



2025 ANNUAL REPORT



IDEA
EPSCOR
NEBRASKA

Established Program to Stimulate Competitive Research



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Established Program to Stimulate Competitive Research
Institutional Development Award Program

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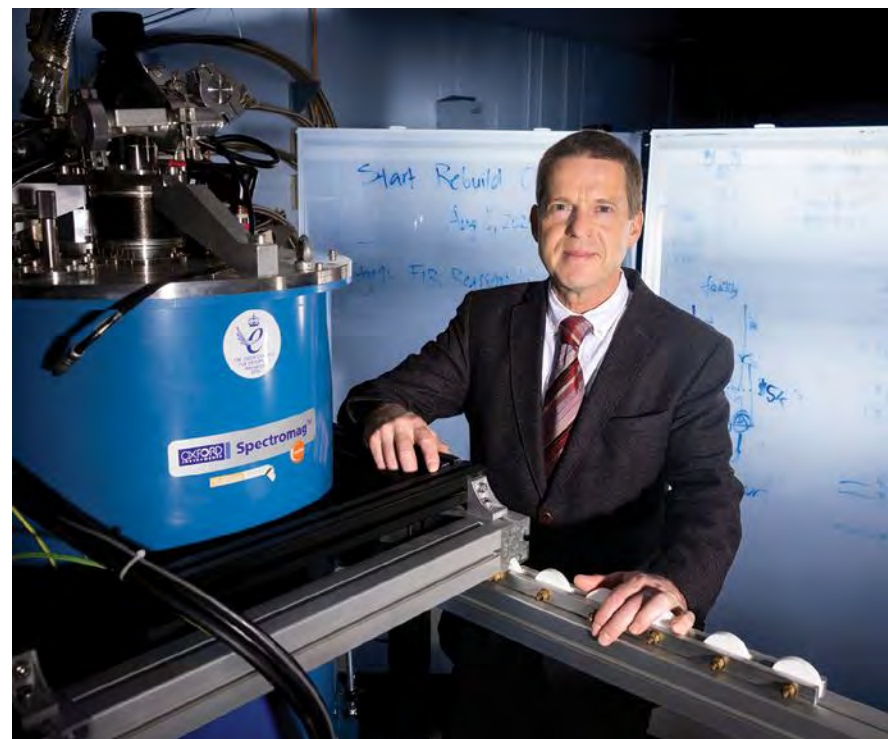
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▲ Nebraska EPSCoR congratulates **Mathias Schubert**, a longtime NSF-funded researcher and professor with the University of Nebraska-Lincoln (UNL) College of Engineering, who was elected to the 2025 fellows of the National Academy of Inventors. Schubert works on Nebraska's Emergent Quantum Materials and Technologies (EQUATE) collaboration, and was on the leadership team with a prior EPSCoR project: Nanohybrid Materials & Algal Biology (2010-16). Schubert is an internationally-active leader in optical ellipsometry.

Photo by Jordan Opp, University Communication and Marketing.

Nebraska's Established Program to Stimulate Competitive Research (EPSCoR) office is funded by the National Science Foundation via OIA-2044049. Any opinions, findings, and conclusions or recommendations expressed in this material do not necessarily reflect the view of the National Science Foundation.

2025 DIRECTOR'S REPORT



SCIENTIFIC ADVANCES ARE OFTEN measured by papers published, new inventions, and grant dollars. These quantifiable metrics are used worldwide to tout researcher status and institutional rankings. However, another indicator of scientific successes receiving far less publicity arises in the everyday efforts of elementary, middle and high school science and math teachers. These dedicated educators are found in every school system in every county throughout the state, and once

a year they get together to share ideas and best practices at the annual conference of the Nebraska Association of Teachers of Science (NATS).

For more than 60 years the NATS conference has been held at various locations, and in October 2025 it was held in Lincoln for the first time in decades. Nebraska EPSCoR and its NSF-funded Emergent Quantum Materials and Technologies (EQUATE) program sponsored this meeting because of the critical role that K-12 science teachers play in our nation's research and development enterprise. The meeting was attended by more than 170 teachers and Nebraska EPSCoR covered the registration and lodging costs for nearly 100 teachers from rural Nebraska.

After a full day of meetings at UNL's Carolyn Pope Edwards Hall on October 17, the group moved to Morrill Hall in the evening where EQUATE faculty and their graduate students demonstrated quantum lessons and activities that the teachers could take back to their school districts and classrooms. This year the field of quantum mechanics turned 100 years old. So, as the world celebrated 2025 as

the International Year of Quantum, Nebraska's science teachers were shown various ways of bringing this world-changing science back to their students.

The 2025 NATS conference was one of the most gratifying science education meetings that I have ever attended. Nebraska EPSCoR will continue to support future NATS meetings so that Nebraska's science teachers will have the tools they need to continue to do their excellent work. ■

Matthew T. Andrews

▼ Paul Timm (left), 2021 Nebraska Teacher of the Year (with Lyons-Decatur Schools), and Lindsey Wilson (middle), 2025 Nebraska Teacher of the Year (with Bennington Public Schools) met with Nebraska EPSCoR Director **Matt Andrews** (right) during the Nebraska Association of Teachers of Science Conference: Oct. 17 at the University of Nebraska-Lincoln.



STATE COMMITTEE

THE NEBRASKA EPSCOR STATE Committee is a 17-member group, appointed by the governor, to oversee Nebraska EPSCoR’s mission. In 2025, the State Committee had the following member changes:

APPOINTED | NEBRASKA EPSCOR WELCOMES THESE NEW MEMBERS OF ITS STATE COMMITTEE!



George Burba
Science and Strategy Fellow
LI-COR Environmental



Eva Franke Schubert
Professor, Dept. of Electrical and Computer Engineering
University of Nebraska-Lincoln (UNL)



Justin Schroeder
Deputy Commissioner
Nebraska Department of Labor



Josie Gatti Schafer
Director and Senior Research Associate
Center for Public Affairs Research
University of Nebraska at Omaha

DEPARTING | NEBRASKA EPSCOR THANKS THESE STATE COMMITTEE MEMBERS FOR THEIR SERVICE!

