



TARIK DICKENS, CHAD ZENG AND RICHARD LIANG

The High Performance Materials Institute (HPMI) is a “village” that utilizes the talents of its multidisciplinary researchers to create and refine cutting-edge materials to revolutionize science and commerce. It’s also the main research center for the FAMU-FSU College of Engineering’s Department of Industrial and Manufacturing Engineering (IME).

Not just one of the foremost resources for the development of novel materials, HPMI also seeks to create and refine manufacturing techniques in order to produce them in a way that is cost-effective as well as reproducible in real-world situations.

As part of a Tier 1 research university, the FAMU-FSU Engineering faculty and scientists affiliated with HPMI work on a wide range of individual projects and have attracted millions in grant money as well as state-of-the-art lab equipment. But its leadership also prides itself on the interdisciplinary collaboration, industry involvement and student participation engendered within HPMI.

“The HPMI is known for our collaborative environment,” said Zhiyong (Richard) Liang, Ph.D., director of HPMI and a FAMU-FSU Engineering faculty member. “Each lead researcher has their independent area but there is a lot of interaction to try to collaborate in new ways. Also, we share all the equipment here, which makes for very effective research. And it’s good for students’ education. They can access all the equipment we have.”

The main research laboratory for several high-profile scientists, the HPMI is located in the Materials Research Building, a short walk from the college.

Liang’s research experience and expertise are in the areas of advanced composites, multifunctional nanomaterials and carbon nanotube materials. The

importance and uniqueness of his research has attracted significant research funding from government agencies and corporations and, as principal investigator or co-principal investigator, Liang has worked on more than 60 research grants and holds about 25 U.S. patents and pending applications.

Since size and shape of nanoparticles often determine their functionality in applications, an urgent need exists to design a “well controlled” nanoparticle production protocol that produces large quantities of nanoparticles of uniform sizes and shapes or at least a narrow distribution in both.

Chiwoo Park, associate professor

HPMI’s leadership also prides itself on the interdisciplinary collaboration, industry involvement and student participation engendered within the research center.

of industrial and manufacturing engineering at the HPMI, is funded by the Air Force Office of Scientific Research to investigate a better way to make consistent carbon nanotubes on a large scale. This research involves developing a dynamic, data-driven control method for controlling the size, shape and composition of a nanoparticle population during production. This research could save time and money in processing nanoparticles.

Liang currently directs the FSU component of a NASA STRI research project (see opposite page) to develop carbon nanotube-based structural materials to create next-generation space vehicles and potentially even space habitats.

Space might be the place for products and processes created via the research of Tarik Dickens,

Ph.D., whose area of expertise is additive manufacturing—commonly known as 3-D printing. His dexterous robotic printing agents provide an avenue for intelligent processing—and building—of new components.

“I’m also part of the NASA project,” Dickens said. “We’re trying to design next-generation materials that will take us to Mars. When we get to Mars—or even before we get there—we need to have habitats and working equipment. 3D printing will likely be part of that.”

Having a 3D printer available on the Red Planet would also be useful, he said, to create needed tools or materials, “since a run to Home

Depot for a missing wrench or part wouldn’t be in the cards.”

But the additive manufacturing technology has more down-to-earth commercial applications—custom-made footwear, for example.

Dickens also leads students in the interdisciplinary National Science Foundation Center of Research Excellence in Science and Technology (CREST) and the HBCU Research Infrastructure for Science and Engineering (RISE) program, developed to encourage minority and female undergraduate and graduate students to consider careers and advanced schooling in the STEM fields.

CREST-RISE supports the education of graduate students and sponsors a well-attended summer Research Experiences for Undergraduates program leveraging the resources of the HPMI.



HPMI plays major role in deep space exploration

The High-Performance Materials Institute (HPMI) and the FAMU-FSU College of Engineering joined a major multi-university project funded by NASA that will focus on developing technologies crucial to human exploration in deep space.

“We are really happy to participate in a project that supports NASA and its future work,” HPMI Director Richard Liang, Ph.D. said enthusiastically.

The work is part of NASA’s overall initiative to create the first-ever Space Technology Research Institutes (STRI), one devoted to biological engineering in space and the other on next-generational materials. Each institute will receive \$15 million over a five-year period to be distributed among the partner universities.

Liang, who is a professor at the college, will serve as principal investigator and deputy director/area leader for

the STRI. Six faculty from FAMU-FSU Engineering will participate in the project, led by Professor Gregory Odegard at Michigan Technological University.

The scientists specifically will work on developing carbon nanotube-based structural materials that could be used in next-generation space vehicles, power systems—and potentially even habitats.

HPMI is a multidisciplinary research institute at Florida State University largely staffed by faculty from the FAMU-FSU Engineering. Because of HPMI’s leadership, both FSU and FAMU will receive funding from the STRI, focusing on next-generation materials and manufacturing. The money will help fund multiple undergraduate and graduate students at the college and one postdoctoral researcher.



Important, said Liang, because most students don't know much about materials and manufacturing before they arrive.

"We try to provide many opportunities to the undergraduate students and let them get into the lab, hang out with professors and grad students and see different projects," he said. "We give them time to figure out what materials research is and to learn about manufacturing research ... This can attract them to engineering research as a career."

One of the greatest success stories is told by Changchun (Chad) Zeng, Ph.D., an associate professor and director of graduate studies for the IME department. When he came to the college in 2007, he was intrigued by a new type of foam first described by a physics professor in the 1980s.

But it would take until 2011 before Zeng got the grant funding from the Department of Veterans Affairs to research "auxetic" foam. The agency was searching for ways to provide better health care for veterans, especially those with prosthetic limbs. He proposed to create auxetic foam, which does not thin out when it is stretched but instead expands, enabling it to provide better protection and stabilization. The material could be

used to make prosthetics conform better to an individual's anatomy, which would in turn relieve pressure points and make them more comfortable.

Zeng and his team were able to create and patent the unique material and develop a process that would allow it to be produced commercially.

"Often, when knowledge comes out of the university, it's usually more like a concept," Zeng said. "It's a product that works, but it doesn't work every time. It may not be the most economically efficient way to make it. But this one, it works. It works every time. And the process is very, very efficient."

The auxetic foam was licensed to Auxadine, a Florida-based startup company, which manufactures the foam for commercial use and now sells a line of medical products including seat cushions, orthotic shoe insoles, wheelchair pads and other therapeutic products.

Other manufacturers are using the foam to create protective products for athletes. In fact, auxetic foam has come full circle back to its birthplace. Players for the Florida State University football team are wearing supportive braces made with the foam and Zeng was surprised to discover Jessie Warren, who led the Seminoles softball team

to a national championship win in 2018, was wearing an ankle brace lined with auxetic foam.

Zeng's work with auxetic foam is far from over. The foam is also being tested for use as the protective liner in football helmets to improve player safety, thanks to a grant received by the licensee Auxadyne from the National Football League. He also envisions helmets having foam coated with sensing nanomaterials such as carbon nanotubes which could immediately measure the force of an impact and where it occurs.

