

 Research

# FISCAL YEAR 2025 ANNUAL REPORT

# OUR MISSION FOR KENTUCKY AND BEYOND

Research is of critical importance to our university and the Commonwealth. Fundamental discoveries are happening every day led by talented faculty, students and staff.



Acting Vice President  
for Research Ilhem  
Messaoudi

Those discoveries translate to new therapies and treatments for patients. They become new products that change the way we live and work. They inform policies and improve the lives of Kentuckians and beyond.

We mentor the next generation of researchers, students who are preparing to enter not just the Kentucky job market, but the global one. We work together to strengthen the pipeline training students to be creative and resilient thinkers ready to adapt, familiar with emerging technologies.

The University of Kentucky is a special place — talented scientists and scholars work closely and collaboratively across every discipline, all on one campus.

There is a deep commitment to pursue discovery improving the health, education and economy of Kentucky.

And at our core, there is a desire to always serve the best interests of our students and all learners.

There is so much momentum behind those goals and so much opportunity to build and do even more.

Our mission is to Advance Kentucky for all citizens. Our goal is very simple: to make life better.



## ABOUT THE COVER

The Office of the Vice President for Research supports the SoftLab through the Celebrating University Research Across the Enterprise (CURATE) program. With this digital knitting machine, Jennifer Meakins develops complex weaved materials and creates designs that incorporate wiring for electronic knitwear. Read more about her work on page 4.

Photos by Jeremy Blackburn and Ben Corwin, Research Communications. Mark Cornelison, UK Photo. Matt Barton, Agricultural Communications. UK Stanley and Karen Pigman College of Engineering, EduceLab, Adobe Stock, and Getty Images.



Scan the QR code to find full-length stories from this report. Visit [research.uky.edu](https://research.uky.edu) for more.

# LEADING DISASTER PREDICTION, RESPONSE

A \$20 million award from the National Science Foundation's Established Program to Stimulate Competitive Research (NSF EPSCoR), "Climate Resilience through Multidisciplinary Big Data Learning, Prediction & Building Response Systems (CLIMBS)," is advancing Kentucky's climate resiliency, using a collaborative, statewide approach.

With \$4 million in additional funding from the Kentucky Cabinet for Economic Development, eight universities are using "big data" approaches and monitoring networks to understand historical data and gather new data, using AI to forecast floods and landslides to bolster response and preparedness efforts, and establishing an enhanced framework for disaster mitigation and community-level response.

"This isn't simply a five-year project, it is an investment that will live on across Kentucky through improved research infrastructure, new faculty hiring, student support and workforce development," said Rodney Andrews, KY NSF EPSCoR program director.



UK leads an eight-institution collaboration with the University of Louisville, Western Kentucky University, Northern Kentucky University, Morehead State University, Eastern Kentucky University, Murray State University and Thomas More University addressing fundamental knowledge gaps in climate-related understanding to help Kentucky communities prepare and respond to disasters.

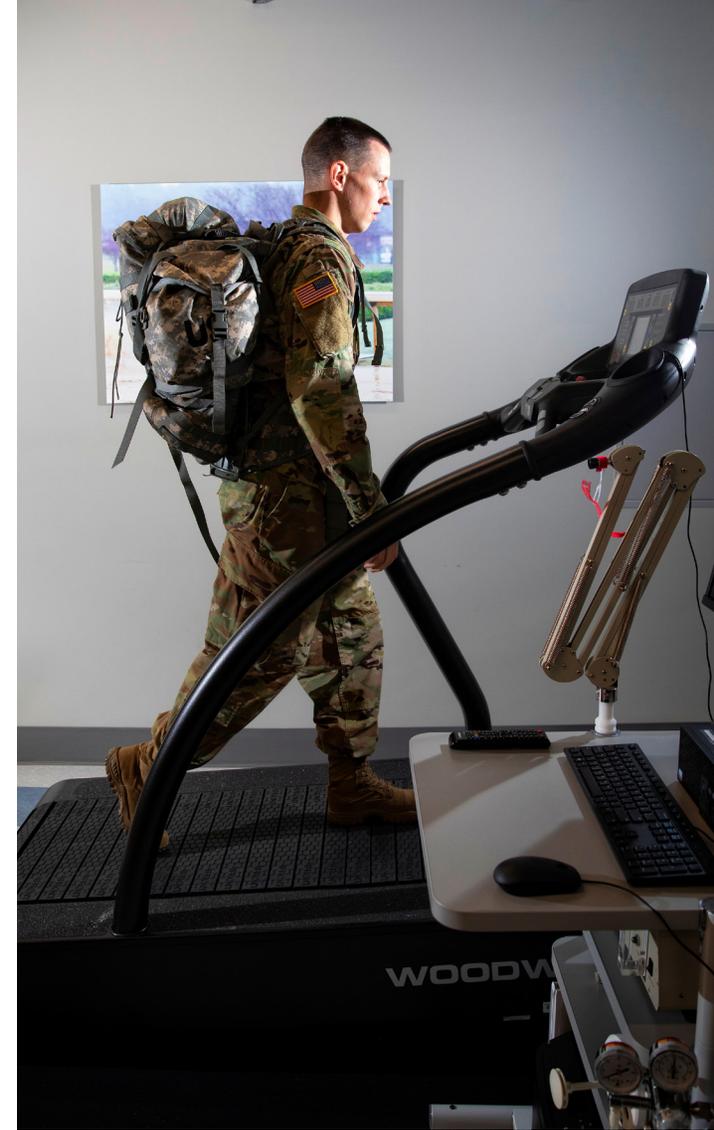
# BALANCING MECHANICS TO AID ARMED FORCES, JOCKEYS

In 2018, the Jockey and Equestrian Initiative (JEI) at the Sports Medicine Research Institute (SMRI) began concussion testing in jockeys. Now, JEI encompasses a wide range of performance testing, including body composition, flexibility, reaction time, leg and grip strength, and balance.