- **Nisha Avey**, former Small Business Assistance Manager, Nebraska Department of Economic Development
- **Jerry Hudgins**, Professor and Chair, Dept. of Electrical and Computer Engineering, University of Nebraska-Lincoln
- **Lyle Middendorf**, retired from a 49-year career with LI-COR Biosciences
- **Roni Reiter-Palmon**, Varner Professor, Department of Psychology, University of Nebraska at Omaha

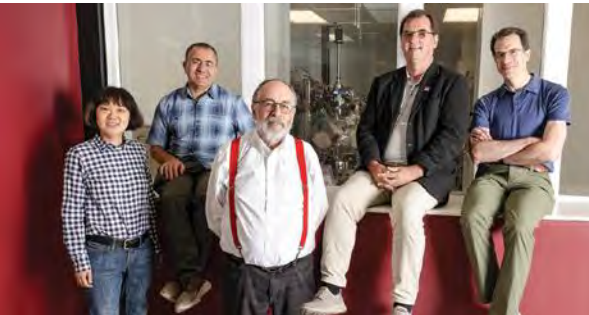
RE-APPOINTED | NEBRASKA EPSCOR APPRECIATES THESE STATE COMMITTEE MEMBERS EXTENDING THEIR SERVICE!

- **Shane Farritor**, David B. and Nancy K. Lederer Professor, Dept. of Mechanical & Materials Engineering, University of Nebraska-Lincoln
- **Bryan Kuntz**, President, Intellicom (Kearney, NE)
- **Yuri Lyubchenko**, Professor, Department of Pharmaceutical Sciences, University of Nebraska Medical Center
- **Julie Strauss-Soukup**, Associate Vice Provost for Research and Scholarship, Creighton University

NSF RII TRACK-1: EQUATE

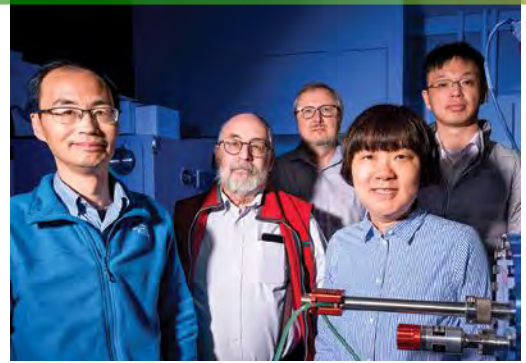
NEBRASKA’S EMERGENT QUANTUM MATERIALS AND TECHNOLOGIES (EQUATE) collaboration is funded by the U.S. National Science Foundation via Nebraska EPSCoR. The five-year, \$20 million project includes 22 faculty and currently 50 student and postdoctoral researchers. In late 2025, EQUATE surpassed 225 research publications and had graduated 15+ graduate and undergraduate students.

EQUATE’s main research goal is to bring Nebraska to the forefront of scientific discoveries and innovation in the design, synthesis, growth, and use of materials and hybrid systems with large-scale quantum properties for applications in sensing, metrology, communication, and information processing. As this grant is scheduled to conclude in May 2026, its focus is sustainability: gaining new funding to extend the research expertise and contributions of EQUATE’s three Focused Research Group (FRG) teams.



NSF FUNDS COLLABORATION: Harnessing Artificial Magnetic Semiconductors in the Flatland: A team of Kansas and Nebraska researchers applies their talents in synthesis, nanofabrication, characterization, sensing and theory to advance the science and device applications of

artificial two-dimensional magnetic materials. This NSF Focused EPSCoR Collaboration (FEC) work will aid design of next-generation 2D magnets and offer new quantum states and applications, to deliver devices with unique functionalities ranging from lithium-ion batteries, flexible electronics, wearable devices, sensors and functional membranes. The four-year, nearly \$4 million project began in August 2025 and brings \$1.8 million in new NSF funding to Nebraska. EQUATE leaders in this “flatland” materials project are: **Xia Hong, Abdelghani Laraoui, Peter Dowben, and Christian Binek.**



HONG HELMS NEW .5M DOE EPSCoR award, advancing quantum research: The U.S. Department of Energy’s Established Program to

Stimulate Competitive Research (DOE EPSCOR) awarded \$2.5 million to a team including EQUATE researchers **Xiaoshan Xu, Peter Dowben, Evgeny Tsymbal, Xia Hong, and Zuocheng Zhang.** with the University of Nebraska-Lincoln Department of Physics and Astronomy.

The new, two-year project, *Emergent Interface Phenomena Enabled by Ferroelectric Oxide Thin Films and Membranes*, also includes South Dakota School of Mines and Technology faculty.

Hong, the project’s principal investigator (PI), said the goal of the new collaboration is to “design, realize, and control a range of emergent interface phenomena in ferroelectric oxide thin films, membranes, and heterostructures.” She said the work will focus on ferroelectric perovskite oxides: materials with electric fields controlled at the nanoscale level with abilities to change quantum properties. Manipulating electrical fields in these two-dimensional materials could reshape their structures in ways not seen before.

The related structures, pairings and layering could reveal new quantum behaviors to researchers: to transform electronics and also yield breakthroughs in energy use and quantum computing. ■



UNL physicist **Evgeny Tsymbal** leads a new project for NSF’s *Designing Materials to Revolutionize and Engineer Our Future* program. With \$2 million in funding, Tsymbal and an international team will apply theory, data science, and artificial intelligence in advanced synthetic and characterization techniques to discover novel materials and optimize their properties.



▲ Students in the classroom of Norris High School teacher **Katy Dornbos** experience pendulum art with UNL's **Robert Streubel**.

Streubel Earns NSF CAREER Award

ROBERT STREUBEL, ASSISTANT PROFESSOR of physics at the University of Nebraska-Lincoln and EQUATE researcher, earned five years of funding from the National Science Foundation (NSF). His grant of nearly \$850,000 is among NSF's prestigious CAREER Awards.