Zeng's team is also working on different types of auxetic foam, either harder or softer. Sturdier auxetic foam could be used for body armor. But what Zeng is excited about is the creation of a softer version that can be used as a "scaffold" to help turn stem cells into, for example, neuron cells, heart cells or brain cells.

This summer, Zeng was a collaborator with FAMU-FSU Engineering colleague Yan Li, Ph.D., a stem cell researcher, on a proposal that received a three-year, \$400,000 NSF grant to develop an auxetic foam that could be used in such tissue engineering.

"If it works as we think it will, it's going to open a floodgate," he predicted. "Basically, it gives



Blended TPU/PLA foams for longer stability

Researchers at the FAMU-FSU College of Engineering want to take memory foams to the next level with blended foams. This research may provide lighter foams with greater shape-changing capability and recovery force that could be useful in the aerospace and biomedical sectors.

“We are looking at the properties of blended foams because they offer more choice and more stability for use,” said Changchun Zeng, an associate professor at the FAMU-FSU College of Engineering. “The blends we work with can keep their shape for a significantly longer period of time and we can better control when the changes are triggered.”

These foams can have uses as actuators in many areas, meaning they are designed to absorb and disperse specific forces, depending on the application.

“Using the blends will offer us numerous options. When the material is triggered for shape change, it generates forces for actuation. Whether you want something harder for higher actuation force or if you want something softer for larger actuation displacement, the choices are endless,” Zeng said. “We also worked out a way for these foams to maintain their shape longer, giving us more control over the process.”

Preliminary research shows a blend of 80 percent TPU and 20 percent PLA enhanced foamability over a wide range of conditions and produced foams with various strengths and capabilities. Compared to the elastic TPU foams, the blend foam retained its shape 3.4 times longer. Preliminary results of this research are promising and researchers believe that understanding the shape fixation process from this research can advance the use of elastomeric foams in conventional as well as novel applications.



Personalized-manufacturing engineering research

Marquese Pollard and Arriana Nwodu, industrial engineering graduate students at the FAMU-FSU College of Engineering, collaborated with students from the University of Michigan (UM) to gain hands-on experience in manufacturing systems.

Hui Wang, Ph.D., a professor in industrial and manufacturing engineering, coordinated the collaboration.

The two graduate students worked with UM senior design teams to design and manufacture a personalized bicycle.

Pollard, a master's student, designed and modeled the handlebars and seat to his specifications and developed a 3D model prototype using additive manufacturing techniques.

Nwodu, another master's student, helped set up the personalization. Using input from an undergraduate senior design project, the UM team used analytics to optimize the manufacturing system design.

you a completely new way of manipulating cells to become certain type of tissue.”

The tissue created using stem cells and the foam scaffold could be used in medical research to treat cardiovascular conditions or Alzheimer's disease.

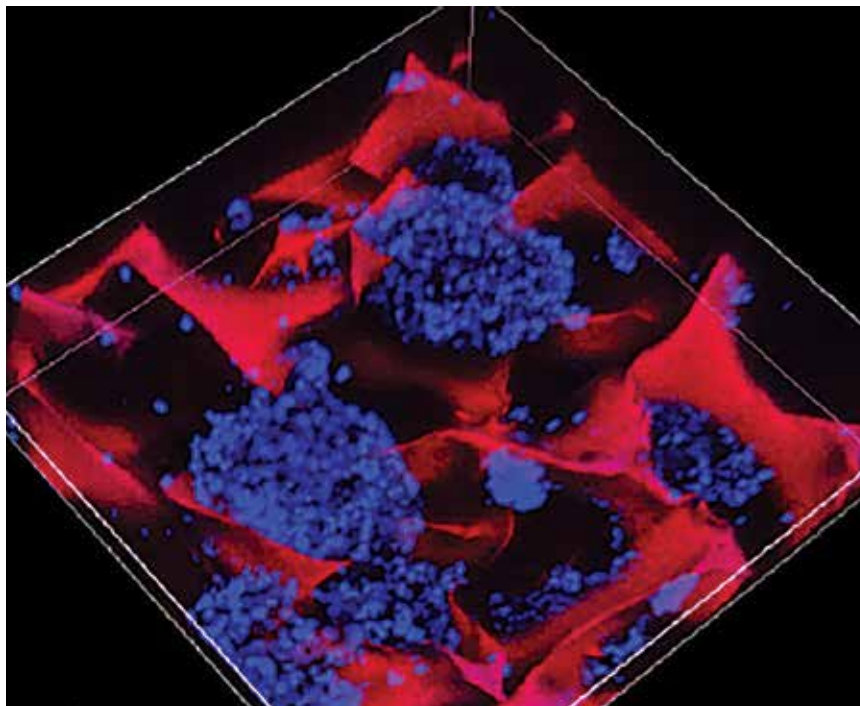
“It has potential,” Zeng said. “We are the only one that can generate this type of scaffold that will provide the ‘living environment’ and mechanical stimulus for these cells to grow.”

HPMI director Liang also emphasizes the value of institute's relationships with many governmental agencies and Fortune 500 companies such as NASA, Lockheed Martin, Intel, Boeing,

Dow Chemical and Northrop Grumman.

“Because we work side-by-side with industry and government research teams, we see the real-world problems,” he said. “We strive to improve their products, particularly for some critical materials they need. We support them with our analytical capability and expertise and, in turn, try to understand their manufacturing process.”

Liang points out another benefit of these relationships: “We also expose our students to industry collaboration. Students can talk with these industry people. It prepares them to go into the real world.”



YAN LI is collaborating with engineering colleague and materials research professor Chad Zeng on using auxetic foam (shown as red above) as a special stress-sensitive foam for the scaffolding on which neurologic and vascular stem cells (blue) can grow. The unique foam responds to biophysical stretching force in multiple dimensions by expanding instead of contracting, thus allowing these biophysical- and biochemical-sensitive stem cells to replicate and differentiate in a unique environment that better simulates human *in situ* growth.



Abiodun Oluwalowo

Graduate nanomaterials researcher

Industrial and manufacturing engineering Ph.D. candidate and High-Performance Materials Institute (HPMI) research assistant Abiodun Oluwalowo has racked up several accolades recently.

As lead author, his article “Electrical and thermal conductivity improvement of carbon nanotube and silver composites” was published in the May edition of the

highly cited journal *Carbon*. In the April edition, he was a contributing author for the article “Carbon nanotube/carbon composite fiber with improved strength and electrical conductivity via interface engineering,” in which another Ph.D. candidate from the same college department, Songlin Zhang, was lead author.

In March, he and graduate colleague Madhuparna Roy were among eight nationwide winners for the 2019 Society for the Advancement of Material and Process Engineering (SAMPE®) University Leadership Experience Award.

In April, Abiodun was awarded second prize at the FAMU 3-Minute Thesis and poster competition, presenting “Lightweight conductors using carbon nanotubes.”

In addition, Abiodun is a vital member of the HPMI team making up the NASA Space Technology Research Institute, which is conducting research to make materials lighter and stronger for deep space travel. In May, he traveled to the University of Utah in Salt Lake City, to update NASA officials on his work in the thermal characterization of materials being researched.



