



THE DEPARTMENT OF
MECHANICAL &
MATERIALS ENGINEERING

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THE DEPARTMENT OF
MECHANICAL & MATERIALS ENGINEERING

10-YEAR
ANNIVERSARY
2011 - 2021

CELEBRATING THE SUCCESSFUL MERGER
OF MECHANICAL ENGINEERING AND
ENGINEERING MECHANICS

UNIVERSITY *of* NEBRASKA-LINCOLN

UNIVERSITY OF NEBRASKA-LINCOLN COLLEGE OF ENGINEERING

CONTENTS

2	FROM THE CHAIR
3	ABOUT THE DEPARTMENT
4	A BIT OF HISTORY: 1869 - 2021
5-7	NEW FACULTY: 2012 - 2021 ■ FOCUS ON ALUMNI: Taylor Kerl
8	SENIOR DESIGN PROJECTS
9-11	MAJOR FACULTY ACHIEVEMENTS ■ FOCUS ON ALUMNI: Tyler Wortman
12	FACULTY START-UPS
13-15	NEW SPECIALIZED LABORATORIES ■ FOCUS ON ALUMNI: Luz Sotelo / Andrea Arguelles
16	NUTECH VENTURES INNOVATORS
17	STUDENT ORGANIZATIONS

ABOUT THE COVER: The cover image features laser powder bed fusion additive manufacturing in action, printing magnesium in an inert environment. It was created in the College of Engineering NEAT Labs.



FROM THE CHAIR



It is hard to believe that it has been 10 years since the Departments of Mechanical Engineering and Engineering Mechanics became the Department of Mechanical & Materials Engineering (MME). We started with 23 tenure/tenure-track faculty and two research faculty, and shortly after the merger added four colleagues from the Department of Industrial, Manufacturing, and Systems Engineering. Since then, we have hired 19 tenure/tenure-track faculty, and added several Professors of Practice and research faculty. We also had retirements and a few departures and are now 32 tenure/tenure-track faculty, 2 professors of practice, and 2 research faculty (and 3 faculty searches underway). In 2011, undergraduate enrollment was 517, compared to 642 this year (down from a peak of 722 in 2018). Our graduate enrollment has gone from about 100 to about 120.

A summary of our metrics over the past 10 years is shown in the “Snapshot” on the following page. One which I am extraordinarily proud of is the number of national graduate fellowships our students have won (15). This reflects both the high quality of our students and the dedicated faculty who mentor them so effectively.

I believe the success of the merged department and the seamlessness of the integration was entirely due to the dedication of the faculty and staff to the mission at hand—the concern was then, and is now, focused on providing high-quality educational experiences at both the undergraduate and graduate levels. Recently, this has been explicitly displayed by how well we have navigated the pandemic the last 18 months. It is indeed an honor to serve such an incredible group of faculty and staff.

We are very grateful to the administration for providing resources that have allowed us to excel and grow. The College of Engineering - starting with Dean David Allen, Interim Dean Jim O’Hanlon, Dean Timothy Wei, and now Dean Lance C. Pérez - has been tremendously supportive of our endeavors, and of course with the expansion of our faculty. The University of Nebraska-Lincoln administration, especially Chancellor Ronnie Green, has provided many resources as well, enabling our faculty to achieve many things. Some examples include renovated laboratory space in Scott Engineering Center; the establishment of the Nanoengineering Research Core Facility, which our faculty had a large hand in developing and has significantly enhanced our research capabilities; the foray into metal 3D printing through the purchase of three machines, which became the Nebraska Engineering Additive Technologies (NEAT) labs; and the new College of Engineering buildings at whose doorstep we await to enter! This, of course, is an incomplete list, as there are countless, everyday examples of things big and small that continue to enable progress in our teaching and research missions.

Concerning students, one major area of emphasis has been experiential learning. For us, this means student involvement in any of our competition teams, internships with industry, or involvement in undergraduate research. We now have more than 90% of our graduates involved in at least one of these. Our goal is 100%, as these activities will contextualize classroom learning, provide additional learning opportunities not available in the classroom, and pave the way for future success. Further, we have many more industry-sponsored senior design projects than we did a decade ago. This is another mechanism to provide real-world experience and connect students with future employers. We are grateful to our sponsors, and are always looking for more!

The following pages provide a brief overview of some of the achievements of our faculty and students over the past 10 years. In particular, there are endless success stories regarding our students that we don’t have the space to describe. If there is one thing I have learned in almost 30 years in academia (can that number be true?!) it is that each student has carved his or her path through various challenges, creating a unique story for each individual. In closing, I am excited to see what lies ahead in the next 10 years. With the dedicated and talented faculty and staff we have, particularly the “young ones” we’ve recruited, I have no doubt that great things await us. We will continue to see our students as individuals and help each to achieve their goals, because every person and every interaction matters.