Streubel's new project, *Short-Range Order as Design Parameter for Topological Magnetism*, began in September 2025. The research aims to identify factors that affect magnetic properties of non-crystalline solid-state materials, for possible use in future microelectronics. According to Streubel, the short-range order of disordered atoms in magnetic metals and non-magnetic semiconductors impacts the onset of magnetism and resistivity in how magnetic films function. His team will investigate the potential of manipulating these materials and measuring outcomes.

A facet of this work relates to neuromorphic computing: design of computer hardware and software to mimic the structure and function of the human brain, using artificial neurons and synapses. This exploration may yield computing that's more energy-efficient and with faster data handling for tasks like pattern recognition and real-time learning.

With this support, Streubel will also:

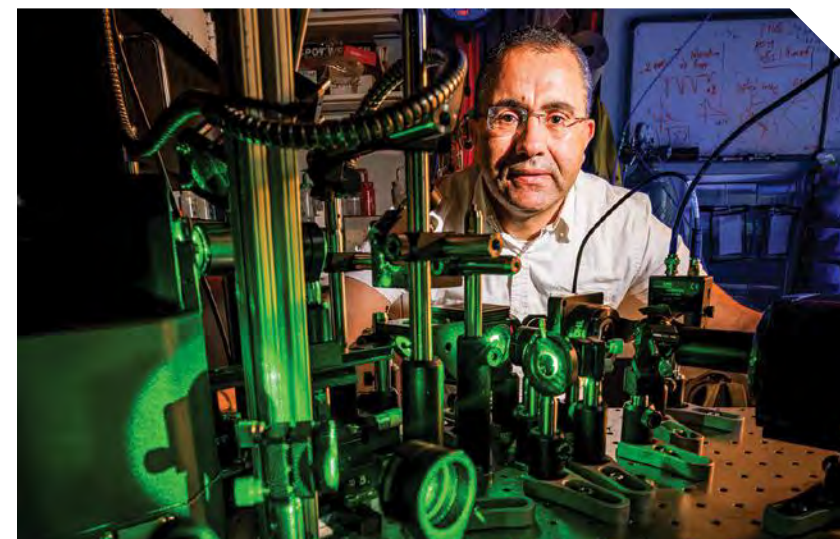
- Extend an outreach program integrating physics and art visualization to engage high school students, by growing youth curiosity in fundamental physics
- Develop a new graduate course on advanced characterization of materials, to address real world problems
- Provide mentoring to high school seniors, undergraduates, and graduate students. ■

EQUATE Researchers Gain NSF EPSCoR Fellowships

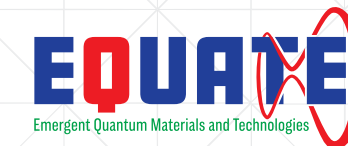
TWO EQUATE SCIENTISTS RECEIVED EPSCoR Fellowship awards from the National Science Foundation (NSF) in 2025. These projects also connect to their work with the NSF-funded Nebraska's Emergent Quantum Materials and Technologies (EQUATE) research collaboration.

Abdelghani Laraoui, assistant professor with the University of Nebraska-Lincoln (UNL) Department of Mechanical and Materials Engineering (MME), gained \$300,000 in NSF funding for several Husker graduate students to add quantum research skills in visits at Pennsylvania State University (Penn State). This EPSCoR Research Fellows team experience will pursue *Plasmonic Cavity Nanostructures to Boost Single Photon Emission from Multilayered Hexagonal Boron Nitride*.

This research aims to fabricate metallic nanocavities integrated with hexagonal boron nitride (hBN) flakes, with defects acting as nanoscale single photon emitters (SPEs) at room temperature. Laraoui said this project could promote the performance and efficiency of new quantum device development by providing key understanding of rich quantum phenomena at the nanoscale level. As host site, Penn State offers high-end facilities for the Nebraska students to practice cutting-edge research in quantum optics and applied aspects of quantum communication, plus enhance skills to boost America's high-tech workforce development with new quantum technologies.



Nebraska EPSCoR 2025 Annual Report



Yanan "Laura" Wang, assistant professor with UNL's Electrical and Computer Engineering Department, earned a \$300,000 NSF EPSCoR Research Fellowship to study Integrated Photonics, encompassing functional devices like light-emitting diodes (LEDs) and lasers, waveguides, filters, modulators, and photodetectors miniaturized onto a single chip. These technologies make impacts on signal sensing, processing, and communication. Wang's EPSCoR Research Fellows project focuses on a family of emerging wide-bandgap crystals--layered cesium lead halide perovskites--and explores their potential in integrated photonics. She and her graduate student will carry out the project via extended visits and collaboration with researchers at the National Institute of Standards and Technology (NIST) in Maryland. Wang, a two-time Seed-funded researcher with EQUATE, said she looks forward to working in the world-class cleanroom and nanofabrication facilities at NIST, where she aims to enhance long-term relationship between UNL and NIST, to benefit Nebraska's quantum research and education landscape. ■





OUTREACH

Annual EQUATE Conference Brings Quantum to Nebraska Teachers

FUNDED BY THE EQUATE project, Nebraska EPSCoR conducts an annual statewide gathering: the Nebraska Research & Innovation Conference (NRIC). As part of EQUATE's final year, which is also the International Year of Quantum, the NRIC event joined forces with a wider community: the annual fall conference of the Nebraska Association of Teachers of Science (NATS).

NATS hosted its annual fall conference at the University of Nebraska-Lincoln (UNL) for the first time in decades. EQUATE scientists and engineers added quantum phenomena to sessions held at Carolyn Pope Edwards Hall and at an evening networking event, “Night at the Museum,” in Morrill Hall.

On Friday, October 17, more than 170 teachers learned the “spooky science” of quantum physics:

- Lab tour – led by **Abdelghani Laraoui**, associate professor of mechanical and materials engineering;
- Demonstrations of quantum lessons and classroom activities developed by **Sehrish Iqbal**, **Sina Khayam**, **Himanshu Mavani**, **Gauthami Viswan**, and **YuanYuan Zhang** (EQUATE-supported graduate students in UNL Engineering and Physics programs); and
- Presentations by Young Nebraska Scientists and the Nebraska Center for Materials and Nanoscience.