Danny Georgiadis, Ph.D.

Systems engineering faculty

Danny Georgiadis, Ph.D., professor in the Department of Industrial and Manufacturing (IME) at the FAMU-FSU College of Engineering was awarded Engineer of the Year in 2018 by the District of Columbia Council of Engineering and Architectural Societies (DCCEAS). Georgiadis was nominated by the American Society of Naval Engineers (ASNE).

Georgiadis joined IME in May 2018 to develop and lead the department’s graduate program in Systems Engineering. He is based at the Florida State University Panama City, Florida campus.

The award honors members of the engineering and architecture professions for outstanding accomplishments in the field of engineering, architecture and affiliated technologies. Georgiadis was presented the award at the DCCEAS Awards banquet held in Washington, D.C. in February 2019 as part of Engineers Week.



Jacquay Henderson Alumni Profile

Jacquay Henderson is a FAMU-FSU alumnus and founder and CEO of Square Peg Technologies, a Washington, D.C.-based company that utilizes data science and analytics to find strategies for optimizing the quality and performance of their clients.

Henderson and his company placed 17th in the 2019 *Seminole 100*, a list of the year’s fastest expanding U.S. businesses run by Florida State University alumni. This year, the *Washington Business Journal* listed Square Peg in their Best Places to Work list for small companies.

Henderson graduated FAMU-FSU Engineering via Florida State, with B.S. and M.S. degrees in industrial engineering in 2002 and 2004, respectively. Directly after graduation he worked on Deloitte Consulting’s workforce analytics team. In 2012, he became director of talent management at *IntegrateIT*.

(Photo L to R): Henderson with IME Chair Okenwa Okoli, Ph.D.

Cold + Turbulent

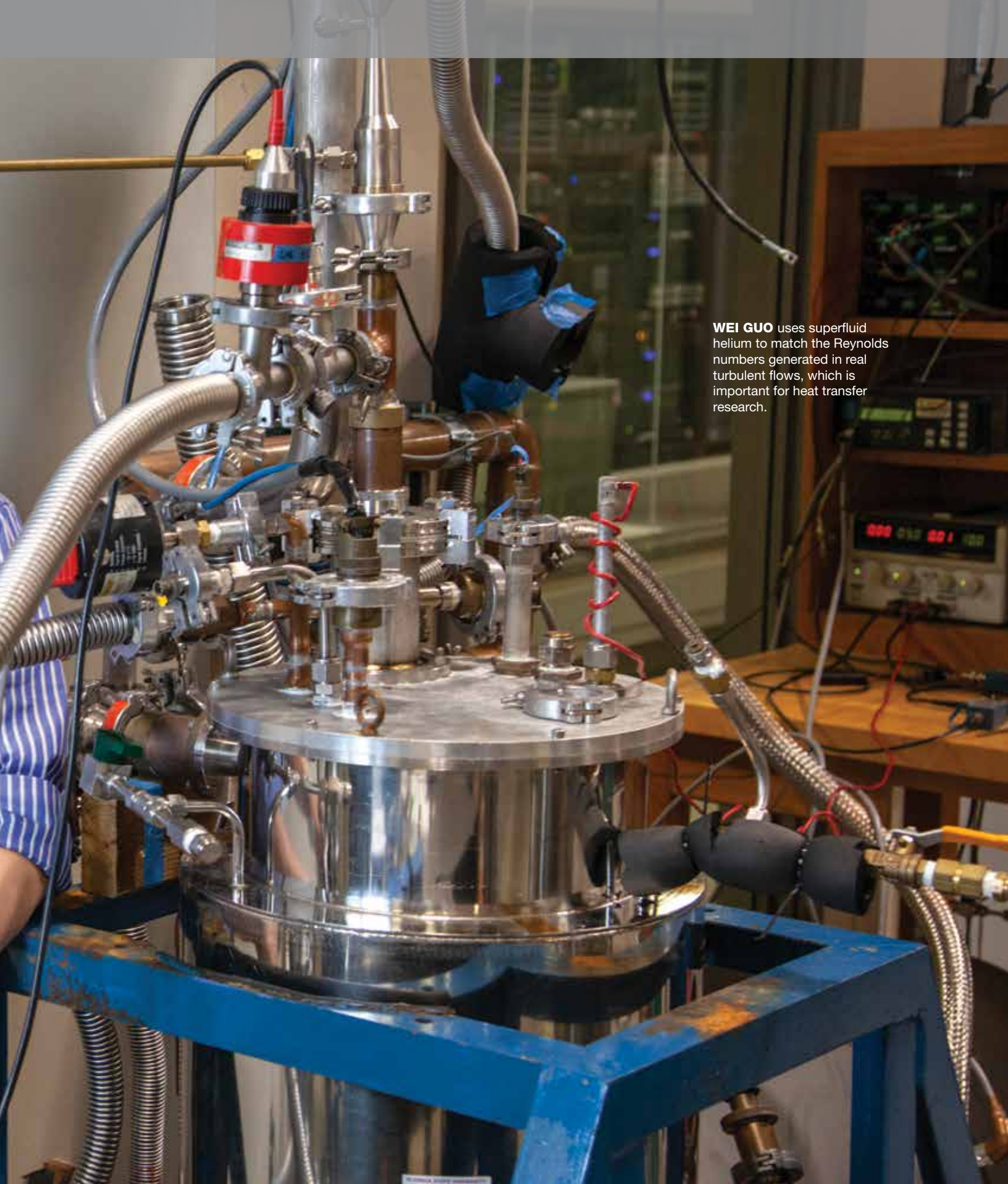
Understanding the usefulness of one of the world's weirdest fluids

After pioneering research into the properties of superfluid helium, known as He II, researchers at the FAMU-FSU College of Engineering cryogenics lab are now developing practical applications using what principal investigator Wei Guo, Ph.D. calls this “very bizarre” substance.

