ENGINUITY
THE MAGAZINE OF THE COLLEGE OF ENGINEERING AT LAMAR UNIVERSITY
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It is an exciting time to be part of Lamar University. I finished two years as Dean of Engineering in July and I am pleased to see significant positive changes in the college. The College of Engineering is dedicated to empowering students and faculty to tackle the world’s most pressing challenges. We are achieving this by combining our traditional strength in excellent teaching with innovative research at the bachelors, masters and doctoral levels. At the bachelors level, we are utilizing modern teaching methods in the classroom to combine traditional lectures with simulation, animation and experimental techniques to prepare students for industries of the 21st century. At the masters level, each department is offering specializations, such as Computer Engineering, Process Systems Engineering, Materials Engineering, Supply Chain Management, Data Mining, Environmental Engineering, Advanced Machine Design, and Power Systems, which are in line with current needs of the industry. At the doctoral level, the college faculty members are pursuing interdisciplinary research in five thrust areas: (1) Materials Engineering & Manufacturing, (2) Process Engineering, Optimization & Robotics, (3) Cybersecurity, Logistics & Risk Assessment, (4) Energy, Sustainability & Environmental Engineering, and (5) Bioengineering & Human Factors. Funded research continues to increase as we develop a significant strength in applied research that benefits the industries of Southeastern Texas and beyond.

If you stop by the Cherry engineering building, you will immediately notice changes that are designed to provide a very inviting atmosphere for students. The classrooms as well as student study areas are being renovated – refreshed, refurbished and rewired to promote learning in the digital era. The research laboratories are humming with new equipment and students, both at the undergraduate as well as the graduate level, have opportunities to be involved in cutting-edge research.

With Cardinal Pride, Srinivas Palanki, Ph.D.
Dean, College of Engineering
Charles and Eleanor Garrett Chair
**HIGHLIGHTS of the YEAR**

**LU engineering, sciences receives National Science Foundation grant**

The National Science Foundation has awarded Lamar University a $395,805 grant under the provisions of its Major Research Instrumentation Program for the acquisition of a nanoindentor, a high-tech instrument not currently available in the region.

“A nanoindentor is a versatile tool that helps researchers characterize different materials at the nanometer scale,” said Paul Bernazzani, interim associate dean of LU’s College of Arts and Sciences and professor in the Department of Chemistry and Biochemistry. It uses an extremely hard tip to probe the surface of a sample by creating precise indentations to measure surface mechanical properties.

The one-year award, “MRI: Acquisition of a Nanoindentor for Advanced Materials Research and Education at Lamar University,” resulted from a collaboration of faculty in the College of Engineering and the College of Arts and Sciences that included the following faculty: Bernazzani; Ali Rehebati, assistant professor of mechanical engineering; Xuejun Fan, professor of mechanical engineering; Ketom Ducom, assistant professor of mechanical engineering; and Rafael Tadmor, professor of chemical engineering and Simmons Distinguished Faculty Fellow.

“This grant supports the purchase of a state-of-the-art nanoindentor to build interdisciplinary collaborations and expand fundamental research activities in the areas of nanomaterials, smart materials, microelectronics, high temperature coatings, antifouling surfaces, polymers, and thin film coatings,” Bernazzani said.

“The instrument will cement collaborations between faculty in biology, chemistry and biochemistry, chemical engineering, civil engineering, industrial engineering and mechanical engineering,” Bernazzani said.

The instrument will enhance the university’s capability to perform fundamental research and will enable faculty and students to collaborate on the development of emerging technology with the assistance of LU’s Center for Innovation, Commercialization and Entrepreneurship (CICE).

“The addition of this instrument to the suite of microscopy instruments purchased recently for port management and other applications us very well to offer high quality research services to industries in the Southeastern United States,” said Srinivas Palanki, dean of the College of Engineering.

“With the instrument, undergraduate and graduate students will participate in research and gain an understanding of small-scale characterization of advanced materials,” Bernazzani said. “The nanoindentor will be made available to the research community and information on the instrumentation will be shared. We expect that this will not only impact research at Lamar, but it will also enhance lectures and teaching laboratories.”

**LU engineering, sciences receives National Science Foundation grant**

**Mechanical engineers compete at Google Garage**

Four senior mechanical engineering students were selected to participate in the Hack-a-Truck competition in Mountain View, California at the Google Garage sponsored by Shell.

Over a three-day weekend, the team of mechanical engineers paired with Cofaerville University students to innovate the two areas of the food truck experience, focusing on the inside and outside of the truck. Teams were tasked with incorporating bright energy solutions to redesign the experience in aspects involving lighting, heating, waste production and handling, but most importantly, to make it fun, making the food truck experience as innovative and energy-efficient as possible.

“This was a rare treat for our students,” said Dr. Ken Aung, senior advisor of the students in their senior capstone course. Lamar University was one of only eight universities selected to compete. “Our students were able to face real-world issues under time constraints with limited resources,” says Aung. “This is exactly what it is like to be an engineer.” Students could not receive help from their advisors during the competition, but were mentored by Cameron Davies, owner and president of Cruising Kitchens, celebrity chef Lando LeBefo, Jaimie Memon and Jose Luis Martin-Oso of Mornort, a firm that excels in areas of servier and digital design.

Lamar’s team consisted of Justin Aamer, Kadosh Weaver, Steven Do, and Andres Toors and was tasked with designing the inside of the food truck. “Going into the competition we were very excited but also very nervous,” says Aamer. “We weren’t sure how we would measure up to the other schools we would be competing against, but once we were settled in and started working, we realized that we were all in the same boat.”