Jeffrey Shield, Ph.D.
Department Chair / Robert W. Brightfelt Professor, Mechanical & Materials Engineering

ABOUT THE DEPARTMENT

The Department of Mechanical & Materials Engineering is located in Nebraska Hall on the City Campus of the University of Nebraska-Lincoln. An outstanding infrastructure within the college and university exists for conducting research, including central facilities housing state-of-the-art instrumentation within the Nebraska Center for Materials and Nanoscience, the Nebraska Nanoengineering Research Facility, and the Holland Computing Center.

In July 2011, the departments of Mechanical Engineering (MECH) and Engineering Mechanics (EM) merged into one administrative unit: Mechanical and Materials Engineering. This merger has allowed the department to offer comprehensive undergraduate and graduate degrees in several primary areas, combining the expertise and research interests of faculty from both departments.

Opportunities for collaborations across the University of Nebraska include the University of Nebraska Medical Center, the Nebraska Center for Energy Sciences Research, the Nebraska Center for Materials and Nanoscience, the Center for Nanohybrid Functional Materials, the Center for Brain, Biology, and Behavior, the Nebraska Athletic Performance Laboratory, the Midwest Roadside Safety Facility, Nebraska Innovation Campus, and other state-funded and federally funded research centers and programs.

SNAPSHOT 2011 - 2021

1,060

B.S. Degrees Awarded

165

M.S. Degrees Awarded

123

Ph.D. Degrees Awarded

19

New Faculty Hired
Tenure / Tenure-Track

\$72M

External Research

1,400

Journal Publications

6

NSF CAREER Awards

15

National Graduate Fellowship Awards
NSF GRF, NDSEG, NASA

~90

U.S. Patents

A BIT OF HISTORY

1869

Under the university charter, the following were created: the College of Practical Science, Civil Engineering and Mechanics, and College of Agriculture.

1877

The Industrial College was established, including agriculture and the School of Mechanical Arts, a trade school. The first civil engineering classes were taught.

1892

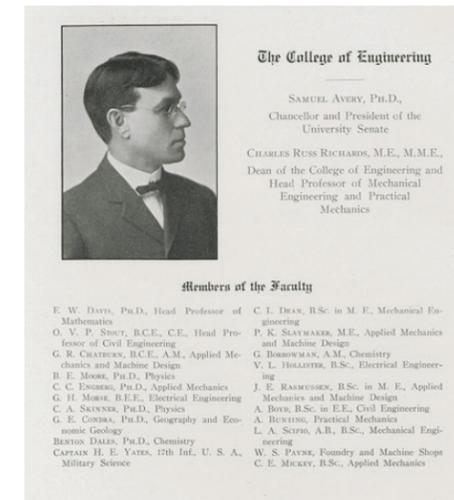
Practical mechanics courses were first offered.

1898

The Mechanical Arts Building was constructed and housed Engineering Mechanics, Civil Engineering and the Math Department. The first mechanical engineering courses were offered.

1909

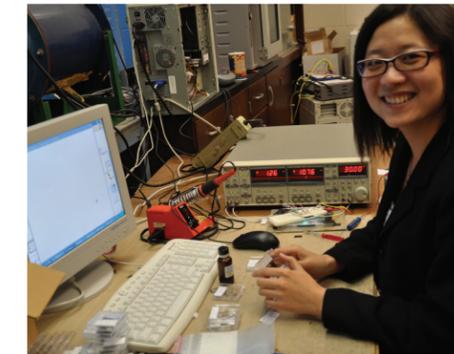
The College of Engineering was established by House Roll No. 76 (Kotouc bill). A \$115,000 mechanical engineering laboratory was established by Dean C.R. Richards (who also served as Head Professor of Mechanical Engineering). Prior to completion of the Mechanical Engineering Laboratories, most engineering classes were theoretical by necessity, since university facilities did not provide the space, nor specialization, for practical,



hands-on training. Woodworking and machine shops, a foundry, and laboratories for heat, steam, gas, forging, drafting, and hydraulics, as well as the usual lecture rooms and offices, were incorporated into Richards' design.

1972

Walter Scott Engineering Center (SEC) was dedicated and housed laboratories, research centers and the engineering shop. Later, the link between SEC and Nebraska Hall was formed and became home to Electrical Engineering and Mechanical Engineering.



2011

The departments of Mechanical Engineering (MECH) and Engineering Mechanics (EM) merged into one administrative unit: Mechanical & Materials Engineering.



2021

The Department of Mechanical & Materials Engineering is celebrating its more than 110-year history and one of its highest student enrollments.



NEW FACULTY 2012-2021

Since 2012, the Department of Mechanical & Materials Engineering has hired 24 new faculty, including those who joined Nebraska from other prestigious colleges and universities and from industry. They add additional strength in teaching and research in such areas as cellular engineering, medical devices, metal/ceramic composites, wireless sensor networks, fluid mechanics, 3D printing of living cells, and more.

2012-13

Sidy Ndao, assistant professor

Ndao previously worked at the Massachusetts Institute of Technology; his Ph.D. in Mechanical Engineering is from Rensselaer Polytechnic Institute.