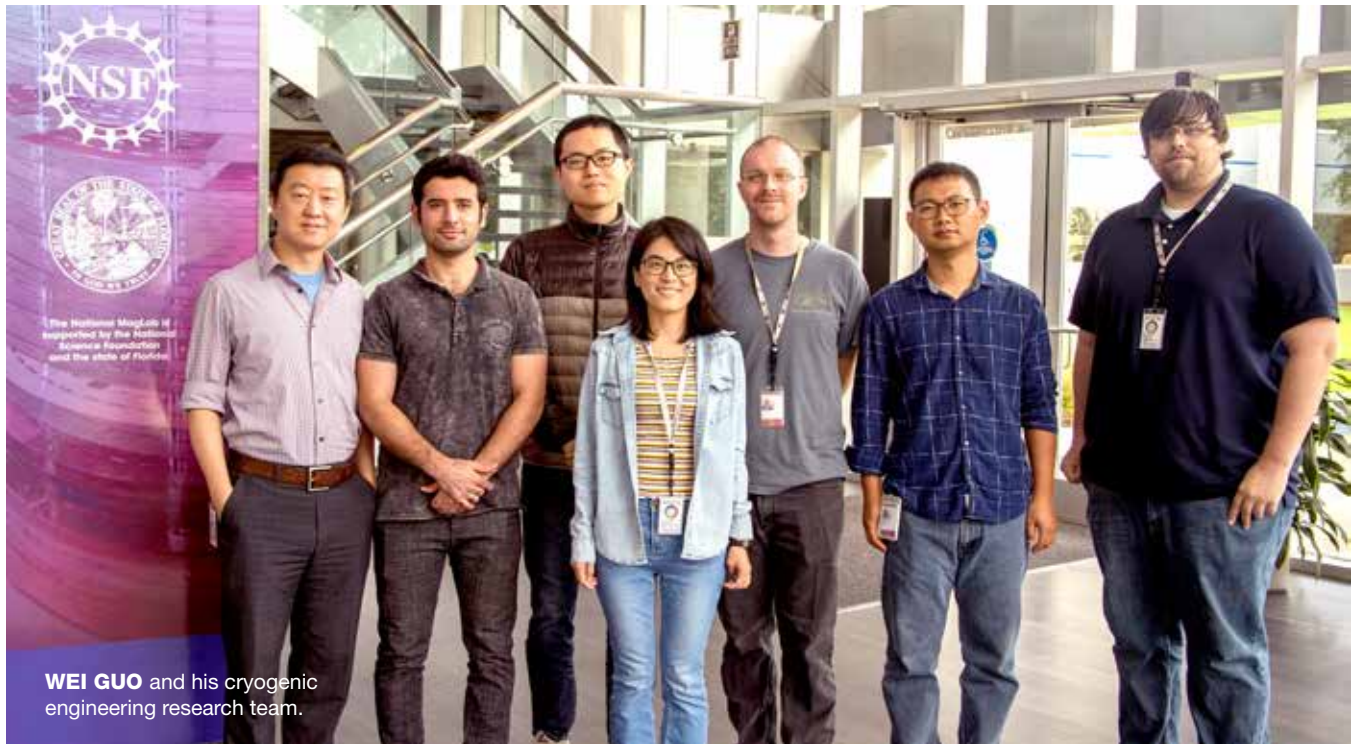
Some of us learned about the three standard heat transfer methods—conduction, convection and radiation—in physics class.

“But heat transfer in He II is via a completely different, extremely effective, heat transfer mode called thermal counterflow,” said Guo, an associate professor in mechanical engineering at the college. >>





WEI GUO uses superfluid helium to match the Reynolds numbers generated in real turbulent flows, which is important for heat transfer research.



WEI GUO and his cryogenic engineering research team.

“At low temperatures, it has heat transfer capability much, much higher than that of a pure metal like gold,” he explained. “For this reason, He II has been widely utilized as a coolant for superconducting magnets, satellites, medical instruments, and also large particle colliders and accelerators.”

To create He II, liquid helium must be cooled to just a few degrees below its boiling point of -269°C . He II effectively consists of two fluid components: a normal viscous fluid component and the superfluid component. The superfluid has no viscosity, which means if you put some superfluid helium in a circular channel and give it a push, it would literally flow forever.

The extremely effective heat transfer of He II can be affected by turbulence in this two-fluid system. The main focus of Guo’s cryogenics lab is to develop novel visualization tools “so we can study the flows in this bizarre fluid and understand the effect of turbulence,” Guo said.

One tool, called particle tracking

velocimetry, is based on the use of frozen particle tracers for velocity field measurement. For instance, by injecting hydrogen gas into cold liquid helium, the hydrogen will

“When we do our research we need cryogenic fluids like liquid nitrogen and liquid helium and other things. Those cryogens can be produced at the MagLab, a big advantage. Otherwise it’s very challenging to do this kind of very-low-temperature fluid research.”

condense and form micron-sized ice particles in the fluid. These ice particle tracers move with the viscous normal fluid in He II, but can also get trapped onto the vortices—little tornadoes—in the viscosity-less superfluid.

For flows in He II where the two fluids move in different directions, such as in thermal counterflow, the behavior of the micron-sized tracers can become difficult to interpret.

This led the lab to develop another technique, called molecular tagging velocimetry.

Seeking the smallest tracer possible, scientists looked to

molecules. By “exciting” a helium atom using strong yet extremely short femtosecond (i.e., 10^{-15}s) laser pulses, the team can create a line of metastable helium molecules in liquid helium and treat them as tracers.

“The cool thing is that those molecules are so small that they either move with the viscous normal fluid above 1°Kelvin or bind to and move with the vortices in the

superfluid below about 0.6°K. Their simple behavior allows us to make accurate flow field measurements,” he said.

A MagLab neighbor, the Florida Center for Advanced Aero-Propulsion (FCAAP) is interested in the possibilities of a “cryogenic wind tunnel” to be used in their research measuring turbulence. The motivation of such a tunnel is for model testing in turbulent flows with extremely high Reynolds numbers.

“Compared to conventional fluid materials such as water and air, cryogenic helium has much smaller kinematic viscosity,” Guo said. “You can produce turbulent flows using cryogenic helium in compact equipment with Reynolds numbers that match that in real turbulent flows, such as those generated by airplanes and submarines.”

One implementation is using superconducting magnets to levitate a model of a submarine or an airplane wing in the helium for non-invasive flow measurements.

Another application would be in particle accelerators. Many modern particle accelerators utilize superconducting cavities to accelerate charged particles. There is a strong demand to reach higher accelerating fields so that the particles can gain higher energies over shorter distances. The prospect of shorter accelerator beamlines is significant due to their high costs—on the order of 1 billion U.S. dollars per mile.

The maximum accelerating field is limited by “cavity quenching” caused by heating from tiny surface defects. By locating and subsequently removing those defects, the maximum acceleration can be significantly improved. There is a long-standing research effort



JONATHAN CLARK AND
GRAD STUDENT JASON BROWN

CLARK

Robots on the move

Jonathan Clark, Ph.D. likes cockroaches. Geckos too. At least, the way they can maneuver, their gait and their ability to move quickly over a variety of terrains. Clark, a professor of mechanical engineering at the FAMU-FSU College of Engineering, is director of the Center for Intelligent Systems Control and Robots (CISCOR). The robotics researcher works on replicating biologically inspired movement to advance robot design.