EQUATE funding via Nebraska EPSCoR helped cover entry fees and travel costs for dozens of teachers statewide to attend the NATS conference for valuable professional development to benefit their students. ■

(Clockwise from top left) Nebraska teachers learn about quantum materials research from EQUATE graduate student **Sehrish Iqbal** during a tour of UNL's Laraoui Lab. During a Night at the Museum event, teachers react to an activity led by graduate student **YuanYuan Zhang** from UNL's Hong Lab. Harvard (Neb.) Schools' **Jodi Bahr** gives two thumbs up during the annual NATS conference in October 2025. EQUATE Scientific Director **Christian Binek** tries pipetting with Southeast Community College representatives. EQUATE's **Steve Wignall** shares a range of teacher training funded by Nebraska EQUATE.



TEACHER TRAINING: EQUATE Support Develops Expertise

ALONG WITH PHYSICISTS AND engineers, another strength of Nebraska’s Emergent Quantum Materials and Technologies (EQUATE) team is former high school physics teacher, **Steve Wignall** (*top, middle*). He handles outreach at the University of Nebraska-Lincoln with the Nebraska Center for Materials & Nanoscience / Nebraska Nanoscale Facility and, for more than a decade, Wignall has led summer programs for science teachers to join university research labs and bring back hands-on experiences to their classrooms. The programs include:

- **Nanoscience Summer Institute for Middle School Teachers (NanoSIMST)**, with a possible \$1,000 stipend for program completion and classroom implementation; and
- **Research Experience for Teachers (RET)**, a six-week cohort involving Zoom sessions and connection to researchers at university labs, for a stipend of \$8,000 plus travel and supplies.

Several 2025 RET participants described their experiences at the 2025 NATS conference. The presenters were **Lynette Frey** (*top, far left*), program chair of Manufacturing Engineering Technology at Southeast Community College (SCC), Milford campus; **Kendra Sibbernsen** (*top, second from right*), physics instructor with Metro Community College (MCC) in Omaha, **David Schmitter** (*top, second from left*), Administrator for the Advanced Technologies and Skilled Trades Division at SCC; and **Brian Hageman** (*top, far right*), who teaches at Lincoln High School.

- Frey worked with UNL MME’s Eric Markvicka on Active Mixing for Dual Extrusion Ink Writing, with materials that could serve in design of stretchable circuits.
- Sibbernsen worked with UNL’s Craig Zuhlke and tested Femtosecond Laser Surface Processing (FLSP) samples in liquid nitrogen, along with timing of cool-down affecting fuel lines in microgravity for space flight.
- Schmitter worked with Jeff Shield, UNL Mechanical & Materials Engineering (MME) department chair; working with graduate students, he prepared samples and measured aspects from scanning electron microscope (SEM) images, plus assisted in microhardness testing of materials.
- Hageman worked with UNL MME’s Ryan Pedrigi and investigated how long-term low-intensity, pulsed ultrasound (LIPUS) affects endothelial cell gene expression, compared to normal flow. He focused on developing a protocol for fabricating custom, low-profile ultrasound patches, plus characterized acoustic output across a range of parameters to gauge acoustic patterning phenomena.

Participants praised the opportunities for collaborative work with other teachers outside their district, ideas on labs and activities for their classrooms, and well-organized workshops.

Wignall and colleague **Jenna Huttenmaier** also guide a High School Interns program with support from the J.A. Woollam Co., the Lincoln-based manufacturer of ellipsometers used in research labs around the world. For Wignall, summers are busier than ever while helping the next generation of Nebraska science teachers gain extraordinary learning to benefit their students. ■





New UNL Food Science Camps Whet the Appetite for STEM

APPLES AND CHOCOLATE WERE the themes for two new summer experiences with the UNL Department of Food Science and Technology (FDST), via the Young Nebraska Scientists program. The STEM in Your Apple Camp developed through a partnership with the Richard and Laurine Kimmel Foundation, with multiple days for high schoolers to tour orchards in Nebraska City and develop new products at Nebraska Innovation Campus. The Science of Chocolate camp was a day-long session led by FDST professors **Jayne Stratton** and **Andreia Bianchini-Huebner** (*top right, center*). The food scientists' connections – to the Kimmel organization and to U.S. Department of Agriculture labs with cacao growers in tropical areas – enhanced the learning and processes for making delicious treats. ■



- ▲ Participants enjoy a YNS camp focused on the science of chocolate.
- ▲ Apple camp activities were supported with funding from the Richard and Laurine Kimmel Foundation, including visits to the Kimmel Orchards site in southeast Nebraska.



FIRST AWARDS

With support from the U.S. National Science Foundation (NSF), Nebraska EPSCoR conducts its FIRST Awards: to help the state's early-career scientist-educators prepare to pursue initial large research funding opportunities from federal agencies. When FIRST Award Recipients apply for major grants such as the NSF CAREER Award, many credit the value from funding and expert scientific reviews via the FIRST Award process.

IN 2025, two FIRST Award recipients earned NSF CAREER Awards:



Kwangsung Oh, UNO

Kwangsung Oh (*left*), an assistant professor in the University of Nebraska at Omaha (UNO) College of Information Science & Technology (IS&T) Department of Computer Science, received a Faculty Early Career Development (CAREER) Award from the National Science Foundation. Oh earned his FIRST Award in 2023.

Oh's five-year, \$550,950 CAREER Award grant will support research into geo-distributed data analytics (GDA): a technology

that helps businesses, scientists, and organizations process large-scale data across multiple cloud platforms.

Many existing GDA systems assume wide area network (WAN) bandwidth is static and limited, leading to inefficient data processing. Oh's work aims to develop a lightweight framework that dynamically adjusts WAN bandwidth based on GDA workload demands — boosting efficiency without increasing costs. His research could yield: faster, more efficient data processing for businesses and researchers; lower costs for companies using cloud and edge computing; and enhanced STEM education opportunities for students at UNO. ■

▲ Source: University of Nebraska at Omaha

Christine Wittich, UNL

WITH A \$615,000 CAREER grant from the National Science Foundation (NSF), **Christine Wittich** (*right*), assistant professor of civil and environmental engineering at the University of Nebraska-Lincoln, is subjecting steel grain bins to simulated natural disasters to better understand what brings them down. Her research could lead to upgrading construction standards; strengthening grain

bins and other rural infrastructure can also improve community resilience, support the nation's agricultural economy, and help protect national and global food security.