Sangjin Ryu, assistant professor

Having a background in fluid mechanics and cell mechanics, Ryu's research interests include interfacial dynamics of bubble, drop and foam; cellular mechanics of cancer cells; and mechanobiology of stem cell differentiation.



Benjamin Terry, assistant professor

Terry spent nine years as a research engineer in industry developing commercial medical devices. His research interests are in medical devices and surgical tool design, and swallowables for gastrointestinal health.

2013-14



Karen Stelling, professor of practice

A 1987 mechanical engineering graduate, Stelling was vice president of Aviation & Facilities, FES with Burns & McDonnell before returning to the College of Engineering. Stelling has been a leader in developing new leadership curriculum for the college and advises the Aerospace Club.

2014-15



Bai Cui, associate professor

Cui's research areas include oxide-dispersion-strengthened (ODS) alloys, MAX phases, metal/ceramic composites, stress corrosion cracking, high-temperature corrosion, irradiation defects, and irradiation-assisted stress corrosion cracking.



Cody Stolle, research assistant professor, Midwest Roadside Safety Facility

Stolle earned his degrees in the College of Engineering and was a postdoctoral researcher at MwRSF. His research interests include vehicle dynamics and controls, vehicle crashworthiness, impact engineering, crash reconstruction and roadside safety design.

2015-16

Michael Sealy, assistant professor

Sealy's research interests include medical device manufacturing, additive manufacturing and process sustainability.



Eli Sutter, professor

Sutter came to the college after 11 years at Brookhaven National Laboratory. Her research interests include variable temperature electron microscopy studies of the properties of nanoscale objects, mechanisms of epitaxial growth and nanostructure formation and two-dimensional materials.



Jian Wang, associate professor

He spent nine years at Los Alamos National Laboratory with experience as a scientist and postdoctoral researcher. His research interests include multi-scale materials modeling, interface mechanics and engineering, and fabrication and mechanics of nanostructured materials and nucleation.

Qin Zhou, assistant professor

Zhou's research interests include developing novel platforms for synthesis, imaging, characterization and application of low-dimensional nanomaterials with emphasis on graphene-like two-dimensional materials and heterostructures.

2016-17



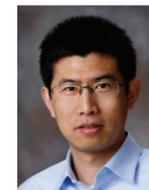
Jae Sung Park, assistant professor

Park's research interests encompass a wide range of fluid mechanics and techniques for energy-saving engineering and nanotechnology. Park also develops advanced computational algorithms to investigate problems in fluid mechanics.



Prahalada Rao, associate professor

Rao's research focuses on sensor-based monitoring and diagnosis of complex biophysical and manufacturing processes, including additive manufacturing, surface morphology and dimensional integrity monitoring, and design of wireless sensor networks and digital data acquisition.



Ruiguo Yang, assistant professor

Yang's research includes nanorobotics, bioMEMS and mechanobiology. His research group designs and develops micro- and nanosystems for cellular engineering to manipulate cells through delivery of biomolecules, and to study cell-to-cell interactions and mechanotransduction at the single cell level.

2017-18



Ryan Pedrigi, assistant professor

Pedrigi's work centers on mechanobiology, with research that studies how disturbances to tissue mechanical environments promote pathological cellular behaviors, the development of mechano-therapies and prognostic indicators of disease progression, and improving the design of implantable medical devices.

Ali Tamoyal, assistant professor

Tamoyal's work includes developing tools for solving medical challenges, and the design, fabrication and characterization of microsystems and fibrous biomaterials for emerging applications such as tissue engineering and drug delivery platforms.

2018-19



Eric Markvicka, assistant professor

A former researcher at Air Force Research Laboratory, NASA Jet Propulsion Laboratory, NASA Johnson Space Center and Honeybee Robotics, Markvicka's areas of interest include transforming how materials interact with the human body and the environment.



Keegan Moore, assistant professor

Moore's research interests include nonlinear dynamics, theoretical and experimental vibrations, system identification, non-reciprocal acoustics, and signal processing.

2019-20



Lucia Fernandez-Ballester, assistant professor

Fernandez-Ballester's research focuses on polymers, the rational design of materials and processing with optimal properties, and the interplay between molecular structure, processing, and final properties.



Mohammad Ghashami, assistant professor

Research interests include micro- and nanoscale energy transfer, near-field thermal radiation, energy conversion and recycling processes, nanoscale thermal transport, thermovoltaics, thermoelectrics, and thermionics.



Piyush Grover, assistant professor

Grover's research includes developing new analysis, control and optimization methods for nonlinear dynamical systems, and their application to several areas, including large-scale multi-agent robotics, fluid mechanics, structural mechanics/nonlinear vibration and astrodynamics.



Abdelghani Laraoui, assistant professor

Laraoui's primary research focuses on developing new quantum materials based on color centers in diamond, defects in wide-bandgap semiconductors, and two-dimensional materials for quantum sensing and information processing.



Kurt Palik, assistant professor of practice

Palik came to the College of Engineering with five years of experience in manufacturing engineering and process design, 15 years in design engineering and project management, and 18 years in engineering management.