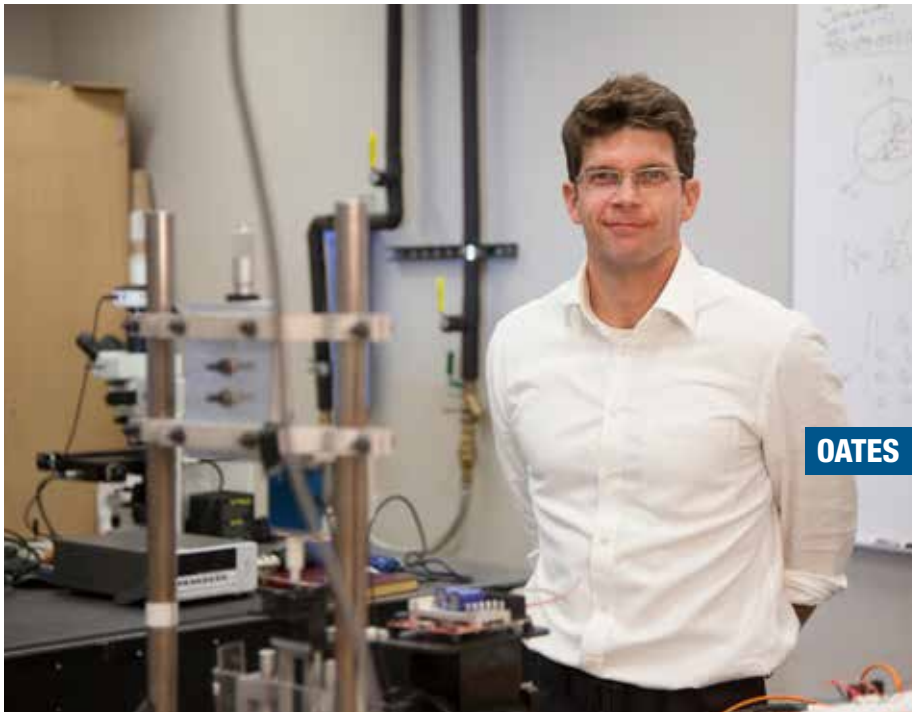
Clark deals with the world of small robots and has built some of the fastest and most efficient legged machines—including one that climbs fast enough to scale a 100-foot building in one minute. His current research aims to expand the versatility of these robots so that they can automatically adjust how they use their legs when they encounter different surfaces. Having robots that can use their legs to run, jump, climb walls, as well as swim, will allow them tremendous flexibility in moving through difficult, real-world environments. Clark has examined and identified three distinct gaits for motion and the differences between them, and hopes understanding these nuances will lead to better design.

Christian Hubicki, Ph.D. is another researcher at CISCOR, a robotics professor who works with a larger-scale robot, fondly known as “Tallahassee Cassie.” Standing 4½ feet tall, Tallahassee Cassie resembles a pair of mechanical ostrich legs. Agility is what sets this robot apart, but this potential for speed and maneuverability also makes stabilization a hard research problem. Hubicki’s research team is trying to implement stabilization algorithms that make the robot stable on rough terrain it can’t even see—what is known as self-stable locomotion.

Hubicki hopes the information learned will teach us how people walk, run and balance themselves. The ultimate goal of the research is to assist people who have lost these abilities by providing designs for exoskeletons and prosthetics.



HUBICKI



Using network science to better understand materials

Using network science—part of a larger mathematical field called graph theory—professor of mechanical engineering William Oates, former graduate student Peter Woerner, Ph.D. and associate professor Kunihiko “Sam” Taira mapped long-range atomic forces onto an incredibly complex graph to simulate macroscopic material behavior.

The group then developed and applied a method that greatly simplifies the graph so that other researchers could replicate the process with other materials. Oates said using graph theory allows researchers to better understand how the molecules that compose a material work on a macroscopic level.

“All atoms have electrons and nuclei with positive charges, they create forces between the ions,” Oates said. “Trying to describe that as a global structure is challenging. There are methods to model molecules, but the challenge is how to describe macroscopic behavior. Knowing how the molecules interact is only half of the problem. Network science provides a unique bridge that allows us to take molecule dynamics to the macroscopic world.”

Ultimately, researchers want to understand all the atomic interactions in a given material so that they can understand how and why materials behave in certain ways, Oates said. But when you keep track of all the atomic interactions in a material, it becomes a huge problem to solve on a computer.

For engineering purposes, it wasn’t necessary to keep track of all the forces between atoms. So, the group applied a method to figure out how the forces in the graph could be reconnected without creating errors.

Using that knowledge, their algorithm deleted certain atomic forces within the graph and rewired it so they kept important information while making it easier to compute macroscopic behavior.

in the accelerator field to develop reliable methods to detect those sub-millimeter defects.

Using molecular tagging velocimetry, Guo posited that a tracer line would deform wherever there might be a hot spot in He II.

“This idea indeed worked very nicely in our recent tests,” he said. “We could see deformation of the tracer line on top of a hot spot. Based on the analysis of this deformation, we can locate the hot spot with an accuracy far better than other existing methods.”

Guo took over the lab after the retirement of Emeritus Professor Steven Van Sciver, who created the facility and literally wrote the book on helium cryogenics.

The cryogenics lab is still sited in the MagLab building, located nearby in the same research park as the College of Engineering.

“Originally, the cryogenics lab conducted testing work and provided technical support for the design of the cooling systems for the superconducting magnets at the MagLab,” Guo said. “This lab gradually evolved into a more independent research site. We have secured sustained external funding support from federal funding agencies.”

“Because of FAMU-FSU Engineering’s unique location in Innovation Park, many valuable resources are available to us,” he said. “For instance, our research requires large amounts of cryogenic fluids like liquid nitrogen and liquid helium and other things. These cryogens can be easily procured from the MagLab. It would be challenging to conduct this kind of low-temperature fluid research elsewhere.”



A quest for high fields for superconductors

If you've ever had a magnetic resonance imaging scan (MRI), you have benefited from the research done at the Applied Superconductivity Center (ASC), which has been part of the National High Magnetic Field Laboratory (NHMFL) and the FAMU-FSU College of Engineering since 2006. In the 1980s, while at UW-Madison, David Larbalestier, an engineering professor, and Peter Lee, Ph.D., an ASC scientist, developed the technology industry still uses today to produce the Nb-Ti superconducting wire that creates the magnetic field in MRI systems. With this technology, powerful MRI studies opened a new world to medical practitioners with the ability to see internal abnormalities such as hairline fractures and tumors more clearly and less invasively.

Currently five FAMU-FSU College of Engineering Mechanical Engineering faculty members are researchers at the Applied Superconductivity Center (ASC). They are professors Larbalestier, Lance Cooley and Eric Hellstrom and associate professors Seungyong Hahn and Fumitake Kametani.

Recently, Hahn and Larbalestier led a team that set a new world-record magnetic field of 45.5 T (Teslas) at the NHMFL – roughly 70 times stronger than the strongest permanent magnets. The group used a small coil made from REBCO superconductor to set the record, which demonstrated high magnetic fields can be generated using superconductors. Greg Boebinger, director of NHMFL, said

these small, powerful magnets could be used in particle detectors, nuclear fusion reactors and diagnostic tools in medicine.

Larbalestier, Hellstrom and Kametani are working on Bi-2212, another superconducting material that can produce very high magnetic fields. Unlike REBCO—a flat tape—Bi-2212 is a round wire. This may seem insignificant, but round wire has many advantages over flat tapes when winding a coil. An interesting project going on at ASC is a collaboration with a private company involving production of Bi-2212 coils. The researchers hope to be able to insert the coils in existing superconducting laboratory magnets to upgrade their performance from 18 T to about 25 T.

Larbalestier and Cooley are studying Nb_3Sn , a superconductor being used to upgrade the CERN accelerator. Cooley also is investigating the superconductor Nb for use in SRF (superconducting radio frequency) cavities. The goal is to accelerate particles to faster speeds over the same distance, resulting in higher beam energies in accelerators. ASC also measures mechanical and electromagnetic properties of superconductors, and designs and tests prototype coils.