“We initially wanted to create a potato-themed food truck but ran into obstacles with the cook time. Thanks to a suggestion from LeBefo, we changed course to postpone, a traditional Canadian dish using french fries and cheese curds. We created a menu containing traditional (cheese cubs and goury), cheeseburger, chicken and french fries and steak and egg as well as a dessert option and named our truck “Routine Positive,” says Aamer.

The team had most of Saturday to plan, design, and print a 3D model to prepare for judges on Sunday. Projects were judged on integration, innovation, creativity, and usability. “It was an amazing experience and a breath of fresh air being able to get out of the classroom and actually contribute to something that really matters,” says Aamer. The Lamar University and Cedarville University team did not walk away empty-handed. The team was awarded “Best Engineering Design” and “Best Energy Calculation” for their calculations and innovative approach when creating their food truck.
A film crew from Discovery Channel Canada visited the LU campus to capture the progress made by researchers in the Phillip M. Drayer Department of Electrical Engineering on an innovative lionfish-hunting robot.

“Lamar’s team is working on this lionfish project—it’s purpose being a means of identifying lionfish in the wild so that divers can go down and capture them or do whatever they need to do,” Discovery Channel project director Christine Mayall said. “It’s really interesting because on one hand you have the robotics, but you also have the computer science aspect to it—how they’ve been able to have this robot identify the lionfish, something that seems very complicated because of its intricate patterns.”

Native to the Pacific, the lionfish grew from an unintentional or inadvertent release of a few as eight females off the Florida coast in the 1980s to a scourge along the eastern seaboard of the U.S., throughout the Caribbean and the Gulf of Mexico. Today, they threaten to collapse entire reef ecosystems and cause incalculable losses for sport and commercial fisheries. Vicious, voracious, and seemingly unstoppable, the lionfish can be called the perfect storm among invasive species.

“This fish will eat practically whatever it can fit in its mouth and lacks natural enemies,” Dr. Zargarzadeh said. “It has blown up into an incredible problem, certainly in the Gulf of Mexico, but also on the seaboard of the U.S., throughout the Caribbean and the Gulf of Mexico. Today, they threaten entire reef ecosystems and cause incalculable losses for sport and commercial fisheries. This is a voracious fish, and it is a voracious invader.”

“Ultimately, it’s about using science and technology for good in the world—for bigger get people to recognize the problem posed by lionfish,” said Zargarzadeh.

“Of course, our vision is to see lionfish eradicated from the Gulf and Caribbean, but realistically, we’re talking about lionfish management,” Dr. Xiang said. “Our focus right now is understanding how lionfish can be controlled and managed in the Gulf and Caribbean, and the southwest U.S. is an emerging management zone.”

Dr. Xiang and her colleagues are at the forefront of this research as demonstrated by their most recent NSF award to study the reliability and maintenance of such systems.

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“I am confident that reaching a large audience will benefit our project and our department by gaining good publicity, but more importantly, I hope it will get people to recognize the problem posed by lionfish.”

- Trident Harris
  Electrical Engineering Major

For senior engineering students, the Senior Design Symposium (SDS) is the culmination of an entire year of planning, designing and putting together ideas to build their final project before graduating. SDS also acts as a link to the public to promote interest in STEM and for the awareness of the successes of the College of Engineering and its students.

In its second year, SDS became more than a showcase for student projects. This year 44 groups competed for individual department awards with the hope to become crowned Grand Champion of the event. With a wide array of projects ranging from concepts for crude oil expansions for local refineries in chemical engineering to a washing machine built for space in mechanical engineering, there was no shortage of interesting projects on display.

Individual department winners came from faculty judges from each department, they were: Ethanol Fermentation, Distillation and Recovery, Chemical Engineering; Erosion Mitigation at FM 787 and the Trinity River, Civil and Environmental Engineering; Spherical Robot, Electrical Engineering; Routing Optimization for FedEx, Industrial Engineering; and TSGC-11 Alternative Sanitation Methods for Long Duration Space Missions, Mechanical Engineering.

In addition to departmental winners, each selected honorable mention projects that stood out, including: BMS-CJS Expansion Team, Chemical; Touch Screen for Ophelia, Electrical; Electronic Tray with Communications, Electrical; MATE ROV Underwater Robotics, Mechanical; Theo Jansen Walking Machine, Mechanical; and SAE Mini Baja, Mechanical.

Five judges, representing each department from various industries, spent time circling each project to determine which would be named Grand Champion. After much debate, the group chose Ethanol Fermentation, Distillation and Recovery from Chemical Engineering as the winning team. Team members include: Team Leader Aaron Gauthier, Micah Murdock, Chad Miller, Chris Cherek, and Chase Pinder. This is the first SDS win for the Dan F. Smith Department of Chemical Engineering. Previous winners include the SAE Mini Baja Car team in 2015, which created a drone buggy to compete in the German, California against over 100 universities from North America.

Lamar University College of Engineering

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New certificate programs in electrical engineering

The Philip M. Dorrery Department of Electrical Engineering continues to innovate its curriculum with the addition of two new professional certificate programs aimed to increase enrollment and help practicing engineers build upon their skill sets. The new certificates can be earned in Instrumentation and Control as well as Power and Energy. Certification in Instrumentation and Control is aimed at engineers who are responsible for research, design, development and control of devices or systems that are found in manufacturing facilities and plants as well as in high-technology industries such as aerospace and automobile. These engineers are typically involved in not only with the manufacturing of aircrafts and spacecrafts, but in design of complex life support systems. In the automotive industry, I&C engineers are involved in the design of complex sensor and control systems. The certificate program can be completed at the undergraduate level and requires 9 credit hours to complete.