2021-22

Nitesh Nama, assistant professor

Among his areas of research interest are biomechanics: image-based modeling of cardiovascular hemodynamics and mass transport, biomechanics of cardiovascular diseases, biomedical microfluidics of lab-on-a-chip systems, and the physics of microfluidic processes.

2020-21



Fanben Meng, assistant professor

Meng's research includes biofabrication and nanofabrication, 3D printing of living cells, soft biomaterials and functional nanomaterials for reconstruction of tumor microenvironments, and electrochemical biosensors for extracellular and intracellular detection.

TAYLOR KERL | B.S. '16

A native of Beatrice, Nebraska Kerl wanted to have a career in the aerospace industry. She started at the University of Arizona for that reason then transferred to Nebraska her sophomore year to major in mechanical engineering.

HIGHLIGHTS

- Joined the Aerospace Club, which had four payloads go up on NASA missions during her time at Nebraska
- Currently a systems engineer at Maxar Technologies in Palo Alto, California since 2017
- Serves as lead electric propulsion systems engineer for the NASA Psyche spacecraft that will embark on a deep-space mission to a metallic asteroid and has been chosen as a lead systems engineer for guidance, navigation and controls on a new, developmental modular bus scheduled to fly for the first time in 2021
- Received the 2020 Promise Award by Space and Satellite Professionals International (SSPI). The honor is given annually to the top three selections from among those chosen for SSPI's annual "20 under 35," a list of the top international aerospace professionals ages 35 and younger.



SENIOR DESIGN PROJECTS

Throughout the years, teams of seniors in the department have exhibited creativity and created projects that, many times, help solve problems in the short-term or the future. Below are examples of projects illustrating the depth and breadth of what students in mechanical engineering learn and use.

2016

DEVICE FOR THOSE WITH BRAIN INJURIES

Traditionally, senior capstone projects involve teams of students from the same program working together to solve a problem and design a solution. Derek Wallin was part of a team, but his capstone experience was not the norm. Wallin was the only mechanical engineer working on the design of a device that helped with the testing and rehabilitation of muscle systems in individuals who suffered brain injuries or progressive diseases of the nervous system. Being the lone mechanical engineer on the project helped Wallin learn about functioning in a cross-disciplinary team.



PARTNERING WITH UGANDA NONPROFIT

Six mechanical engineering students (Zachary Boyer, Maggie Clay, Dana Fuchs, Zachary Gardner, Collin Humphrey and Scott Schenkelberg) went extra miles during spring break. The students were part of senior capstone project working with a nonprofit organization in Uganda, where they developed a machine that would more efficiently flatten used drinking straws into material that can be weaved into bags, jewelry and other accessories.

2019

1964 CHEVY CORVAIR CONVERSION



Inspired by an electric vehicles course led by Don Cox, adjunct faculty in the College of Engineering, Eric Peterson joined a multidisciplinary senior design capstone team that converted a 1964 Chevy Corvaire from an internal-combustion engine to full electric power. The "Retro-Vair" was designed for a city commuter and can travel for at least 30 miles on a full charge. Top cruising speed is about 70 miles per hour. The students developed the project over three years and completed the build in the final 18 months.

2017

BEST SNOW REMOVAL DEVICE

Mechanical & Materials Engineering faculty Carl Nelson and Michael Sealy challenged their senior design capstone teams to compete against each other to develop a better snow-removal device. One team designed a large, deployable and retractable device resembling a heated blanket that would melt snow from above. The other team created a robot that blows snow off paved areas, then returns to a charging station much like robotic vacuums used in houses.

ENRICHMENT TOYS FOR GIRAFFES

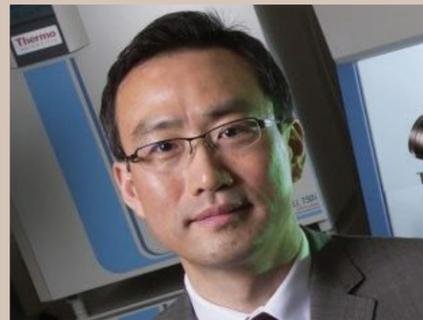
Students in Nebraska Engineering's Theme Park Design Group learned valuable lessons in fabrication and the engineering process by creating enrichment items - aka toys - to help keep giraffes at Lincoln Children's Zoo occupied and healthy.



MAJOR FACULTY ACHIEVEMENTS

From National Science Foundation and National Institute of Health funding to prestigious fellowships and fellow designations, the faculty in the Department of Mechanical & Materials Engineering are committed to solving challenges for Nebraskans and on a global scale. These highlights are a small representation of the accomplishments of the MME faculty between 2011 and 2021.

