



FALL 2023

# Improve & Inspire

## Texas Tech Mechanical Engineering





## CHAIR'S MESSAGE

*Song-Charng Kong, Ph.D.*

*Department Chair,  
Don Kay Clay Cash Endowed Chair*



In these past few months, the WCOE Dean and all the department chairs went as a group to major Texas cities to meet with alums to celebrate the 100th anniversary of Tech. Mr. Ed Whitacre also attended one of the events. It was my pleasure to visit with so many ME alumni who excelled in their professions. I brought back the unmistakable message to the Department's faculty: maintaining high academic standards. And this is what we will do!

As we usher in the second century of Tech, we also have a new dean in the College. Dr. Roland Faller joined WCOE on August 1. He brings tremendous academic experience to us and will lead the College into the second century of its existence. One of the goals is to establish WCOE as a research-intensive institution. We also aligned the Department's research focus with the College's strategic areas in energy, engineering in medicine, and nanotechnology, among others. Three new assistant professors started their careers this semester. Their research is focused on healthcare engineering. You will find their profiles in this newsletter.

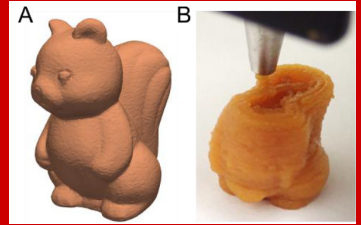
The Department has 1,514 undergraduate students, including 873 in the foundational program and 641 accepted into ME. We also have 145 graduate students. The Department now has 39 faculty members and will continue to grow. One area of growth is the aerospace engineering area. Because of the strong demand, we have implemented the Aerospace Concentration within the ME curriculum. In Spring 2023, several students took advantage of this opportunity and graduated with an Aerospace Concentration. We plan to expand this curriculum option by hiring new faculty in flight dynamics and systems engineering. Such curriculum options will provide added value to our students and increase their marketability.

Hands-on experience is an essential trait of our ME graduates; this experience goes hand in hand with teamwork. Capstone design projects and student competition teams are good examples. Starting last year, we have been hosting the Senior Design Expo on the last Monday of the semester. You can count on the date and are welcome to return to enjoy their shows. Please feel free to visit the Department's website to view those projects. Meanwhile, the Rover Team competed in April at a NASA facility in Alabama and won an award. Their story was featured on a Lubbock TV channel.

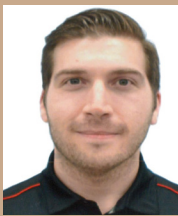
While we are proud of the high enrolment in ME, renovating instructional laboratories is our top priority. We have received significant funding from the alums and the College to purchase new equipment for the Thermal-Fluids Laboratory, the remaining laboratory that has not been renovated. Additional support is needed to renovate the laboratory infrastructure. We are also working on several building projects to consolidate research laboratories and offices to make space for undergraduate students. If you have a chance to visit Lubbock, please stop by the Department, and I will show you around the two ME buildings. Please do not hesitate to contact me (sokong@ttu.edu) if you have any idea or memory to share.

## New Research

*Three ME faculty have received federal research awards.*



## Recognition & Awards



*Jerry S. Rawls*

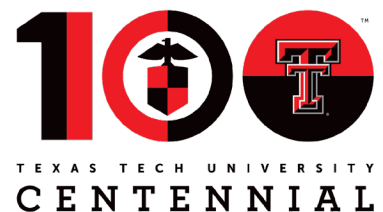
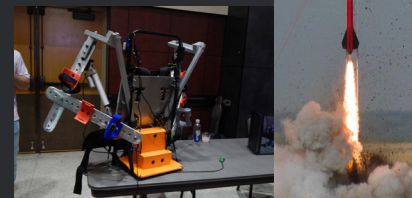
*Distinguished Undergraduate Educator*



*Distinguished Engineers*

## Student Organizations and Senior Design

*Looking back at what our student organizations have done in 2023*



# Focus on New Faculty

The ME department welcomes four new faculty members this year



**Yanyan Zhang , Ph.D.**

*Lecturer*

Dr. Yanyan Zhang is a lecturer in the Mechanical Engineering Department, having previously served the Department in other teaching roles. She has a record of success in providing college-level instruction and delivering engaging lectures. Her

passion for teaching is clear, and she enjoys helping students develop their interests in learning and expanding their horizons. Dr. Zhang is committed to creating a positive learning environment that encourages the exploration and growth of students in the classes. Courses Dr. Zhang currently instructs include Statics, Materials Science, and the Materials and Mechanics Lab.