The Power and Energy certification focuses on industrial complexes and large commercial and public buildings with large support system utilities and training to operate and maintain the special equipment within. This equipment can range from a single electrical motor or transformer to a complex system of generation, transmission and distribution including turbines, energy automation systems and smart grid technologies. P&E engineers research and implement ways to integrate renewable power technology and are often involved in public works projects and employed on federal projects involving the integration of large power grids. The program can be completed at the master’s level and requires only 18 credit hours.

Hamidi awarded

Dr. Maryam Hamidi, assistant professor of Industrial Engineering Professor and member of the Center for Advances in Port Management, was awarded phase 2 of a contract with the Houston Ship Channel (HSC). Given that the HSC is one of the US busiest waterways, this grant mitigates the consequences of HSC closures required for the Belco II Bridge replacement. This congestion avoidance study allows the waterway to operate with the shortest vessel waiting time and highest throughput.

Port Management hosts Panama Canal CEO

The Center for Advances in Port Management hosted Jose Quijano on campus this past spring. Quijano presented “Development and Operation of the Newly Expanded Panama Canal and Vision for Its Future.”

Quijano is a graduate of Lamar University, obtaining his undergraduate degree in Industrial Engineering in 1973, followed by his Master of Engineering degree in 1974. He moved back to Panama shortly after he began his career working for Panama’s Texas-Oil Refinery before joining the Panama Canal Authority in 1973. For 41 years, he worked for the proclaimed Eighth Wonder of the World until 2012 when he was promoted to CEO where he brought the expansion of the canal to completion in 2016. In his presentation, Quijano spoke of his experience as the $5.5 billion project came to a close in mid-2016. “More than 100 years ago the Panama Canal connected two oceans. Today, we connect the present with the future,” he said. Quijano’s success lies in the importance to drive diversification while promoting the development of local logistics activities to reap the most benefit from Panama’s geographical position to further evolve as the “Hub of the Americas.”

The completion brought faster transit times and lower costs and provide tremendous benefits in moving cargo between Texas ports and Asia as well as the west coast of South America. In addition to his work at the Panama Canal Authority, Quijano serves as a member of the Lamar University Civil Engineering Advisory Council. In 2015, he received the Lamar University Industrial Engineering Lifetime Achievement Award and was named a Distinguished Alumni in January 2017.

SWE success

Proga Chirontoni, a Chemical Engineering junior won the 3rd Place Award on the Undergraduate Poster Competition at the 2017 Society of Women Engineers Regional Conference held at Texas A&M University on February 17-18, 2017. Her winning poster entitled: “Acoustical Measurement of Toxic Metal Contaminants in Waters of Golden Triangle Area.” Proga currently serves as the President of the Lamar chapter of Society of Women Engineers (SWE).

Wu Honored

Dr. Xing Wu, Assistant Professor of Civil Engineering, one of 16 researchers nationally honored by TxDOT and the American Association of State High and Transportation Officials for his work on traffic mitigation in the Houston area. Wu’s research examined traffic streams from arterial roads in the Houston and discovered underlying issues with traffic, signals causing congestion that could be remedied. Wu has submitted a proposed model and system that will alleviate these problems.

Engineering for the final frontier

Three teams of students representing mechanical and electrical engineering spent the past year researching and designing their senior design projects working with NASA through the Texas Space Grant Consortium (TSGC) Design Challenge. Through their extensive work with NASA scientists and astronauts, students were able to create projects for extended space travel and compete with a dozen universities. The TSGC Design Challenge is a unique academic experience offering undergraduate students the opportunity to propose, design, and create a solution toward solving research objectives of importance to NASA and its mission. The competition has been sponsored by NASA and administered through the TSGC since 2002 and Lamar University has been a frequent competitor in recent years.

The Lamar Array of Microphones for Debriefing Audio (LAMDA) team represented the Phillip M. Dorrery Department of Electrical Engineering. The team was tasked to create an acoustic processing microphone array system that not only provides for hands-free voice communication, but also monitors the condition of the equipment operating and integrity of processed samples by scanning for anomalous ultrasonic signatures. The LAMDA team created a non-tracking dual-wideband microphone system proof-of-concept that worked and was capable of detecting anomalies such as a failing pump or a leak detected in the craft.

The Mars Sample Return System (MSRS) Team consisted of a group of five mechanical engineering students tasked with creating a device that could efficiently pick up and contain sample caches found on the surface of Mars. “The hardest part of this concept was creating a design that could withstand the travel and landing on the surface of Mars,” said teammate Travis Miller. “The design would have to obtain samples from a rover, secure them and transport back to the International Space Station for examination.”

The final team representing the Department of Mechanical Engineering faced the challenge creating an alternative sanitation method for long-duration space missions. Aptly named, Lamar Launderers, the team quickly realized the difficulties of creating a washing machine for space. “With limited power and water available to astronauts, we created a method for sanitation by using the power of ultraviolet light,” said Chris Stelse. “Currently, astronauts on the space station do not clean their clothing. Clothing is discarded after a couple of uses and it costs NASA around $5,000 per pound to send something into space. There is a lot of money and manpower to be saved with our design.” The team partnered with Adwina Kuckeres, Associate Professor of Biology at Lamar University to test the system which successfully destroyed all bacteria in less than 20 minutes.

Each team found success during the TSGC Design Challenge. LAMDA took home second place overall while the MSRS team scored fifth. Lamar Launderers scored fourth place in the oral presentation portion and limped second during the design portion.

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- Chris Stelse

Mechanical Engineering Major
RET BRINGS RESEARCH TO HIGH SCHOOL TEACHERS

Lamar University’s Research Experience for Teachers (RET) program, funded by a National Science Foundation (NSF) grant and led by industrial engineering professor Weihang Zhu, has completed its first of three summer programs, which brought together 12 local high school STEM teachers June 5 to July 14 to research in advanced design and manufacturing.