NSF CAREER AWARDS



STEM CELLS

Jung Yul Lim earned a five-year, \$430,554 CAREER award to understand how and why a type of stem cell morphs into fat cells with a focus on finding therapies that one day could be used to control obesity. May 2014

3D PRINTING

Prahalada Rao received a five-year, \$500,000 CAREER award to further research to develop a smart additive 3-D printing process that produces flawless metal parts more efficiently than current technology. April 2018



ATHEROSCLEROSIS

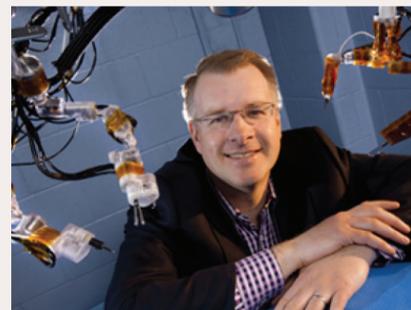
Ryan Pedrigi is using a five-year, \$543,000 CAREER award to lay the groundwork for a targeted, noninvasive treatment for atherosclerosis – plaque buildup in the inner lining of arteries – which is a primary driver of cardiovascular disease. March 2020

FELLOWSHIPS



ACOUSTICAL SOCIETY OF AMERICA

Joseph Turner was elected a 2014 Fellow of the Acoustical Society of America for his contributions to theoretical and experimental ultrasonics. June 2014



NATIONAL ACADEMY OF INVENTORS

Shane Farritor was chosen a Fellow of the National Academy of Inventors. At the time, he held 48 patents for surgical devices and railroad technologies and is co-founder of Virtual Incision Corp., developing miniaturized robots for surgical procedures. December 2016

NATIONAL ACADEMY OF INVENTORS

Robert “Bob” Wilhelm was named a Fellow of the National Academy of Inventors. Wilhelm, who is the University of Nebraska-Lincoln vice chancellor for research and economic development, was elected for his expertise as an engineer, inventor, and administrator. December 2018



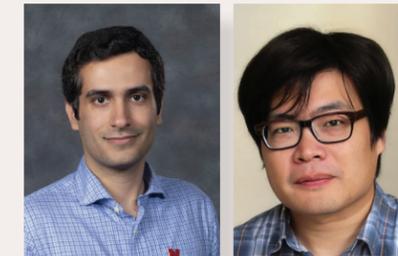
NGTC FACULTY FELLOWS

Michael Sealy and Cody Stolle were chosen to the inaugural cohort of Nebraska Governance and Technology Center (NGTC) Faculty Fellows. NGTC studies the ever-changing relationship between law and technology – how the law regulates technology and how technology affects the law. October 2020



UNL RESEARCH DEVELOPMENT FELLOWS

Mohammad Ghashami and Fanben Meng were chosen to the UNL Research Development Fellows Program, which enhances the grant success of the university’s early career faculty through proposal development best practices. October 2020



NATIONAL STRATEGIC RESEARCH INSTITUTE

Benjamin Terry was chosen to be part of Nebraska’s inaugural cohort of National Strategic Research Institute (NSRI) Fellows, which was created to amplify the University of Nebraska system’s research contributions to the Department of Defense and other federal agencies with national security missions. May 2021



OTHER PRESTIGIOUS AWARDS



AO FOUNDATION BERTON RAHN RESEARCH FUND PRIZE

Jung Yul Lim was awarded the AO Foundation’s 2015 Berton Rahn Research Fund Prize Award for his research into bone regeneration. July 2015



ASME/SME M. EUGENE MERCHANT MANUFACTURING MEDAL

K.P. Rajurkar was awarded the M. Eugene Merchant Manufacturing Medal from ASME/SME for “pioneering contributions to enhance the productivity of nontraditional machining processes used in automobile, aerospace and medical device manufacturing.” May 2018

FACULTY START-UPS

VIRTUAL INCISION

Virtual Incision, a Nebraska Innovation Campus-based medical device company founded by University of Nebraska faculty, announced the raising of \$20 million in Series B+ investment in February 2020.

The venture capital funding will support regulatory and clinical programs leading to commercialization of the company's surgical robot platform, called MIRA, which stands for "miniaturized in vivo robotic assistant." The unique robot aims to transform abdominal surgeries — particularly colon resections — from open, highly invasive surgeries into minimally invasive, laparoscopic procedures with significantly shorter recovery times.



The latest round of funding brings the total investments in Virtual Incision to more than \$50 million since 2006, when UNL Mechanical and Materials Engineering Professor Shane Farritor and University of Nebraska Medical Center surgeon Dmitry Oleynikov founded the company. John Murphy of Pleasanton, California, joined as CEO in 2010.

Last year, the company expanded its headquarters at NIC, moving into a facility that integrates research and development, quality control, assembly and test procedures – a first-of-its-kind in Nebraska.

- by Tiffany Lee, Research and Economic Development

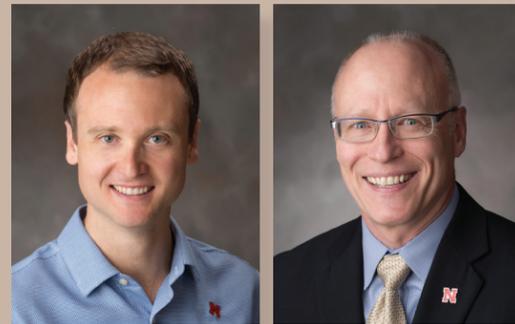
AGRICULTURAL FLAMING INNOVATIONS

Agricultural Flaming Innovations, a startup company co-founded by a Nebraska Engineering faculty member and a doctoral alumnus, was honored as the Startup Company of the Year at the 2020 NUtech Ventures Innovator Awards.