**Xiaolong Liu, Ph.D.**

*Assistant Professor*

Dr. Liu is an Assistant Professor for the department starting in the fall of 2023. His research focuses on enabling autonomous miniature robots in the medical field, opening doors for new surgical methods for confined spaces inside the human body. Due to the variety of patient anatomies, he aspires to create machine learning methods that can design patient-specific implants and computing optimal surgical options under uncertainty for congenital heart disease treatment. Following the development of his cardiovascular surgical planning system in 2021—which allows cardiac surgeons to make patient-specific implants—he received the Maryland Innovation Initiative Award.



**Minliang Liu , Ph.D.**

*Assistant Professor*

Dr. Liu's research is focused at the intersection of cardiovascular biomechanics, computational modeling, and machine learning. Patient-specific biomechanical evaluation and computational models of major blood vessel disease con-

ditions, such as those threatening the aorta, are getting closer to reality, but have limited clinical translatability. To resolve challenges related to several major bottlenecks of current technology, Dr. Liu has been developing data-driven machine learning surrogate models for accelerating computations and physics-informed machine learning approaches for soft tissue constitutive modeling. He is the recipient of numerous awards, including the American Heart Association Predoctoral Fellowship from 2019-2020, as well as the Georgia Tech Sigma Xi Ph.D. thesis award in 2021.

**Indrajit Srivastava, Ph.D.**

*Assistant Professor*

Dr. Srivastava specializes in the study of biomimetic nanosensors and its application to medical imaging field, screening for interventions for cancer, cardiovascular diseases, and bacterial pathogenesis. His research dives into the multi-faceted field of medical applications, one of which can aid in developing nanotherapeutics, nanovaccines, and infectious disease detections. The improved use of surface-enhanced Raman scattering nanosensors allows the rapid and accurate detection of blood-clot related proteins, assisting doctors in assessing cardiovascular diseases. Dr. Srivastava has won a multitude of awards including the Baxter Young Investigator Award and the American Chemical Society OMSE Future Faculty Scholar.



## Homecoming

October 14, 2023 is an important day for many Red Raiders as Texas Tech will be hosting the homecoming game against Kansas State. The Department of Mechanical Engineering welcomes you back to campus this weekend to celebrate the Centennial Homecoming. We will also be holding our annual meeting of the Industry Advisory Board on October 13. The meeting will allow members—successful engineers and entrepreneurs—to provide advice on the Department's research, curriculum, and fundraising.

# Research Grants Highlights

## Recent new research grants for new ME professors



**Donald Docimo, Ph.D.**  
*Assistant Professor*

Dr. Donald Docimo received funding from the National Science Foundation's Directorate for Computer and Information Science and Engineering for research on computing systems and their impact on the environment. Traditionally, computing systems are designed to maximize energy efficiency and job performance, while elements such as greenhouse gas emissions and electronic waste continue to trend upward. This project tackles the sustainability of computing systems using dynamic system optimization, setting an explicit

focus on critical sustainability metrics for designing future computing systems. An emphasis is placed on pushing forward the scientific understanding of sustainable computing systems, and to impact future critical structures such as data centers. Dr. Docimo wants to not only support the computing field, but also to provide advancements in the design and controls fields. This project will support the education of scientific communities and the public through expansive multimedia resource development and student training.



**Paul Egan, Ph.D.**  
*Assistant Professor*

Dr. Paul Egan recently received a grant from the National Institute of Food and Agriculture to develop technology that will not only create food with appealing shapes and high nutrition values, but also be personalized to individual pallets. Dr. Egan is an Assistant Professor of Mechanical Engineering and leads the Medicine, Mechanics, and Manufacturing Design Lab. Facing challenges in the industry of foods having a poor taste due to additives necessary for the structure, Dr. Egan strives to create machine learning models that will assist in counterbalancing these problems. His research is focused on oleocolloid/hydro-oleocolloids (OC/HOCs) and how these can be improved to create foods high in nutritional value and

with a consistency like peanut butter. Through machine learning, it will be possible to predict the outcome of food structures with the addition of new ingredients. Whey/soy proteins, canola/soy oils, rice bran wax, and water will all be tested for their different properties including their firmness and thermal properties. Dr. Egan's team also plans to measure how much individuals like the food, so that he may put together a system that will be used for creating optimized food for individual consumers. His research should provide both societal and economic growth as healthier and more appealing foods will be available, and as the automated food production industry will be further stimulated.