Wittich was a 2018 recipient of Nebraska EPSCoR's FIRST Award. Her CAREER-funded project took shape in 2020 when the most damaging series of thunderstorms in American history hit Iowa, causing \$11 billion in damage and destroying 57 million bushels of stored grain.

To better understand grain bin vulnerability, Wittich and her team use numerical modeling and large-scale experiments, among other methods. The team is testing bins against Florida International University's Wall of Wind and on Nebraska's Scott Engineering Center's seismic shake table.

Wittich is also creating opportunities for citizens to contribute research data following disasters, and outreach programs to encourage rural students to pursue engineering careers. ■



▲ Source: UNL College of Engineering

Students Benefit from Small College/University Undergraduate Research Experience Funding

THE 2025 RECIPIENTS OF Nebraska EPSCoR’s Small College/University Undergraduate Research Experiences awards span a range of settings and topics. Each award, up to \$5,000 per proposed project, is funded from the National Science Foundation award #OIA-2044049, Nebraska’s Emergent Quantum Materials and Technologies (EQUATE) collaboration. Among the successful applicants—limited to faculty from Nebraska higher education institutions with <\$8 million annual research expenditures—a common factor is engaging undergraduates in a variety of meaningful research

- **Kimberly Carlson**, University of Nebraska at Kearney, Biology, *Determination of the Nora virus receptor in Drosophila melanogaster*
- **Krista Forrest**, University of Nebraska at Kearney, Psychology, *Creating stimuli for studying jurors’ perceptions of ASD suspects in interrogations*
- **Catherine Johnson**, University of Nebraska at Kearney, Biology, *Impact of androgen receptor-targeted prostate cancer therapy on osteoblast differentiation*
- **Jayne Jonas-Bratten**, University of Nebraska at Kearney, Biology, *Effects of soil restoration on soil seedbanks in Waterfowl Production Areas (WPAs) of the Rainwater Basin of Nebraska*
- **Benjamin Newton**, Central Community College, Environmental Sustainability, *Nebraska native plants and pollinator visitation*
- **Sudha Shanmugam**, Little Priest Tribal College, Biology, *Antibacterial effects of different plant extracts from the Winnebago Reservation of Nebraska, ideal for therapeutic use* ■



Digging into Geology Research

JASON PRICE, ASSOCIATE PROFESSOR with Wayne State College’s (WSC) Department of Physical Sciences and Mathematics, gained grant funding from Nebraska EPSCoR to help support earth science research involving WSC undergraduates.

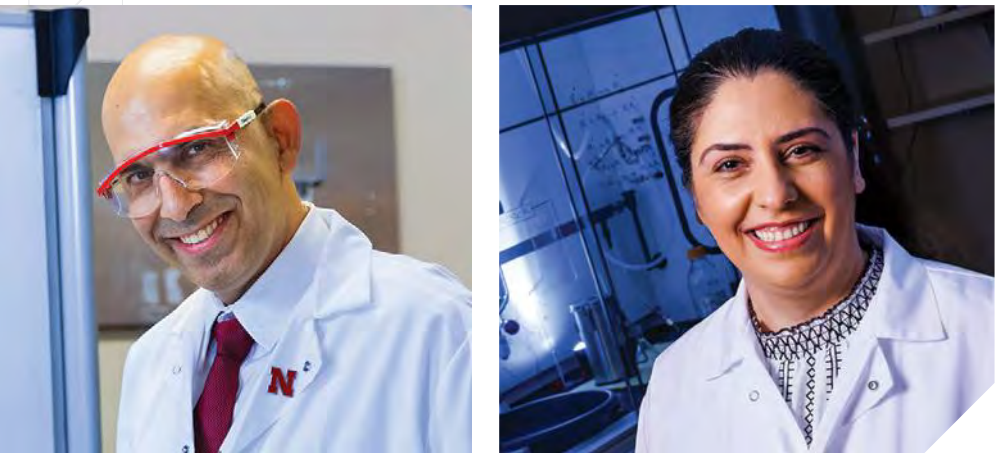
The students were **Emerson Andelt**, who was responsible for the sample preparation needed for performing chemical analyses of fluorapatite grains by electron microprobe at the University of Colorado — and **James Kinnison**

(pictured above), who utilized GIS (Geographic Information Systems) to quantify the areas of ecoregions in the Southern Rocky Mountains, and he has also been involved in coring lake-bottom sediment: funded by Nebraska EPSCoR.

After input from Dr. **Suzanne Bricker** with the National Oceanic and Atmospheric Administration (NOAA), the research routed to the journal *Chemical Geology* and resulted in publication of the article, “Decoupling between silicate and phosphate mineral weathering in the granitic periglacial weathering-limited landscape of the Loch Vale watershed, Rocky Mountain National Park, Colorado, USA.”

Andelt graduated and now works on GIS projects with the City of Crete; Kinnison graduated and now works with Nutrient Advisors in West Point. On the value of supporting undergraduate research at Nebraska’s small colleges, Price said, “Emerson and James were great to work with and instrumental in bringing this research to publication in a peer-reviewed, international journal.” ■

NSF EPSCoR FEC Funds Sustainable Water Reuse Project to Benefit Great Plains Rural Communities



discovery, adding sustainable research capacity in Science, Technology, Engineering and Math (STEM). *(See also the Kansas-Nebraska project, Collaborative Research: FEC: Harnessing Artificial Magnetic Semiconductors in the Flatland on page 6.)*

As the Great Plains faces the need to conserve dwindling water reserves from the Ogallala Aquifer, the region annually generates more than 80% of the country’s total livestock waste which degrades water quality and living conditions. Interdisciplinary researchers will collaborate on circular waste resource recovery and water reuse technologies to benefit primarily rural communities. The project focuses on building research capacity to create a circular resource recovery platform with water reuse—advancing valuable co-products that result from a production process involving livestock waste. This team also seeks new cross-convergent research between applied and fundamental science-based researchers and manufacturing and industry partners. ■

SIAMAK NEJATI (PI) and **MONA BAVARIAN** (Co-PI) are colleagues at the University of Nebraska-Lincoln (UNL) Department of Chemical and Biomolecular Engineering. This year they began work on *Circular waste resource recovery and water reuse systems to drive sustainability and resiliency of the Great Plains rural communities*, along with researchers at Kansas State University and Oklahoma State University.