Major ASC funding comes from the Department of Energy's Office of High Energy Physics and from the National Science Foundation's Division of Materials Research.

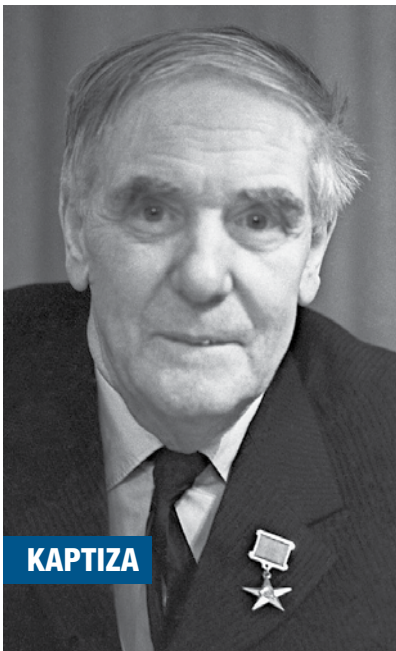
From concept to Psyche

For their capstone project, a FAMU-FSU College of Engineering Senior Design Team traveled to Huntsville, Alabama in April 2019 to test their project. The group collaborated on a project for NASA's Psyche space exploration mission led by Arizona State University.

The six-member team validated their prototype design at NASA's Marshall Space Flight Center, which supports the 2022 Psyche Mission—a quest to send a spacecraft to the eponymous asteroid to collect data. The team created a prototype of the Xenon Flow Controller, designed to provide efficient flow rates of xenon gas to the Hall-effect thruster, an ion thruster that will propel the spacecraft.

"So impressed with our NASA Psyche capstone students at the FAMU-FSU College of Engineering," the agency said via social media. "These college seniors were at Marshall's Propulsion Research and Development Lab earlier this month to test a prototype xenon flow controller that could help power Psyche's cruise through deep space."

Shayne McConomy, Ph.D., teaching professor in mechanical engineering, said the design project provided invaluable experience to the students as they interacted professionally outside the university and represented the college in a positive light. Their work has led to sponsorships from other organizations.



KAPTIZA

Researcher receives prestigious Peter Kapitza Award

In May 2019, Shiran Bao, Ph.D., a postdoctoral researcher at the cryogenics lab at the National High Magnetic Field Laboratory, was selected as the winner of the prestigious Peter Kapitza Award from the International Institute of Refrigeration (IIR).

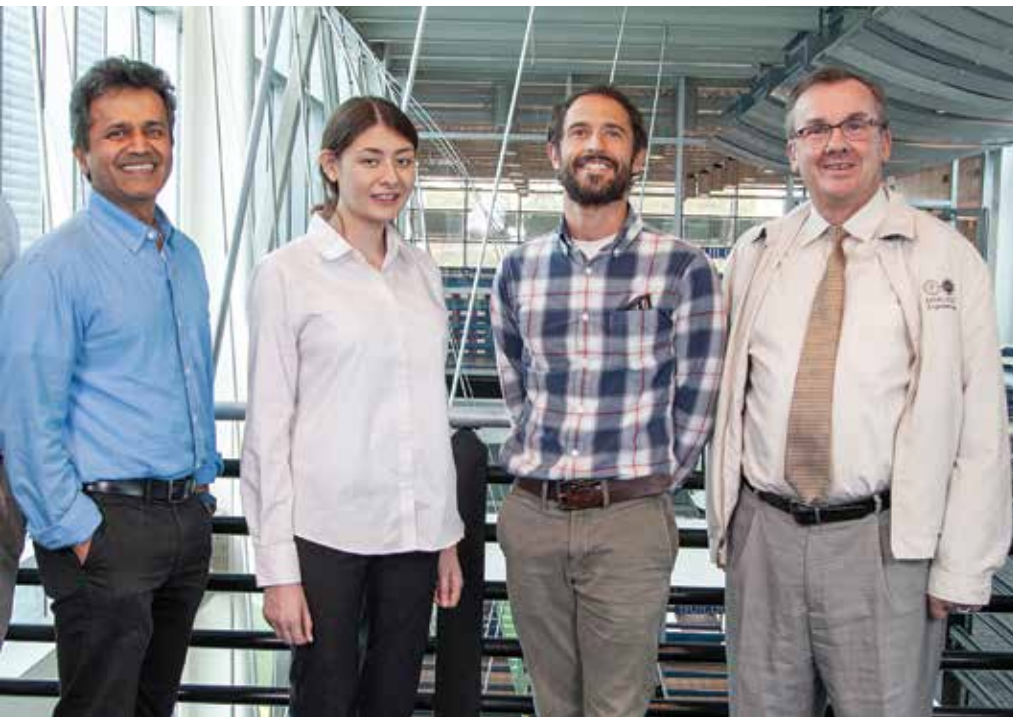
Bao is part of associate professor Wei Guo's cryogenics group. His research at the cryogenics lab focuses on developing molecular tagging-based flow visualization techniques in cryogenic helium and the relevant applications to various practical engineering problems. One aspect of Bao's recent work is the development of a novel flow visualization-based quench-spot detection method for superconducting radio frequency (SRF) cavities.

By analyzing the tracer-line deformation, Bao showed that the heater location can be reproduced within a few hundred microns, which significantly advances the state-of-the-art of cavity diagnostics.

His analysis also uncovered important physics for solving the decades-long puzzle underlying the operation of second-sound triangulation cavity diagnosis. He found

that the heat transported in He II is only a small fraction of the total input heat. The remaining heat energy is consumed in the formation of a cavitation zone near the heater. By analyzing the size of this cavitation zone, Bao and Guo proposed a model that can quantitatively explain the fast second sound evidenced in those triangulation experiments.

Kapitza was a leading Soviet physicist and Nobel Laureate.



(L to R): Associate Dean Farrukh Alvi, Jackie Jermyn, Brian Van Stratum and engineering Dean J. Murray Gibson.

2019 Dean's Doctoral Fellows

Two new FAMU-FSU engineering students selected for Dean's Engineering Fellows Program

In 2018, engineering dean J. Murray Gibson initiated the Dean's Engineering Fellows Program, a new graduate funding area facilitated through the Associate Dean of Research and Graduate Studies. The initiative aims to enhance the quality and number of engineering Ph.D. students at the college.

In 2018, Eugenia Stanisauskis, David Perez and Shannon Helsper were the first recipients of the fellowships. Two new doctoral fellows, Brian Van Stratum and Jackie Jermyn received fellowships in the fall of 2019. Van Stratum is pursuing a doctoral degree in mechanical engineering and Jermyn is pursuing a Ph.D. in electrical engineering.

Jermyn has her sights set on becoming a U.S. Navy researcher. She is working on mobile robot navigation, specifically with simultaneous localization and mapping that allows robots to map and determine their position within their environments.

"This fellowship has really been helpful to me," Jermyn says. "I appreciate it and want to thank the college for all the support I've received while earning my B.S, M.S. and now my Ph.D."