The six-week program, open to all high school teachers in the STEM disciplines in Texas’ Region 5 and 4 schools, sought to advance educators’ knowledge of concepts in design and manufacturing as a means of enriching high school curricula and meeting foundational standards set by 2013’s Texas House Bill 5. These standards required enhanced STEM contents in high school curricula as a prerequisite for graduation, detailed in the Texas Essential Knowledge and Skills standard.

“They have high school teachers that have not received sufficient training to prepare for these new course modules,” Zhu said. “It is imperative to build active, long-term collaborative partnerships between high school teachers and LU engineering to bring knowledge of advanced engineering to classrooms. The RET site is a timely opportunity to recruit high school teachers to gain experience in design and manufacturing and developing course modules.”

In the mornings, teachers attended daily workshops to expand their knowledge of topics in advanced design and manufacturing before embarking on applicable research projects in the afternoons. Six LU professors, assisted by student research assistants across the engineering disciplines, each mentored two teachers on projects ranging from 3D design and 3D printing to LED modeling and robotics mechanisms. The six engineering mentors, Weihang Zhu, Xuejun Fan, Nicholas Brake, Xiuyu Liu, Xianchang Li, and Jenny Zhou, each led one week of workshops as well. Zhu and Fan served as Principal Investigator and Co-Principal Investigator, respectively.

The group participated in excursions to local and regional companies including Sage Automation, Schlumberger, Forterra and BASF, and worked with Lamar University curriculum specialist Dorothy Sisk, professor of teacher education, on applying their learnings to lesson plans.

“Every week, Dr. Sisk would meet with a group of teachers, broken down into three cohorts,” Zhu said. “These meetings gave the teachers some guidance on how to develop a thorough curriculum while following TEKS standard, which is not always easy.”

Participants also met for weekly Brown Bag teacher seminars to share their experiences and discuss curricula, organized by master teacher Robert Barham of Porter High School, New Caney Independent School District. “Mr. Barham shared his past RET participation experience from Texas A&M, and provided great leadership in our RET program,” Zhu said.

On the final day of the program, the teachers presented their curriculum prototype for the fall semester to the group and received certificates. “We don’t expect them to complete their entire curriculum development in this six-week period,” Zhu said. “The RET Site program is incredibly intensive; they have to be in workshops, carrying out research, attending excursions, and more—so they just have to have a prototype by the end of this period that they share with the group.”

The six professors acting as research mentors will visit their mentees’ classrooms to see the lesson plans being implemented. In January 2018, the teachers will present their refined curricula at an on-campus conference and submit their standards-aligned plans to teachengineering.org for other K-12 educators to access. The program assessment is led by assessment specialist Julia Yoo, associate professor of Teacher Education at LU.

“We plan to accept 250 attendees for this conference—all teachers in the regional area,” Zhu said. “The results of the summer program and the findings from implementing their developed high school curricula will be presented at this conference. All of the participants will present and submit their curricula as per NSF requirements.”

“We are all very happy about how smoothly this program went, and multiple teachers from this first program have expressed interest in returning next year,” Zhu said. “It was hard without previous experience to begin a program like this, but next time we will all be aware of what we need to do and what our responsibilities are to better assess the teachers’ needs and pinpoint what they want to accomplish during their six weeks with us. I hope they will have returned home not only with financial support from their participation, but with new knowledge and a sense of real accomplishment.”

The Research Experience for Teachers Site program is made possible through a grant from the National Science Foundation valued at $545,380. Over a three-year period, this RET Site will offer an intensive six-week summer research program to a total of 36 regional STEM high school teachers.

All participating teachers will be paid a $1,000 per-week stipend for each week of the program, as well as $1,800 upon completion of the implementation and evaluation activities during the following academic year. One Master Teacher, who will have a leadership role in the curriculum development process with a strong knowledge of TEKS, communication and problem-solving, will receive a $1,200 per-week stipend. Two additional cohorts will be chosen in the summer of 2018 and 2019.

The Research Experience for Teachers Site program is open to all high school STEM teachers in the STEM disciplines in Texas’ Region 5 and 4 schools. The Teachers’ Site program will offer an intensive six-week summer research program to a total of 36 regional STEM high school teachers. All participating teachers will be paid a $1,000 per-week stipend for each week of the program, as well as $1,800 upon completion of the implementation and evaluation activities during the following academic year. One Master Teacher, who will have a leadership role in the curriculum development process with a strong knowledge of TEKS, communication and problem solving, will receive a $1,200 per-week stipend. Two additional cohorts will be chosen in the summer of 2018 and 2019.
The College of Engineering introduced a new summer camp this year to assist high school students looking to pursue their interests in STEM, called Lamar Introduction To Engineering – Senior (LITE – Senior), now the second summer program under the LITE name. “The purpose of LITE is to engage junior high students with our faculty and students to explore the various fields of engineering LU has to offer,” says Dean Srinivas Palanki, “LITE – Senior takes that premise and brings it to the high school level.”

Over 70 students were invited to participate in the week-long camp. Students excitedly came from all over southeast Texas from Spring to Orange and everywhere in between. Students were split into groups based on their current grade level and were paired with College of Engineering Ambassadors every day to explore the fields of chemical, civil, electrical, industrial and mechanical engineering.