The approximately \$6 million award, including \$1.5 million in funding for the Nebraska work, comes from NSF’s Focused EPSCoR Collaborations (FEC) program: supporting teams of multi-state researchers in topics that align with NSF priorities and help drive

Liu Gains NSF EPSCoR Fellowship



QIANG LIU, **ASSISTANT PROFESSOR** with the University of Nebraska-Lincoln School of Computing, gained an EPSCoR Fellowship from the National Science Foundation (NSF) in 2025. His two-year project, *Online Hierarchical Learning for Network Autonomy in Open Radio Access Networks* (O-RAN), was funded for \$285,694 and he’s conducting the work at Iowa State University, with its city-scale network infrastructure.

Liu said the Midwest and EPSCoR states’ lack of network infrastructure has widened America’s digital and economic gaps. He pursues O-RAN mobile networks in a long-term vision to help achieve autonomous mobile networks for 6G with novel techniques to address real-world network management challenges: to aid in bridging the digital divide between rural and urban areas. ■

DEPSCoR Grant Supports Saha’s Research



RAJIB SAHA IS THE Principal Investigator for a new three-year U.S. Department of Defense EPSCoR award totaling nearly \$600,000. The research is titled *Dissecting Melanin Synthesis and Regulation in a Polyextremotolerant Black Fungus*, in collaboration with researchers at Washington University in St. Louis (WUSL). Saha, who is Richard L. and Carol S. McNeel Associate Professor in the University of Nebraska-Lincoln Department of Chemical & Biomolecular Engineering, also had recent funding of more than \$1.4 million from the Air Force Office of

Scientific Research (AFOSR) and the National Science Foundation (NSF) to uncover how extremotolerant fungi synthesize, regulate, and secrete melanin—advancing both fundamental biology and its potential applications in radiation shielding, sensors, and sustainable materials. Erin Carr, a postdoctoral researcher with Saha’s lab, is active in this research. ■

Wang Earns Department of Energy EPSCoR CAREER Award

YANAN “LAURA” WANG, an assistant professor with the University of Nebraska-Lincoln (UNL), has earned the U.S. Department of Energy’s (DOE) Early Career Award. Her five-year research project, funded for \$876,663, began in August and is titled *Quantum Photonic-Phononic Transduction Empowered by Van Der Waals Layered Crystals*.

Wang works in UNL’s Department of Electrical and Computer Engineering and was a two-time Seed Grant researcher with Nebraska’s Emergent Quantum Materials and Technologies (EQUATE) collaboration, funded by the U.S. National Science Foundation (NSF). She previously received Nebraska EPSCoR’s FIRST Award, and also gained NSF EPSCoR Research Fellows support for a two-year project on *Integrated Photonic Platforms Empowered by Solution-Processed Wide-Bandgap Perovskites*.

Her DOE project focuses on how to use special materials called van der Waals layered crystals to build tiny devices that can control sound and light in very precise ways. These materials have unique quantum properties and can combine with other materials.

By studying how these materials and systems serve devices and how energy is lost along related processes, Wang’s efforts could help design devices that work better and minimize inconsistencies during manufacturing. Her research aims to: control sound particles (called phonons) very accurately; connect sound particles with tiny sources of light (quantum emitters); and convert signals between sound and light.

Wang’s research could help build new kinds of circuits that use both light and sound to process information in a quantum way. Such advances could lead to changes in how data is handled, especially in quantum computers and communication systems.

DOE Early Career Awards are highly competitive, with only 80-90 proposals funded per year; many of the awards go to researchers inside DOE’s national laboratories system. ■

Alsaleem Leads \$1M DOE EPSCoR Project Involving Los Alamos National Laboratory



A \$1 MILLION AWARD from the U.S. Department of Energy (DOE) supports Nebraska-led research on *UMNS: Ultrasonic MEMS Neuromorphic Sensor for Additive Manufacturing In-Process Monitoring*. The 2024-2028 project is funded through DOE's EPSCoR-State/National Laboratory Partnership Grants program.

The work centers on Additive Manufacturing (AM): also known as 3D printing, trending in industries and research. AM's merits versus traditional "subtractive manufacturing" include: less waste, faster production, and easier design changes. However, challenges can arise in production quality; building objects layer by layer with AM, defects arise from poor material quality to complex machine settings. Sensors are important during AM production, to address such issues—yet these sensors produce a huge amount of data. For example, one sensor can create over 75 gigabytes of images every second—more than what Netflix streams! Powerful computers and memory are needed to handle all that data.

A team at the University of Nebraska-Lincoln (UNL) and Iowa State University (ISU) is focusing on analog computing (a different way of processing information than regular digital computers) that listens to sounds made during AM production. By analyzing these sounds in real time, this approach can detect defects as they happen—without storing huge amounts of data. This also makes the system safer from cyberattacks, since no data is saved.

Fadi Alsaleem, associate professor with UNL's Durham School of Architectural Engineering and Construction, leads the research team with **Jinying Zhu**, a UNL Civil Engineering professor, and **Joseph Turner**, a professor at ISU. Together they bring expertise in analog computing, sound sensing, and additive manufacturing; also on board is **David Mascarenas** from Los Alamos National Laboratory.