The company was founded by George Gogos, professor of mechanical and materials engineering, and Chris Breuning, who received a doctorate in mechanical and materials engineering, along with Stevan Knezevic, professor of agronomy and horticulture.



The Agricultural Flaming Innovations team developed equipment that uses heat for certified organic weed control. When mounted to a tractor, it directs propane-fueled flames at weeds, which then wilt and die – leaving crops unaffected.



ASME/SME NIBIB R21 TRAILBLAZER AWARD

Ryan Pedrigi and Joe Turner are part of a team awarded the NIBIB R21 Trailblazer Award for work on a research project titled, "Ultrasound as a mechanotherapy for endothelial cell dysfunction." September 2020



NSF FELLOWSHIP

Jae Sung Park earned a \$177,433 fellowship from the NSF to use a computational and mathematical approach to predict turbulent dynamics between ordered flow structures in a collaborative research project with the University of Minnesota. August 2018

TYLER WORTMAN | B.S. '08

Tyler Wortman walked on to the Nebraska football team in 2004 and was a starting linebacker as a senior. He graduated with a bachelor's degree in mechanical engineering in 2008.

HIGHLIGHTS

- Credits Lederer Professor of Engineering Shane Farritor, whose research includes robotics, artificial intelligence and entrepreneurship, for teaching him valuable lessons throughout college as well as during his early professional career
- Later went on to work in Farritor's lab as a graduate student, was part of a team building robots, exploring everything from aerospace engineering to biomedical sciences. With Farritor's encouragement, Wortman worked his way into the Ph.D. program at MIT
- Started his career journey working in biotechnology in a small startup and now is a senior manager at PillPack, designing and building pharmacy fulfillment centers for Amazon Pharmacy



NEW SPECIALIZED LABORATORIES

NEAT LABS - ADDITIVE MANUFACTURING



The Nebraska Engineering Additive Technology Labs, added to the College of Engineering in 2018, feature three hybrid printers that can add or subtract a variety of materials — from plastics to titanium — to create complex 3D designs.

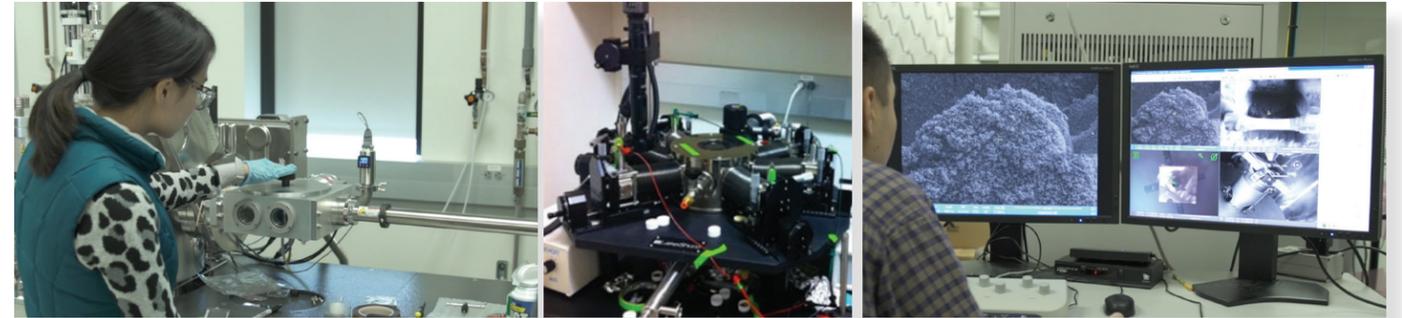
The purpose of the NEAT Labs is to provide a state-of-the-science regional hub for additive manufacturing technology and to create opportunities for collaborations among academic research and industry.

Located in Scott Engineering Center, the lab allows Husker researchers and students to create projects using highly reactive materials. This process accommodates for creation of intricate geometries, such as lattice structures and complex internal cooling channels for aerospace applications.

The printing possibilities could transform many industries, especially paired with the quality control systems development research of Prahalada Rao, assistant professor of mechanical and materials engineering and recent winner of a National Science Foundation CAREER Award. He is working to perfect the 3D printing process, focusing on creating new methods that generate flawless parts — from replacement knees to airplane turbines — every time.

“Nebraska is positioning itself as a hub for additive manufacturing in a variety of industries, including agricultural equipment, manufacturing and biomedical,” Rao said. “If this research is successful, it will have a huge impact on how quickly and reliably we can turn around new products and design.”

NANO-ENGINEERING RESEARCH CORE FACILITY



Located at the 32,000 square foot Voelte-Keegan Nanoscience Research Center on UNL’s City Campus, the new Nano-Engineering Research Core Facility (NERCF) was created as a shared-user facility that houses state-of-the-art research instrumentation valued at nearly \$4.5 million to position the University and state of Nebraska at the forefront of advance materials manufacturing and nano-engineering.