While LITE – Senior shares a similar concept with its sister camp for younger students, Senior incorporates the research professors from each department are currently conducting. For example, Dr. Hassan Zargarzadeh, assistant professor of electrical engineering, has an expertise in the realm of robotics and drone programming. “Drones are becoming a huge area of interest for younger kids today, so I wanted to incorporate the design and programming aspect into my portion of the camp,” says Zargarzadeh, who purchased mini drones for students to work with. Students were presented with the information and had to program their drones to act on command.

Through five days of fun activities and learning, students were left satisfied by the amount of information that was given. In fact, many students found that their chosen field of interest may not be the one they inevitably pursue. “Because of how successful the LITE – Senior camp was this year, we hope to attract 125 students next year and to continue to spike these students interest in engineering,” says Palanki.

“I wanted to give students the opportunity to dive deeper into understanding how drones operate and why they are an integral piece of technology in the world today.”

– Hassan Zargarzadeh
Assistant Professor
Electrical Engineering

“My research centers around the synthesis, design and fabrication of nanostructures. To be able to expose young students to this and various aspects of mechanical engineering was very special and I found their interest to be amplified at the conclusion of the camp.”

– Keivan Davami
Assistant Professor
Mechanical Engineering

Lamar Introduction To Engineering – Senior opens new pathways for high school students

“LITE was a great opportunity to work with students and show them the various aspects of civil and environmental engineering including structural engineering, water filtration and different 3D printing can assist engineers.”

– Nicholas Brake
Assistant Professor
Civil & Environmental Engineering

Students were able to explore various fields of engineering while conducting experiments in Lamar Engineering laboratories with Lamar’s Engineering Ambassadors and faculty from each department.
Dr. Tracy Benson, Associate Professor in the Dan F. Smith Department of Chemical Engineering, and his research team understand the need to mitigate the negative environmental impact of fossil fuel production and have found much success in research involving carbon capture, storage, and utilization. Through his work, industry powerhouse companies will be able to utilize his findings to lessen the environmental impact of using fossil fuels.

Long-term viability and sustained livelihoods of our planet’s growing economies are at the forefront of today’s technological advances. Fossil Fuels (i.e., crude oils, natural gas, and coal) are expected to be the major sources of energy for the next several decades, mitigating the environmental impact of waste carbon dioxide has become the focal point of Dr. Benson’s research platform. The research team seeks to develop economical solutions to engage both Carbon Capture & Storage (CCS) and Carbon Utilization (UC) technologies.

Through a collaborative partnership with the University of Texas at Austin, geologic research has revealed subsurface stratigraphy of onshore and offshore areas in the Gulf of Mexico that have extensive seals that could permanently sequester carbon dioxide. Current CCS work includes the equation of state analysis to determine the permeability and diffusivity for deep well injection for supercritical carbon dioxide. In addition to storage, deep well injection of waste carbon dioxide is used in Enhanced Oil Recovery, a method used to push subsurface crude oil through bedrock to oil production wells.

Dr. Benson’s research investigates the use of tri-reforming and low-temperature photocatalytic conversion of carbon dioxide to useful fuels and chemicals. Both technologies breakdown carbon dioxide into carbon monoxide using methane and water for a hydrogen source to produce a synthesis gas (i.e., carbon monoxide and dihydrogen). Synthesis gas, a feedstock for Fischer–Tropsch processes, can then be converted to long-chain hydrocarbons (i.e., gasoline, kerosene, and diesel) and to long-chain alcohols.

“Utilizing information found through CCS and UC technologies, we’re beginning to discover new information assisting in carbon capture, storage, and utilization,” said Benson, “sustainable methods will continue to improve emissions standards and increase profitability for all industries.”

Research for capturing CO₂ proves beneficial for environment & industry
A better understanding of the behavior of pervious concrete subjected to severe weather conditions is essential for industry to design and install concrete that will outlast current maintenance practices. Dr. Liv Haselbach’s research investigates potential strengths of using pervious concretes over traditional, impermeable concrete used for pavement in urban settings.

“Previous concrete is a special type of concrete made with few or no fine aggregates making it a permeable material,” says Haselbach. “In an urban setting where roads, buildings, parking lots and sidewalks are almost 100 percent impermeable, the use of pervious concrete as a pavement surface course allows water to seep through, reduce runoff, alleviate flooding and brings many other benefits, such as recharging groundwater and reducing urban heat islands.” Because of these benefits, it is considered a Best Management Practice by the Environmental Protection Agency, and its application can contribute to a Leadership in Energy and Environmental Design certification.

When pervious concrete pavements are installed in cold climate areas, they are subjected to deicing chemicals and freeze-thaw cycles, as with any other kind of pavement. However, during severe winters, there is evidence this material can be more heavily affected than traditional concrete pavement. This is due to the porous structure of the pervious concrete that allows deicing chemicals to accumulate and infiltrate precipitation to freeze-thaw within its structure. It is not clear whether the deicing chemicals, the freeze-thaw cycles or both are responsible for the failure of pervious concrete in cold climates.

Dr. Haselbach’s research intends to further investigate the behavior of the pervious concrete when subjected to the above conditions. To better understand how drivers can chemically and physically affect the cement paste matrix, aggregate bonding, pavement durability and strength, a series of laboratory experiments must be conducted using various deicing chemicals including, but not limited to: sodium chloride, magnesium chloride and calcium chloride.

“A better understanding of the behavior of pervious concrete when subjected to severe winters is crucial in order for the industry to design and install concrete that is more resistant to wintertime maintenance practices,” says Haselbach. Her research will suggest a testing procedure comparing various mix designs and their resistance to deicing degradation. This will enable the industry to more efficiently and economically implement the installation of this alternative pavement, promoting low-impact, sustainable development.
Electromagnetic research solves problems for Air Force

Dr. Cagatay Tokgoz was recently awarded a Faculty Fellowship from the United States Air Force Research Laboratory (AFRL) where he spent twelve weeks over the summer of 2017 conducting research for antenna placement in aircrafts. Through his fellowship, Dr. Tokgoz developed efficient ray-tracing techniques and electromagnetic solutions then applied them to representative computer models of aircraft platforms to identify co-site interference between antennas on the same platform.