Van Stratum would ultimately like to work in research and development at a university, government laboratory or with private industry. His research area of interest is "soft" robotics. These robots have thousands of points where they can bend and mimic creatures like an octopus or eel. Such "squishy" robots interact with their environment in a fundamentally different way than traditional robots with rigid structures.

"Personally, it's really exciting to use robots to do something that a human just can't do or currently can't be done," Van Stratum said. "I am so thankful to be a recipient of the fellowship, without this help I may not have been able to pursue my dream to be involved in the robotics field."

Farrukh Alvi is Associate Dean for Research and Graduate Studies and is the administrator for the program. The Dean's Engineering Fellows Program provides a four-year fellowship, including assistantships, with a minimum of \$34,000 per year plus tuition waivers.

"We are delighted to award the 2019 Dean's Fellows," Alvi says. "This program is a recognition of these students' commitment to graduate studies and we look forward to attracting more highly motivated graduate students to engineering."

To date, five students have been awarded this fellowship. In the future, the college hopes to provide funding for many more outstanding students as Dean's Doctoral Fellows.

New Fellows began their Ph.D. at the FAMU-FSU College of Engineering in fall 2019.

DEPARTMENT OF Chemical & Biomedical Engineering

Degree Programs

Chemical Engineering	BS	MS	MS non-thesis	PhD
Biomedical Engineering	BS	MS	MS non-thesis	PhD

DEGREE ENROLLMENT	BS	MS	PhD
Biomedical Engineering	196	4	8
Chemical Engineering	315	8	22

DEGREES AWARDED	BS	MS	PhD
Biomedical Engineering	-	1	2
Chemical Engineering	87	13	7

NEW FACULTY



Natalie Arnett, Ph.D.
Associate Professor
Research focused on developing polymers for membrane applications and tissue engineering.



Steven Arce, Ph.D.
Teaching Faculty II
Focused on helping build out the new Biomedical Engineering degree program.

DEPARTMENT OF Civil & Environmental Engineering

Degree Programs

Civil Engineering	BS	MS	MEng	PhD
Environmental Engineering	BS Civil/Enviro			

DEGREE ENROLLMENT	BS	MS	PhD
Civil Engineering	443	18	48

DEGREES AWARDED	BS	MS	PhD
Civil Engineering	106	24	8

NEW FACULTY



Quian Zhang, Ph.D.
Assistant Professor
Research focused on high-performance and multi-functional cementitious materials and innovative application of advanced materials in structures and infrastructure.



DEPARTMENT OF Electrical & Computer Engineering

Degree Programs

Electrical Engineering	BS	MS	MS non-thesis	PhD
Computer Engineering	BS			

DEGREE ENROLLMENT	BS	MS	PhD
Electrical Engineering	251	17	59
Computer Engineering	256		

DEGREES AWARDED	BS	MS	PhD
Electrical Engineering	48	34	10
Computer Engineering	17		

NEW FACULTY



Rebekah Sweat, Ph.D.

Assistant Professor

Research focused on micromechanics, nanomaterials, composites, digital twin technology, predictive simulations and multifunctional materials.

DEPARTMENT OF Industrial & Manufacturing Engineering

Degree Programs

Industrial Engineering	BS	MS		PhD
Engineering Management			MS non-thesis	
Systems Engineering			MS non-thesis	

DEGREE ENROLLMENT	BS	MS	PhD
Industrial Engineering	165	36	29

DEGREES AWARDED	BS	MS	PhD
Industrial Engineering	40	11	10

DEPARTMENT OF Mechanical Engineering

Degree Programs

Mechanical Engineering	BS	MS	MS non-thesis	PhD
Sustainable Energy		MS		

DEGREE ENROLLMENT	BS	MS	PhD
Mechanical Engineering	600	28	49

DEGREES AWARDED	BS	MS	PhD
Mechanical Engineering	125	28	11

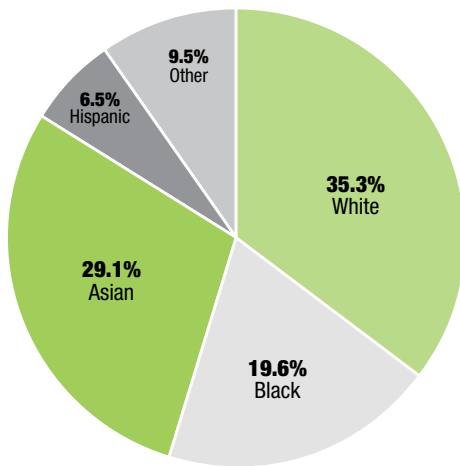


Graduate student overview

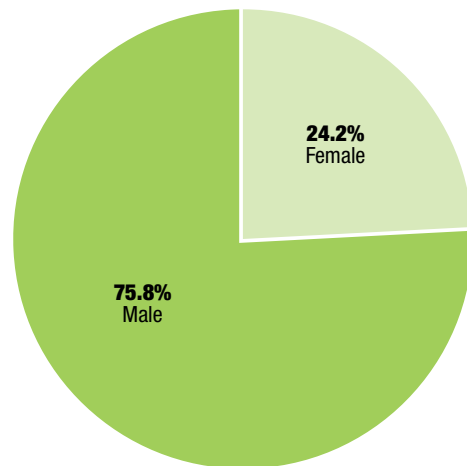


Countries of origin
for FAMU-FSU Engineering
graduate students

GRADUATE STUDENT
Population by Ethnicity
Fall 2019



GRADUATE STUDENT
Population by Gender
Fall 2019



University Leadership

Larry Robinson, Ph.D.
President, Florida A&M University

John Thrasher
President, Florida State University

Maurice Edington, Ph.D.
Provost and Vice President for Academic Affairs, Florida A&M University

Sally McRorie, Ph.D.
Provost and Executive Vice President for Academic Affairs, Florida State University

College Leadership

J. Murray Gibson, Ph.D.
Dean, FAMU-FSU College of Engineering

Farrukh Alvi, Ph.D.
Associate Dean for Research & Graduate Studies

Michelle Rambo-Roddenberry, Ph.D., P.E.
Associate Dean for Student Services and Undergraduate Affairs

Mark H. Weatherspoon, Ph.D.
Associate Dean for Faculty Affairs

Janine Welch
Assistant Dean, Finance & Administration

Eric Hellstrom, Ph.D.
Interim Chair, Professor & FSU Materials Science Program Director

Bruce Locke, Ph.D.
Chair & Professor, Department of Chemical & Biomedical Engineering

Okenwa Okoli, Ph.D., CEng, CSci
Chair & Professor, Department of Industrial & Manufacturing Engineering, Associate Director of HPMI

Sastry Pamidi, Ph.D., MBA
Chair & Professor, Department of Electrical & Computer Engineering

Lisa Spainhour, Ph.D., P.E.
Interim Chair & Professor, Department of Civil & Environmental Engineering

Engineering Centers Leadership

Louis Cattafesta, Ph.D.
University Eminent Scholar and Professor, Mechanical Engineering, Aero-Propulsion, Mechatronics & Energy Building (AME) Director