NERCF enhances research capacity and quality by providing in-house nanofabrication and nanocharacterization facilities open to use by faculty across the University of Nebraska system. The equipment and operations are funded in part by the Nebraska Research Initiative and the UNL Office of Research and Economic Development.

Equipment available in NERCF enhances research capacity and quality by providing in-house nanofabrication and nanocharacterization technology, including a Stratys Objet500 Connex3 3D Printer, a Spark Plasma Sintering system, FEI Helios dual-beam scanning electron microscope/focused ion beam mill and an Asylum Research MFP-3D-Bio Atomic Force Microscope, and an Anasys Instruments afm+.

“This facility was developed to provide area researchers and industry with multi-scale equipment that otherwise would not be available or would have to be purchased at extreme costs,” said Joseph Turner, Robert W. Brightfelt Professor of Mechanical and Materials Engineering. “It is the intent of this facility to become a regional hub for nano-engineering of materials and devices.”

FOCUS ON ALUMNI

LUZ SOTELO | Ph.D. '21 | Graduate Research Fellow

Luz Sotelo knows what it means to stay busy – doctoral research, course work, teaching and service activities. That level of involvement has led to Sotelo being recognized as one of the nation’s top engineering graduate students.

HIGHLIGHTS

- Born in McAllen, Texas and raised in Leon, Guanajuato, Mexico
- Graduated from the University of Texas Rio Grande Valley with a B.S. in mechanical engineering in 2016; named Mechanical Engineering Undergraduate Student of the Year
- Has received multiple institutional and national fellowships, including the 2021 NASEM NRC RAP postdoctoral fellowships, the 2019 NSF GRIP internship fellowship, and the 2018 National Science Foundation Graduate Research Fellowship
- Awards include the 2019 Hispanic Engineering National Achievement Awards Graduate Student Leadership Award from Great Minds in STEM and the 2020 National SHPE STAR Award-Graduate Role Model



FOCUS ON ALUMNI

ANDREA ARGUELLES | Ph.D. '16

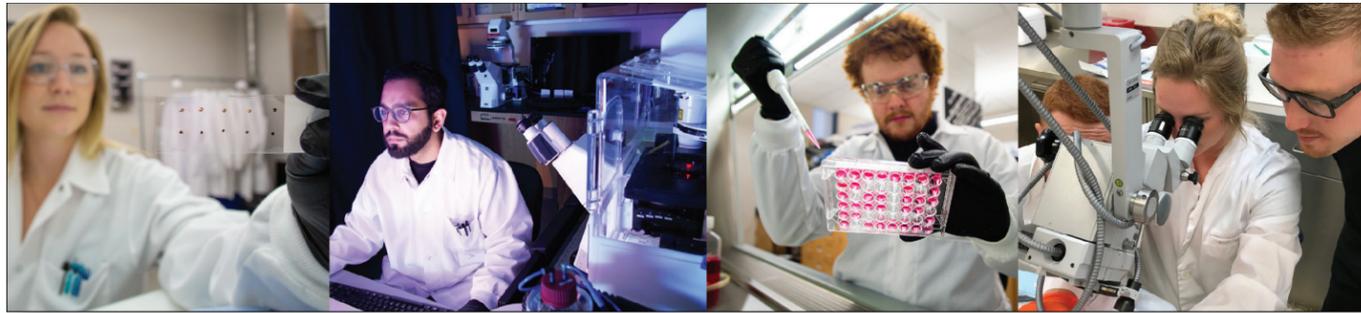
Andrea Arguelles joined Penn State University in 2018 as an assistant professor in Engineering Science and Mechanics. She was born and raised in Venezuela and moved to the U.S. in 2007.

HIGHLIGHTS

- Obtained her B.S. (2011) and M.S. (2012) in mechanical engineering from the University of Texas Rio Grande Valley
- Received her doctorate degree in mechanical engineering and applied mechanics from the University of Nebraska-Lincoln
- Notes that she loves interacting with students on a daily basis and potentially impact their trajectory like many mentors throughout her life have impacted her.
- Research interests involve analytical and experimental studies of wave propagation and scattering with the overarching objective of advancing ultrasonic testing toward cutting-edge material characterization



TRANSLATIONAL MECHANOBIOLOGY LAB



From tissue to genome and benchtop to bedside: research in the Translational Mechanobiology Lab (TML) employs techniques in biomechanics, cell and molecular biology, histology, imaging, regenerative medicine, and tissue engineering to explore the influence of biomechanical (and biochemical) stimuli in modulating normal and pathological cell behaviors. The goal is to make discoveries in mechanobiology that provide new avenues of translation to the clinic.