Alsaleem said this project is the first time anyone has tried to use analog computing for real-time monitoring of AM. The work also connects with DOE goals in advanced and smart manufacturing. ■

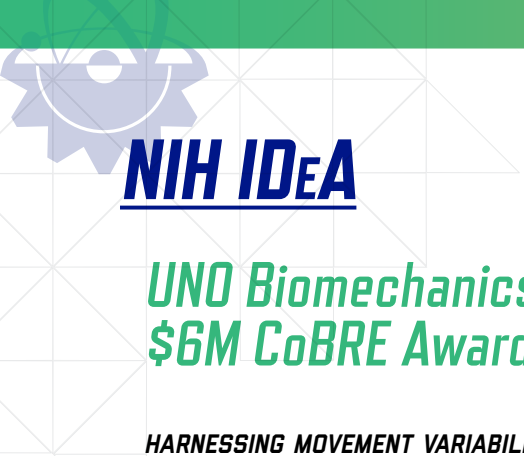


NASA NEBRASKA EPSCoR Husker Focuses 3D Printing for Use in Space

ASSISTANT PROFESSOR ERIC MARKVICKA'S NASA EPSCoR project, conducted at the University of Nebraska–Lincoln and in collaboration with researchers at NASA Marshall Space Flight Center, focuses on advancing a 3D-printing method designed for fabricating electronics and sensors directly in space. This capability is increasingly important as NASA plans for long-duration missions and a sustained human presence on the Moon, where crews will need to create tools, replacement parts, and monitoring systems without waiting for resupply from Earth. Central to the project is a newly developed space-grade material composed of liquid-metal droplets suspended in a durable silicone elastomer. By adjusting the 3D printer's settings, the material can be formed into either conductive pathways or insulating structures, enabling both functions to coexist within a single printed component.

This approach would allow astronauts to manufacture custom electronics, stretchable sensors, and wearable devices on demand, potentially reducing payload mass and increasing mission resilience. Markvicka's broader vision includes combining this printable material with compact electronic modules—such as microcontrollers or inertial measurement units—to create advanced wearables capable of monitoring habitat conditions, astronaut health indicators, and even behavioral patterns like sleep quality. In the future, the same technology could also support new Earth-based industries focused on high-performance wearables, personalized health monitoring, and smart materials for everyday use. ■

▲ **Eric Markvicka**, the Robert F. and Myrna L. Krohn Assistant Professor of Biomedical Engineering at the University of Nebraska-Lincoln, examines a sample 3D printed using a space-grade emulsion ink, which is being developed for on-demand fabrication of electronics in space.



UNO Biomechanics Earns \$6M CoBRE Award Renewal

HARNESSING MOVEMENT VARIABILITY TO *Treat and Prevent Motor Related Disorder*, a research project at the University of Nebraska at Omaha (UNO), received a \$6 million award from the National Institutes of Health (NIH) to continue work of the Center for Research in Human Movement Variability (MOVCENTR). This renewal award continues the project's work into 2030.

MOVCENTR was established in 2016 with support from the NIH's Centers of Biomedical Research Excellence (COBRE) program. Led by **Nikolaos "Nick" Stergiou**, Ph.D., assistant dean and director of MOVCENTR, the center's researchers aim to deepen understanding of neuromuscular adaptability and develop innovative, mechanism-based therapies that restore optimal movement in individuals with disorders affecting coordination and balance.

Housed in UNO's Biomechanics Research Building, the first facility in the nation dedicated solely to biomechanics research and created with the generous philanthropic support led by the Ruth and Bill Scott family, MOVCENTR's world-class laboratories allow scientists to study movement at every level, from cells to full-body motion.

Altered movement variability is increasingly linked to disorders such as Parkinson's disease, cerebral palsy, and stroke-related impairments. By understanding the mechanics behind these changes, researchers can design targeted interventions that restore healthy movement patterns. The research also has far-reaching applications for injury prevention, rehabilitation, and performance optimization in athletes and aging populations. The ultimate goal is to translate scientific discoveries into new therapies that restore adaptability in the human body.

According to UNO, faculty affiliated with the Center secured more than \$54 million in additional research funding, fueling a 36% average annual increase in UNO's research portfolio. Since 2019, the Center's work has generated an estimated \$27.5 million economic impact in the Omaha area—a return of about \$2.80 for every \$1 invested by the NIH. ■

CoNDA Center at UNMC

In 2025 the Cognitive Neuroscience of Development and Aging (CoNDA) Center began Phase 2 of funding from the National Institutes of Health's (NIH) Center of Biomedical Research Excellence (COBRE) program. A multi-institutional initiative based at the University of Nebraska Medical Center (UNMC), the CoNDA Center launched with more than \$11 million in funding for 2020–25; it focuses on neurocognitive conditions such as Autism Spectrum Disorders (ASD) and age-related disorders such as Alzheimer's Disease.



The renewal award is \$11,470,890 for a five-year term extending to 2030. Beyond UNMC, participants include Boys Town National Research Hospital, Creighton University, and the University of Nebraska at Omaha.

"We are eager to continue building toward our mission of supporting neuroscience research in the Omaha region," said **Anna Dunaevsky**, CoNDA Center's principal investigator (PI) and professor of developmental neuroscience in the UNMC Department of Neurological Sciences. In Phase I, the CoNDA Center supported 43 individual investigators through its Research Project, Pilot Project, and Research Core voucher programs. CoNDA researchers were awarded over \$18.5 million in extramural research funding, with hundreds of articles and scholarly publications produced from CoNDA support.

CoNDA's Translational Imaging and Behavioral Analysis (TIBA) Research Core complements the human-centered Neuroimaging Acquisition and Analysis (NA2) Core, adding cutting-edge tools that investigators need for their work on neurocognitive conditions. The center's Phase 2 activities also include new funding opportunities and future seminars, with a colloquium scheduled for April 2026. ■

2025 NSF EPSCoR Co-Funding for Nebraska

U.S. NATIONAL SCIENCE FOUNDATION (NSF) EPSCoR co-funds specific NSF units in support of meritorious proposals from individual investigators and teams in EPSCoR jurisdictions. These proposals have been peer-reviewed and recommended for award, but could not be funded without the combined, leveraged support of NSF EPSCoR and the corresponding directorates. Co-funding leverages EPSCoR investment and facilitates participation of EPSCoR scientists and engineers in NSF-wide programs and initiatives.