Dr. Egan and his team will explore the creation of appealing and nutritious food through his recent research award.







**Victor Maldonado, Ph.D.**  
*Associate Professor*

Dr. Victor Maldonado received a grant from the Office of Naval Research for his research in hydro-acoustic mechanisms and how they can be enhanced by bioinspired micropillars. The desire for cross-domain vehicles is challenged by the difference in viscous force that exists when operating in both sea and air. This project seeks to gain new understanding of the momentum and energy transfer modes of bioinspired micropillar coatings on underwater, low-frequency flapping blades, and high-frequency rotating blades for aerial

use. These blade movement methods will be tested with a micropillar surface, which is the subject of an investigation for drag reduction in quasi-steady two-dimensional flow and ongoing investigation in three-dimensional vortex dominated rotor flows. A major unique aspect of the project is the proposed water tunnel/tank flow and acoustic experiments at the Naval Undersea Warfare Center, Division Newport, and preliminary results from testing have already shown up to 10% electric power reduction.

## Celebrating Our Team

### 2022-2023 Jerry S. Rawls Distinguished Undergraduate Educator Award



**Jeff Hanson, Ph.D.**  
*Lecturer*



**Turgut Baturalp, Ph.D.**  
*Lecturer*

Every year the Jerry S. Rawls Distinguished Undergraduate Educator Award is given to three individuals within the engineering department who leave a lasting impact on the students

that they teach. This year, the Mechanical Engineering Department has the honor of receiving two of the awards, given to Dr. Turgut Baturalp and Dr. Jeff Hanson, recognized in the testimonial letters sent in by students who had previously taken their classes. Dr. Baturalp was noted for his ability to bring "new approaches to the teaching of existing courses such as use of artificial intelligence in programming and design by generative design techniques." Similarly, Dr. Hanson was acknowledged as following the teaching philosophy that a "student will learn best when they know that their instructor cares about them as an individual." The Mechanical Engineering Department is grateful not only for the recognition of the college, but also for the continued eagerness of professors in the department to provide the best education to each student.

## Research Corner

Research in the Mechanical Engineering Department is multidisciplinary, due to the impact ME topics and fundamentals can have on various research areas. One noticeable example is the work being performed by Dr. Jerzy Blawdziewicz's laboratory. In the biological sciences, understanding the movement of cells during embryo formation of fruit flies has typically been explored using a chemistry-based perspective. Dr. Blawdziewicz, in collaboration with partners at the Texas Tech University Health Sciences Center and Angelo State

University, propose using a mechanical perspective to capture these dynamics. Morphogenetic movements are directly tied to cellular pressure, and thus compression and tension between cells. The formation of embryos are thus, in part, described by mechanical feedback. Increasing the fundamental understanding of these dynamics can impact research in not only the biological sciences, but other engineering disciplines that involve bioinspired design or even feedback mechanisms.

# Distinguished Engineer 2023

Greg Sargent grew up in Borger, Texas, a small town built around the Phillips Petroleum Refinery. At the young age of 14, Greg began working as a roustabout in the oil fields, a field that has since stuck with him in the following years. As a student in high school, one of his teachers nominated him for the Tech Anonymous Donor Scholarship which he promptly won, enabling him to focus his time on academic endeavors his freshman year at Texas Tech. Greg participated in a multitude of organizations at Tech including Pi Tau Sigma and Tau Beta Pi, and eventually graduated with a B.S. in Mechanical Engineering. After graduation, he worked in

many different divisions including Vice President of Hanover Compression's Treating and Turnkey Division. This division worked throughout the world, overseeing the turnkey installation of Natural Gas compressors, plants, and power generator sets. In 2006, Greg founded and became the CEO of TransTex Gas Services which installed gas treating equipment throughout the US. Greg has also founded and is the CEO of Pinnacle Midstream II—a company that operates natural gas gathering systems, gas processing, and liquid handling facilities.



## STUDENT ORGANIZATIONS

### Raider Aerospace Society (RAS)

The Raider Aerospace Society was highly populated this year, with students from many different backgrounds however with a majority of mechanical engineers. With the support of corporations, local businesses, and special interest groups, all three divisions—Space Raiders, Pegasus, and PigeonWorks—were able to pursue their adage, “Ad astra per aspera,” the Latin phrase meaning, “through hardships to the stars.”