In the area of computational electromagnetics, Dr. Tokgoz is one of a handful of researchers in the United States whose expertise resides in the development and application of efficient numerical techniques and solutions for antenna placement on large structures such as aircrafts. Because of his expertise in this area, Dr. Tokgoz has attracted strong interest from the CREATE-RF, a program funded by the Department of Defense and run through AFRL.

“Numerous antennas with various communication purposes are installed on a typical modern aircraft,” says Tokgoz. “These airborne antennas operate and communicate independently without being affected by the aircraft or each other as little as possible. The careful placement becomes extremely crucial for antenna-platform interactions and co-site interference.”

The techniques and solutions developed during the fellowship have been planned to be integrated into the SENTRi software currently being developed by the CREATE-RF team. New capabilities will greatly assist the United States Air Force in finding optimal placement of antennas on airborne platforms of aircraft and missiles to minimize the co-site interference between the two.

“These airborne antennas operate and communicate independently without being affected by the aircraft or each other as little as possible. The careful placement becomes extremely crucial for antenna-platform interactions and co-site interference.”

– Cagatay Tokgoz
Electrical Engineering
Assistant Professor
Dr. Yueqing Li, Assistant Professor of Industrial Engineering, and his team of researchers are conducting research exploring various physiological signals (e.g., EEG, EMG, ECG, EOG, oxygen consumption, respiration, heartbeat, body temperature, etc.) to design ergonomic interventions for reducing MSD and fatigue, enhance rehabilitation and improve task-performance during work.

With many underlying projects, Dr. Li is kept busy in the Human Factors and Ergonomics Lab, which looks like a cross between a gym and laboratory. One of Dr. Li’s research projects is to develop a robotic exoskeleton for rehabilitation for stroke patients and individuals with neurological diseases. Millions of people around the world suffer from loss of motor skills due to the neurological diseases. In United States, neurological disease is the leading cause of motor disability. Additionally, more than 750,000 people in United States and 15 million people around the world suffer from a stroke each year with approximately two-thirds survive to require rehabilitation. “Many patients have the potential to recover motor control, but missed opportunities occur due to ineffective rehabilitation strategy or the equipment is too expensive for the patient,” says Li. “Our robotics exoskeleton can increase independence during therapy, reduce the work of caregivers and can potentially be a much more affordable option for patients.”

Li’s research integrates robotics, brain-computer interface (BCI), EEG, EMG and other physiological signals by using 3D printing technology. The research group is developing the first low-cost system for patient therapy both in the clinic and at home. The group also plans to develop an adaptive control algorithm to enhance rehabilitation. In a collaboration between Lamar University, Texas A&M University and Tarleton State University, Li’s research group hopes to advance the future of rehabilitation.

“The advances we are making will greatly increase the independence of those with motor disabilities and gives patients a control mechanism when a normal pathway of communication or control does not work.”

“3D printed exoskeleton to help stroke victims

- Yueqing Li
Assistant Professor
Industrial Engineering
in collaboration with Texas A&M and Purdue University, Dr. Ali Beheshti, Assistant Professor in the Department of Mechanical Engineering has been granted $773,000 ($165,000 for Lamar) funding support from Department of Energy to study tribological performance of Nickel alloys under a helium environment. The results of this project will enhance very high-temperature gas cooled reactors efficiency through obtaining basic/fundamental knowledge of failure mechanisms and tribological response in high temperature materials as well as developing predictive models. The project is expected to run through October 2019.

“Tribology is the science of interacting surfaces in relative motion dealing with the study of friction, wear and lubrication from nano to micro and macroscales,” said Beheshti, whom has been assigned the modeling portion of the project and hopes evaluate the tribological response of Nickel alloys at operating temperatures that can exceed 700-950℃ (1292-1742℉) and establish predictive models. Beheshti’s team (Multiscale Tribology and Contact Mechanics Group) will focus on comprehensive multiscale numerical modeling to investigate and compare friction, surface damage and contact response of high temperature contacting pair materials in atmospheric condition and helium environments.

Operation at high temperatures is critical for power plants and nuclear reactors, resulting in substantial thermal efficiency. Materials that can withstand high temperatures and harsh environments are necessary for reliable and effective nuclear reactor operation. Nickel alloys are the principle candidates in high/very high temperature gas cooled reactors with outlet temperatures of 700-950℃. Therefore, understanding and optimizing mechanical and tribological response of high-temperature materials, particularly Nickel alloys, used in very high-temperature gas cooled reactors is crucial to increase durability, operational reliability, decrease exchange cost and understanding thermal effects on mechanical response.

“Our modeling concentrates on hot nano-indentation/scratch to estimate mechanical properties of the bulk material and potential thin oxide film. In addition, novel modeling of friction considering surface nano/micro features, creep and temperature fluctuations will be performed,” says Beheshti.

“By September 2019, we hope to find fundamental knowledge of failure mechanisms, and identify a tribological response in these materials and establish predictive models,” says Beheshti. Specifically, knowledge of friction coefficient behavior, surface wear, fretting, and self-welding leading to interface failures, as a function of aging time, dwell time, temperature, speed, load, gas composition, and surface roughness will be established for each material pair in the presence of air, helium and helium with impurities. In addition, this research hopes to uncover and suggest alternative solutions to mitigate tribological problems with Nickel alloys under high and very high temperature gas cooled reactors conditions by investigating different practical approaches such as optimizing design, operating conditions, and surface modifications. The successful fulfillment of this project promotes an improved, safer design of high and very high temperature gas cooled reactors.