Jonathan Clark, Ph.D.
Professor of Mechanical Engineering, Director of Center for Intelligent Systems, Control, and Robotics (CISCOR)

Lance Cooley, Ph.D.
Professor of Mechanical Engineering, Director of Applied Superconductivity Center (ASC)

Sungmoon Jung, Ph.D.
Professor of Civil Engineering, & Director of Crashworthiness and Impact Analysis Laboratory (CIAL)

Zhiyong (Richard) Liang, Ph.D.
Professor of Industrial & Manufacturing Engineering, Director of HPMI

Roger D. McGinnis Sr., Ph.D.
Director of Center for Advanced Power Systems (CAPS)

Eren Ozguven, Ph.D.
Director, Center for Resilient Infrastructure and Disaster Response (RIDER)

John Sobanjo, Ph.D.
Professor of Civil Engineering & Director, Center for Accessibility and Safety for an Aging Population (ASAP Center)

Distinguished Faculty

Farrukh Alvi, Ph.D.
Don Fuqua Eminent Scholar Professor & Professor of Mechanical Engineering

Rufina Alamo, Ph.D.
Simon Ostrach Professor of Engineering & Distinguished Research Professor of Chemical & Biomedical Engineering

Louis Cattafesta, Ph.D.
University Eminent Scholar & Professor of Mechanical Engineering

Peter Kalu, Ph.D.
3M Distinguished Research Professor & Professor of Mechanical Engineering

David Larbalestier, Ph.D.
Krafft Professor & Professor of Mechanical Engineering

Bruce Locke, Ph.D.
Distinguished Research Professor & Professor of Chemical & Biomedical Engineering

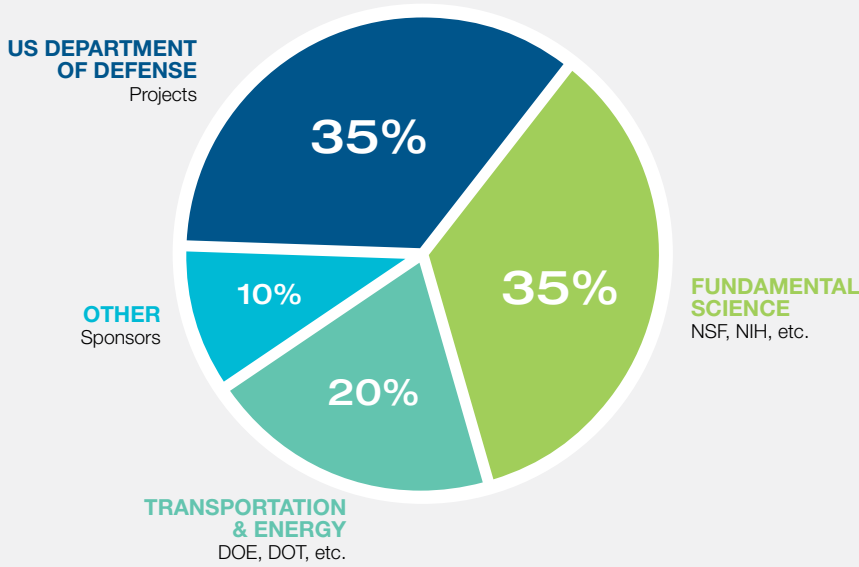
William Oates, Ph.D., P.E.
Cummins, Inc. Professor in Engineering & Professor of Mechanical Engineering

Jim Zheng, Ph.D.
Sprint Eminent Scholar Chair & Professor of Electrical & Computer Engineering

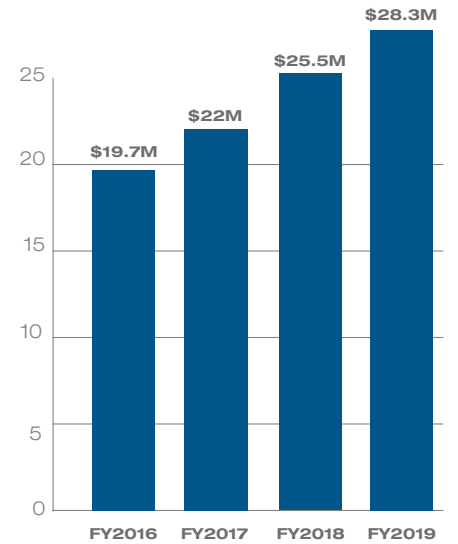
Engineering research by the numbers

FY 2019 Sponsored Research Expenditures

\$28.3M**

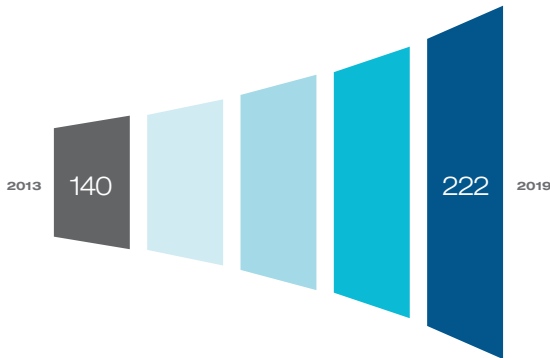


Sponsored Research Expenditures



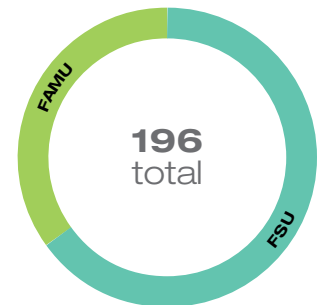
Proposal Submissions

Over past 6 years



#3
in number of African-American engineering faculty nationwide

FY 2019 Awards by university

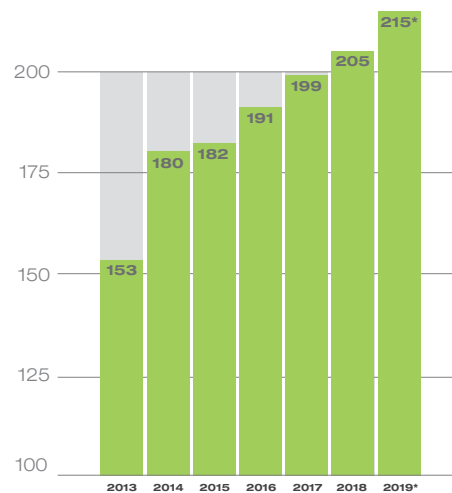


Junior faculty awards

- 6 NSF CAREER
- 1 AFOSR YIP*, 1 ONR YIP*
- 3 DARPA YIP*
- 1 AFRL YIP*

*Young Investigator Program

PhD Enrollment



**Numbers are approximate as of July 31, 2019;
FY 2019: July 1, 2018 – June 30, 2019



FAMU-FSU Engineering

2525 Pottsdamer Street
Tallahassee FL 32310
www.eng.famu.fsu.edu

One **college**,
two **universities**,
unlimited **opportunity**.

The FAMU-FSU College of Engineering is the joint engineering institution for Florida A&M and Florida State universities, the only such shared college in the nation. We are located less than three miles from each campus. After satisfying prerequisites at their home university, students learn together at the central engineering campus with its eight adjacent, associated research centers and a national laboratory.