Space Raiders designed, built, and flew a high-powered rocket as part of the Spaceport America Cup competition. In its preliminary flight, the rocket flew an impressive 10,000 feet, reaching its target altitude. Unfortunately, while in competition in New Mexico, challenges were faced. While in flight, neither of the redundant trackers functioned correctly, rendering both the rocket and its data lost.

Pegasus participated in a competition sponsored by the American Institute of Aeronautics and Astronauts where they built a radio-controlled, electric-powered, fixed-wing aircraft. The aircraft was equipped with a high tail design making it capable of flying a simulated electronic warfare mission. Grievously, the intended pilot was unable to make it to the competition in Tucson, Arizona. Despite this challenge, the team placed first in the design proposal.

PigeonWorks continued throughout the year to develop an autoclave for building rocket bodies from composite materials as well as investigated the possibility of competing in NASA's micro-g competition in future years.



Pegasus at Abernathy Airstrip after successful flight



Centennial Champion and Space Raiders prepare for test



Test launch of Centennial Champion

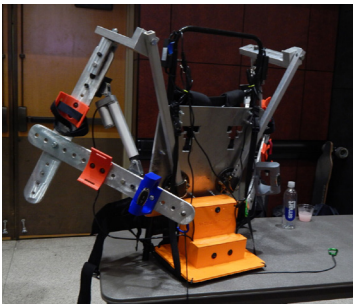
# Young Distinguished Engineer 2023



Ruslan Filyukov was born in Rostov-on-Don, Russia, and moved to California with his family when he was 12. He eventually moved to Dallas/Ft. Worth, where he graduated high school, and applied to Texas Tech with the hopes of pursuing a career in medicine. Ruslan quickly learned that he enjoyed solving engineering problems, and he ultimately transferred to Mechanical Engineering. Ruslan was heavily involved in his time at Texas Tech in organizations like the Society of Petroleum Engineers, ASME, Greek Life, Pi Tau Sigma, and as the lead for the Young Engineering Alumni organization (Young Guns). Ruslan graduated from Texas Tech with a MBA degree

focused in Management and Leadership. He began his career as a Field Engineer with Baker Oil Tools, and he assisted in developing multiple districts across the US. In 2014, Ruslan took a job as an Operations Engineer with XTO Energy where he held roles in engineering, operations, and production. He joined Formentera Partners as a reservoir engineer in 2022, where he works in business development, managing oil and gas reserves, and portfolio strategy. Ruslan continues to leave an impact on the Texas Tech community, where he has served on the Mechanical Engineering Industry Advisory Board since 2016 and currently as the Board Chair.

## Spring 2023 Design Expo



**Upper Body Exoskeleton System**

our esteemed faculty and the skilled machine shop staff provided invaluable guidance, while the generous support of numerous sponsors and advisors reinforced the student's noble mission of applying core engineering principles to drive innovation and address the pressing challenges of our complex societal and environmental landscape. The next Design Expo will be held on December 4th.

## NASA Rover Team

The NASA Rover Team is one of the leading innovative engineering and robotics organizations on campus, partnering with senior design groups and students around the school. The team recently competed in NASA's Human Exploration Rover Challenge (HERC) where they were expected to design, build, and run a rover that navigates a course while completing a series of tasks requiring the rover to collect water at 5 different stations. Led by President Alexander Calabrese and Vice President Cruz Torres, the group attacked the fast-paced timeline, completing design proposals, 30-page reports on the design and operational readiness of the rover, and finally building the rover. After months of work, the team attended the competition in Alabama where they received one of 7 awards—Safety. They were recognized for not only their technical writings, but also for their quick action in helping another team in a moment of danger. The day before competing, Tech's team helped to fix the shaft size of another team's rover enabling it to work. During the competition, the Rover Team rushed into action and helped the same team when one of their members collapsed on the ground, bringing him to the tent and offering water. The NASA Rover Team has proved to not only integrate the educational values of the ME Department, but also the caring attitude that is employed by professors and faculty daily. Alex looks forward to a new year of competition, welcoming new faces from all colleges around the camps, saying that "some people can have amazing ideas, everybody thinks differently. We just want them to learn."







TEXAS TECH UNIVERSITY

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Two of the Spring 2023 Design Expo projects and their teams. Cycling Aid and Automated Stick Charring