“By September 2019, we hope to find fundamental knowledge of failure mechanisms and identify a tribological response in these materials and establish predictive models.”

– Ali Beheshti
Mechanical Engineering
Assistant Professor
Dr. Henry joins the Dan F. Smith Department of Chemical Engineering from Louisiana State University where he taught undergraduate and graduate courses in biochemical engineering. Henry has a number of awards and honors, including: licensed professional engineer, Tiger Athletic Foundation Teaching Award (2007) and received Outstanding Poster Presentation at the Mid-Atlantic Biochemical Engineer Consortium in 2001.

Henry has made a number of publications on his research topics including: development of photometric sensors for the detection of neurotoxic agents, analysis of cell surface molecules and their roles in disease progression, biosensors modeled after cellular structures and evaluation of natural occurring molecules as modulators in disease progression among many others.

Dr. Henry is a graduate of the University of Arkansas where he received his bachelor's and master's degree before receiving his Ph.D. from Texas A&M University.

Thinesh Selvaratnam, Ph.D.
Civil and Environmental Engineering

Dr. Selvaratnam joins the Department of Civil and Environmental Engineering from the Arizona Center for Algae Technology and Innovation (AzCATI) at Arizona State University. His primary focus is in sustainable energy positive wastewater treatment technologies and biological water/wastewater treatment processes. During his doctoral studies at New Mexico State University, Dr. Selvaratnam evaluated a novel approach to treat municipal wastewaters using acidophilic mixotrophic algae. His current research revolves around achieving bioremediation of municipal and industrial wastewaters using an algal-based system.

Dr. Selvaratnam is a member of the Diversity Advisory Board, ReNUWIt, which is an interdisciplinary, multi-institution engineering research center whose goal is to change the ways urban water is managed.

Ajit Patki, Ph.D.
Mechanical Engineering

Originally from India, Dr. Patki received his doctoral degree from Lamar University in 2016 and joined as a visiting assistant professor. As a student, Patki received a full doctoral fellowship from 2012-2016 and made a number of publications during that time.

Dr. Patki has a number of research interests including: numerical simulation of black carbon emissions from non-premixed flames, computational fluid dynamics of important flare operating parameters and combustion efficiency and emissions of industrial flares. Outside of work, Dr. Patki wrote and published a spiritual and inspirational book titled “Think Beyond.” His book explores the personalities of various world leaders, intellectuals and directors to discover they all contain the same philosophy of thinking beyond the norm in order to win over ones self.

Spring 2017 Enrollment

<table>
<thead>
<tr>
<th>Undergrad</th>
<th>Graduate</th>
<th>Doctoral</th>
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<tbody>
<tr>
<td>1716</td>
<td>386</td>
<td>8</td>
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Spring Commencement

- Undergraduate: 186
- Graduate: 443
- Doctoral: 6

106 undergraduates joined Order of the Engineer

Over 40 companies participated in our bi-annual career fair

1 in 4 engineering students have at least 1 scholarship awarded to them

Over $60,000 awarded for 44 Senior Design projects in 2017
Fellowship leads to new discoveries in Taiwan

Nicoloutsos helped optimize lab processes and designed experiments. He also benefited from private meetings with his mentor, Hu.

“The post-doc and I regularly went to Dr. Hu to shoot off ideas, and those meetings were really useful to me,” he said. “I would say that out of everything, these intimate meetings with our mentor had the most influence on me during my fellowship—they really helped me grow as a researcher and as a person.”

Apart from work, he explored the city and surrounding area extensively, visiting landmarks and museums including Taipei 101 (a 101-story high rise with a lookout), the National Palace Museum, the Taipei Zoo, Chiang Kai-shek and Sun Yat-sen Memorial Halls and Taipei’s many night markets.

“I traveled a lot in Taiwan and explored Taipei’s night markets regularly, which sell things from snacks to souvenirs to odd curios. I’d definitely say my favorite part of my cultural education in Taiwan was embracing the regional food with my friends from the lab,” he said. “The ‘bravest’ food I tried was stinky tofu—it wasn’t great, but it definitely wasn’t as terrible as I thought it would be. I’m still glad I tried something new.”

Although this summer marked his first time traveling out of the country, Nicoloutsos’ anxieties were quickly allayed when he reached Taiwan.

“This was my very first time traveling out of the country, and to mention the trip spanned the whole summer. But I felt incredibly safe;” he said. “Taipei is a great place to be; it was accessible, almost everyone spoke English, and I got to meet some amazing minds. As a researcher, I definitely improved in Taiwan; it was maturing to start a new project and see it through to a publication.”

The experience also boosted his confidence in his chosen field and opened his mind to future international collaboration.

“If I could, I would absolutely do my fellowship all over again,” he said. “It further solidified my love for research and the field of bioengineering. I am now sure that I want to do this kind of work for the rest of my life. I would even take a job abroad one day; there are certain projects and labs, certain experts that you can only find in new places. I encourage all students and professionals who can feasibly do so to partake in something abroad. The global exchange of information and the cultural education you receive from it is incomparable.”

As for LU students considering applying for the Beck Fellowship in the future, Nicoloutsos says “just try.”

“Whether you have a solid foundation or are just getting started with research—just try,” he said. “If you can find a project, apply. Do it. Even if you don’t win it, by constructing a proposal you already won by learning something new and making lifelong professional connections.”