Primary areas of research include:

- **Mechanotherapy** - studying the role of mechanobiology in atherosclerosis progression and regression
- **Nanomedicine** - examine the use of nanoparticles with DCE-MRI as a noninvasive diagnostic of atherosclerotic plaque phenotype
- **Cell Engineering** - exploring how mechanical stimuli generated from ultrasound can be used to control cell behaviors
- **Tissue Modeling** - characterizing the mechanical environment of tissues during normalcy, disease, and after implantation of medical devices

Principal Investigator is Ryan Predigi, assistant professor, with MME collaborators Joseph Turner, professor, and Ruiguo Yang, assistant professor. Also serving as collaborators are Forrest Kievit, assistant professor of Biological Systems Engineering, and Yiannis Chatzizisis, associate professor of internal medicine at the University of Nebraska Medical Center.

In September 2020, the team was awarded the NIBIB R21 Trailblazer Award. The award was entitled: "Ultrasound as a mechanotherapy for endothelial cell dysfunction."

"ELISSACHAIRS" WINS ENGINEERING PITCH COMPETITION IN 2019



2019 senior mechanical engineering major Mary Radke understands transportation barriers faced by people who use wheelchairs. Her family took 29-hour road trips to California: flying meant renting a car and most rental cars don't accommodate the type of wheelchair her sister, Elissa, needs.

She spent her fall semester developing a better solution: a wheelchair that breaks down to fit inside any vehicle, while allowing wheelchair users to remain in the same seat during the loading process.

Radke's design, dubbed "Elissachairs," won first place in the undergraduate category at the December Engineering Pitch Competition. The competition was hosted by the College of Engineering, NUtech Ventures and the National Strategic Research Institute and featured business pitches from 16 teams.

NUTECH VENTURES INNOVATORS

NUtech Ventures is the nonprofit technology commercialization affiliate of the University of Nebraska, serving the Lincoln and Kearney campuses. Their mission is to protect and license the university's intellectual property. They also promote entrepreneurship through programming and sponsored events, such as the Innovator Awards, including to the following faculty from the MME department.

2016

Startup Company of the Year *Virtual Incision*

Co-founded by Shane Farritor, professor of mechanical and materials engineering
Video: <https://mediahub.unl.edu/media/6391>



Breakthrough Innovation of the Year

Former MME faculty, Jinsong Huang, Haotong Wei and Wei Wei
Video: <https://www.youtube.com/watch?v=L1ld1t9jnk4>

2018

Breakthrough Innovation of the Year

Ben Terry, associate professor of mechanical and materials engineering
Video: <https://mediahub.unl.edu/media/10127>



2019

Prem S. Paul Innovator of the Year

Shane Farritor, professor of mechanical and materials engineering
Video: <https://mediahub.unl.edu/media/11688>

2020

Startup Company of the Year

Agricultural Flaming Innovations - Co-founded by George Gogos, professor of mechanical and materials engineering
Video: <https://mediahub.unl.edu/media/14870>



2021

Emerging Innovator of the Year

Eric Markvicka, assistant professor of mechanical and materials engineering.



Breakthrough Innovation of the Year

Midwest Roadside Safety Facility and Traffix Devices, Inc.

Cody Stolle, research assistant professor of mechanical and materials engineering, is part of the Midwest Roadside Safety Facility team.



STUDENT ORGANIZATIONS

AEROSPACE CLUB

The UNL Aerospace Club is a student-led organization consisting of six different design teams: Design Build Fly (DBF), RMC (also referred to as Lunabotics), Rocketry, Rocketry Project 100k, RockSat, and Unmanned Aerial Vehicles (UAV). The Aerospace Club is open to UNL students of any discipline.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

As members of this professional society, students are given the opportunity to stay informed regarding recent developments in the field of mechanical engineering through publications, field trips and meetings.

HUSKER MOTORSPORTS: FORMULA SOCIETY OF AUTOMOTIVE ENGINEERS

Husker Motorsports challenges students to design and build a formula-style racing car from the ground up. The car competes with more than 250 universities internationally in the Formula SAE Competition.



HUSKER RACING: BAJA SOCIETY OF AUTOMOTIVE ENGINEERS

Baja SAE features three regional competitions that simulate real-world engineering design projects and related challenges. Students are tasked to design and build an off-road vehicle that will survive severe punishment of rough terrain.

THEME PARK DESIGN GROUP

The Theme Park Design Group offers students opportunities to work on projects, competitions, and network within the themed entertainment industry. They have also created enrichment items for local zoo animals.

VEX U ROBOTICS CLUB

The University of Nebraska-Lincoln VEX U Robotics Club is an inclusive, student-driven organization focused on teaching engineering concepts through a hands-on, competitive team experience.

PI TAU SIGMA

There are 129 active chapters of this honorary fraternity at universities in almost every state of the U.S. Objectives include fostering high ideals in the engineering profession, supporting departmental activities, and developing leadership and citizenship.



MECHANICAL ENGINEERING MENTORSHIP PROGRAM

MEMP is a student-led program whose purpose is to facilitate the success of undergraduate mechanical engineering students at UNL through peer mentorship, networking, and citizenship.



NEBRASKA HALL: home to the Department of Mechanical & Materials Engineering