In 2025, NSF EPSCoR Co-Funded projects brought \$6,006,160 to Nebraska. Recipients were:

ROBERT STREUBEL | University of Nebraska-Lincoln, Department of Physics and Astronomy | **CAREER:** Short-Range Order as Design Parameter for Topological Magnetism

MATTHEW VAN DEN BROEKE | University of Nebraska-Lincoln, Department of Earth & Atmospheric Sciences | Collaborative Research: Polarimetric Radar and Modeling Perspectives of Updraft, Cold Pool, and Mesovortex Evolution in Quasi-Linear Convective Systems

ELIZABETH VANWORMER | University of Nebraska-Lincoln, Complex Biosystems PhD Program | **AccelNet Design:** Integrating global networks to advance parasite ecology and transmission research at the human-animal-environment interface

TIRTHANKAR ROY | University of Nebraska-Lincoln, Department of Civil & Environmental Engineering | **CAREER:** Characteristics of Rain-on-Snow Flooding in the Midwest

SHUBHENDU BHARDWAJ | University of Nebraska-Lincoln, Department of Electrical & Computer Engineering | **CAREER:** Exploring Spin and Angular Momentum Waves towards Future Wireless Communication Paradigms

MARTHA D. MORTON and **CHIN LI CHEUNG** | University of Nebraska-Lincoln | **REU Site:** Research Experiences for Undergraduates in Chemical Assembly at the University of Nebraska

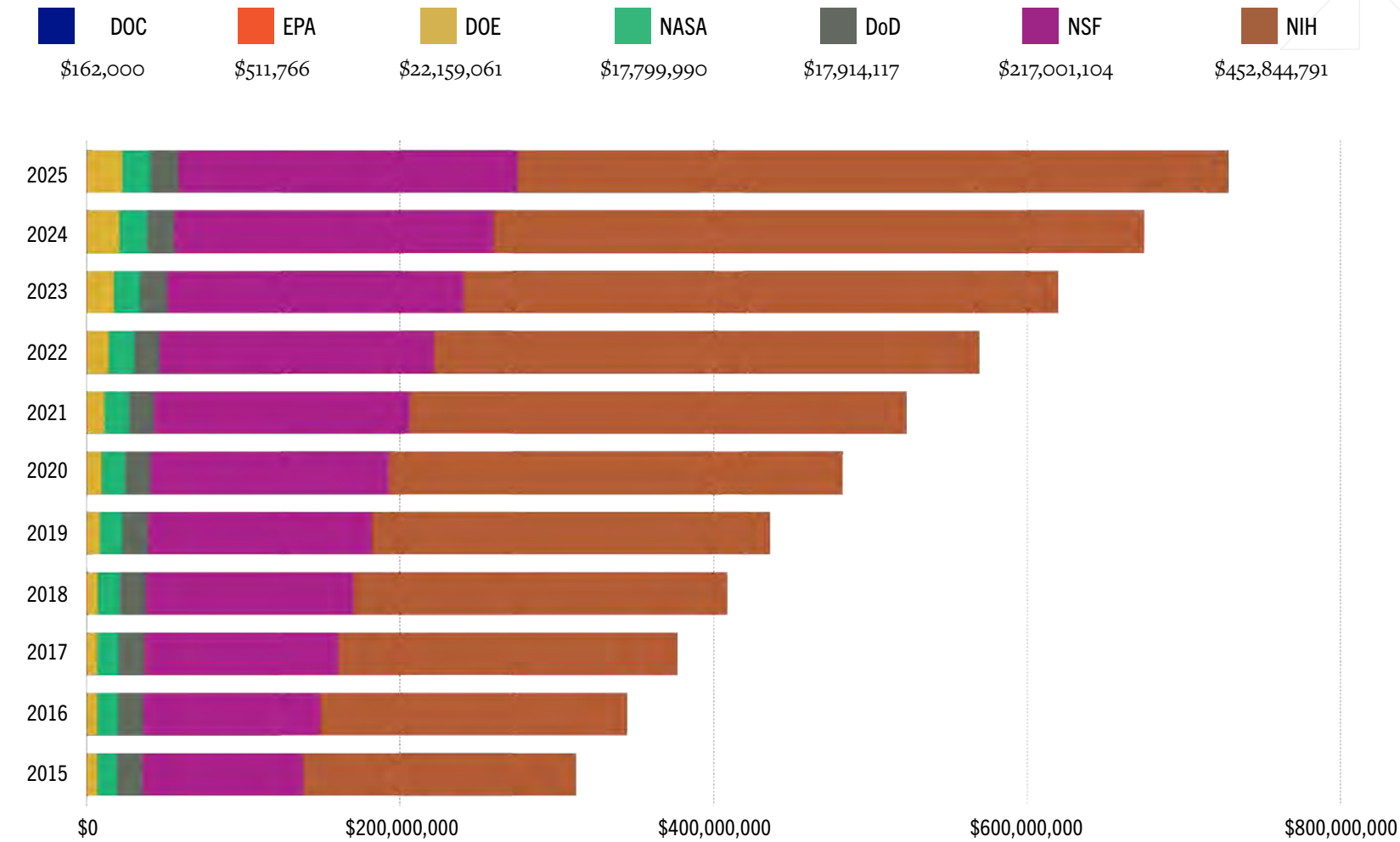
SUNIL K. SUKUMARAN | University of Nebraska-Lincoln, Department of Nutrition & Health Sciences | **CAREER:** The roles of zinc in taste cell regeneration and sweet taste signaling

ERIC MARKVICKA and **GREGORY R. BASHFORD** | University of Nebraska-Lincoln, Departments of Mechanical & Materials Engineering and Biological Systems Engineering | **REU Site:** Undergraduate Research Opportunities in Biomedical Engineering Devices at the University of Nebraska-Lincoln

LUCIA FERNANDEZ-BALLESTER | University of Nebraska-Lincoln, Department of Mechanical & Materials Engineering | Tailoring donor-acceptor morphologies through melt-crystallization

Cumulative Federal EPSCoR/IDeA Funding in Nebraska

NEBRASKA BECAME AN EPSCoR jurisdiction in 1991 and has successfully competed for more than \$728 million in federal EPSCoR or EPSCoR-like research funding. This chart shows funding by agency and the cumulative growth of funding over time for the most recent decade: 2015-2025. ■



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