Nicoloutsos has presented cancer research at Panera on the Hill in Washington, D.C., conducted independent mathematics research, and participated in the National Institute of Standards and Technology (NIST) Summer Undergraduate Research Fellowship Program while at Lamar University.

Lamar University has allowed Nikoloutsos to use his summers “productively,” which he said is a priority to him.

“I have been incredibly lucky to have Dr. Ian Lian as my Beck mentor. I have conducted research under Dr. Lian since my freshman year of college, and he connected me with Dr. Hu, who was his former Ph.D. classmate at UCSD,” he said. “I also have further support and a stronger academic foundation to my research thanks to the Realn Homes College.

“At most medium to large institutions, I would just now, as a senior, be receiving the opportunities and building the relationships I had as a freshman at LU. I feel I have benefited from Lamar so much already, but here, new doors continue to open.”

“As a researcher, I definitely improved in Taiwan; it was maturing to start a new project and see through to publication”
Lamar University announced the inaugural recipients of the College of Engineering Faculty Fellowship Program, awards made possible through the generosity of five alumni of the university. Eleven faculty members where recognized and received funding and the title of faculty fellow in an afternoon program, March 22 in the Center for Innovation, Commercialization and Entrepreneurship.

“These faculty fellowships recognize and support the innovative endeavors of outstanding members of the College of Engineering faculty,” said Srinivas Palanki, dean of the college. “We are grateful to our alumni who have made these fellowships possible through their generosity. Their support and interest in building and sustaining a culture of innovation at Lamar University is outstanding.”

Ten fellowships were possible thanks to funding from five alumni donors: Anthony George, Jack Gill, Larry Norwood, Larry Riddle, and Anita Riddle. Each donor contributed $20,000 a year for three years, totaling $300,000. As a result, each of the 10 faculty members will receive a stipend of $10,000 a year for three years. An eleventh faculty member will receive an stipend of $5000 a year for three years from the College of Engineering.

Tracy Benson, associate professor of chemical engineering, and Rafael Talaman, professor of chemical engineering, were named Gill Fellows. Ramazan Guduru, assistant professor of mechanical engineering, and Jerry Lai, professor of civil and environmental engineering, were named Norwood Fellows. Qiang Xu, associate professor of chemical engineering, and Qin Qian, associate professor of civil engineering, were named Riddle Fellows. Bao Ruan, assistant professor of electrical engineering, and Hassan Zargarzadeh, assistant professor of industrial engineering, were named George Fellows. Xuejun Fan, professor of mechanical engineering, and Xing Wu, assistant professor of civil engineering, were named Lamar Fellows. Yuqing Li, assistant professor of industrial engineering, was named a College of Engineering Fellow.

“In addition to providing valuable resources to support research and innovation, fellowships like these reflect well on the faculty who carry the title,” Palanki said. “Our benefactors have experienced incredible careers that reflect the entrepreneurial spirit and innovative initiative that reflect well on their alma mater. We are proud to have fellowships named in their honor.”

Anthony George is the CEO of Nautical Control Solutions and founder and president of Control Dynamics International, a company he sold in 2010. A 1988 graduate of Lamar University, George has been an entrepreneur and inventor for more than 25 years in the fields of automation and control systems engineering and marine fuel management systems. George is a founding member of The Woodlands chapter of The Entrepreneurs Organization, a global network of entrepreneurs providing peer-to-peer learning, experiences and connections to experts with more than 12,000 members.

A successful scientist, technology entrepreneur, venture capitalist, educator and philanthropist, Jack Gill is a 1956 graduate of LU’s Distinguished Alumni, and holds a Ph.D. in organic chemistry from Indiana University. At 35, he founded his first business pioneering micro-processor-based scientific instruments. In 1961 he co-founded Vanguard Ventures, whose first five funds invested $155 million in 103 startups and generated more than $1 billion in return to investors. Gill joined the Harvard Medical School faculty in 2000 and has taught entrepreneurship courses at Harvard, MIT, Stanford, Rice and Indiana University. In 1998, Jack and his wife, Linda, established The Gill Foundation of Texas. Gill is a past president of the LU Foundation and member of LU’s College of Engineering Advisory Council. Larry Norwood, another university benefactor, attended LU in the 1960s and, after switching careers from music to health care, founded Cardio Diagnostics in 2004, which became one of the Top 500 fastest-growing companies in America from 2009 to 2012. Ernst & Young tapped Lawson as its Health Science Entrepreneur of the Year in 2009.

Larry Norwood graduated from Lamar University in 1973 with a bachelor’s degree in chemical engineering and spent his entire career with Lubitel Corp., retiring in 2012 as corporate vice president of operations, a position he held since April 2004. He is a benefactor of LU, having established the Larry and Cynthia Norwood Chemical Engineering Scholarship through a $1 million endowment, and serves on the College of Engineering Advisory Council.

Anita Riddle has been procurement manager for ExxonMobil since February 2009. Previously she was sourcing manager, 2005-2009; process department head, 2003-2005; senior environmental advisor, 2001-2003; and crude oil optimization manager, 2000-2001. She holds two advanced degrees from Lamar University: a master in engineering management, 1993, and a Doctorate of Engineering, 1996. Riddle serves on the College of Engineering Advisory Council, and together with her husband, Steven Schmidt, established several faculty development and innovation funds in the college.
SCHOLARSHIPS and OPPORTUNITIES

Because of continued donor support, our students are able to attend class without the heavy financial burden of taking out loans or working full-time, giving them the freedom to study and enjoy their time as students. Donations to the College of Engineering are extremely vital to our faculty and students, giving the university the opportunity to enhance the collegiate experience by evolving our classrooms in an era of digital learning. Without your support, making these advances would not be possible.

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