After testing the individual elements of their performance, the jockeys are covered with tiny electrodes and hop up on Charlie, the SMRI's mechanical horse. Jockeys participate in a simulation of racing. A small screen shows instant feedback, like how the rider shifts their weight or pulls the reins.

Research director of the Equestrian Athlete Initiative Kimberly Tumlin (College of Public Health) said the goal is to get a baseline assessment for ideal jockey performance which could help prevent injuries for both horse and rider.

"Unlike the NFL, or other professional sports, jockeys aren't on a salary — they work for themselves, and they don't get paid if they don't ride," said Michaela Keener (College of Health Sciences, Equestrian Athlete Initiative). "So, we want to protect their health, yes, but also get them back to riding as safely and quickly as we can."



SMRI Researchers received a \$3.4 million grant from the Air Force Research Laboratory (AFRL) to study the health demands of special tactics support personnel and create a plan to reduce their risk of job-related injuries. The research, led by Nicholas Heebner (College of Health Sciences), hopes to create information and resources for service members and their health care providers to improve warfighter health, performance and resilience.

# UNWRAPPING HISTORY



For more than two decades, Brent Seales (Stanley and Karen Pigman College of Engineering) and his team have been on a mission to unlock the secrets of the Herculaneum scrolls (damaged by Mt. Vesuvius’s eruption in 79 CE) and other ancient artifacts. His foundational research on virtual unwrapping takes a 3D X-ray from a micro-CT machine and pushes it through a machine learning process to find the ink and flatten the document so it can be read.

In 2015, Seales and his team revealed text from the ancient En-Gedi scroll to be the beginning of the Book of Leviticus. It is believed to be one of the oldest Hebrew biblical texts ever found outside of the Dead Sea Scrolls.

In 2023, Seales (in partnership with EduceLab: A Digital Restoration Initiative, the Library of the Institut de France and founders of the Vesuvius Challenge) hosted a livestream event at UK to read the first text from a Herculaneum scroll.

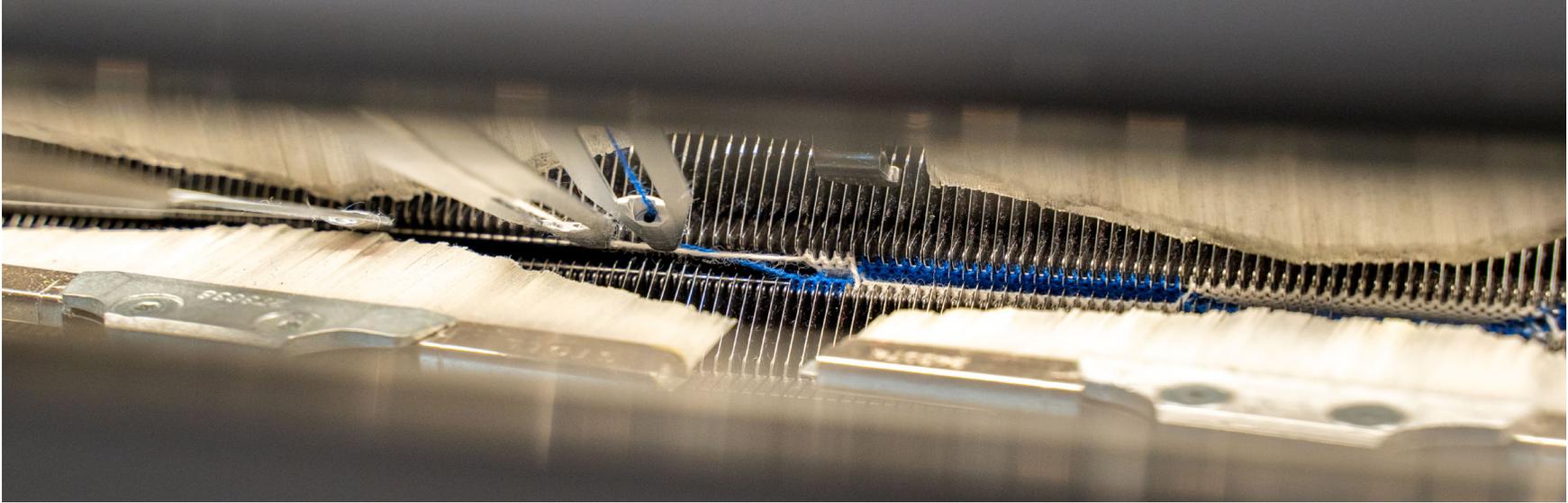
In 2025, Seales was awarded a prestigious European Research Council (ERC) Synergy Grant as part of an international team seeking to unlock the secrets of the Herculaneum scrolls.

Seales’s research team is supported by a five-year \$14.6 million grant for EduceLab from the U.S. National Science Foundation and a four-year \$500,000 grant from the National Endowment for the Humanities.



Overcoming damage incurred during a 2,000-year span is no small challenge. But that’s what researchers do – together, we conquer the seemingly impossible.

**Brent Seales,**  
Pigman College of Engineering

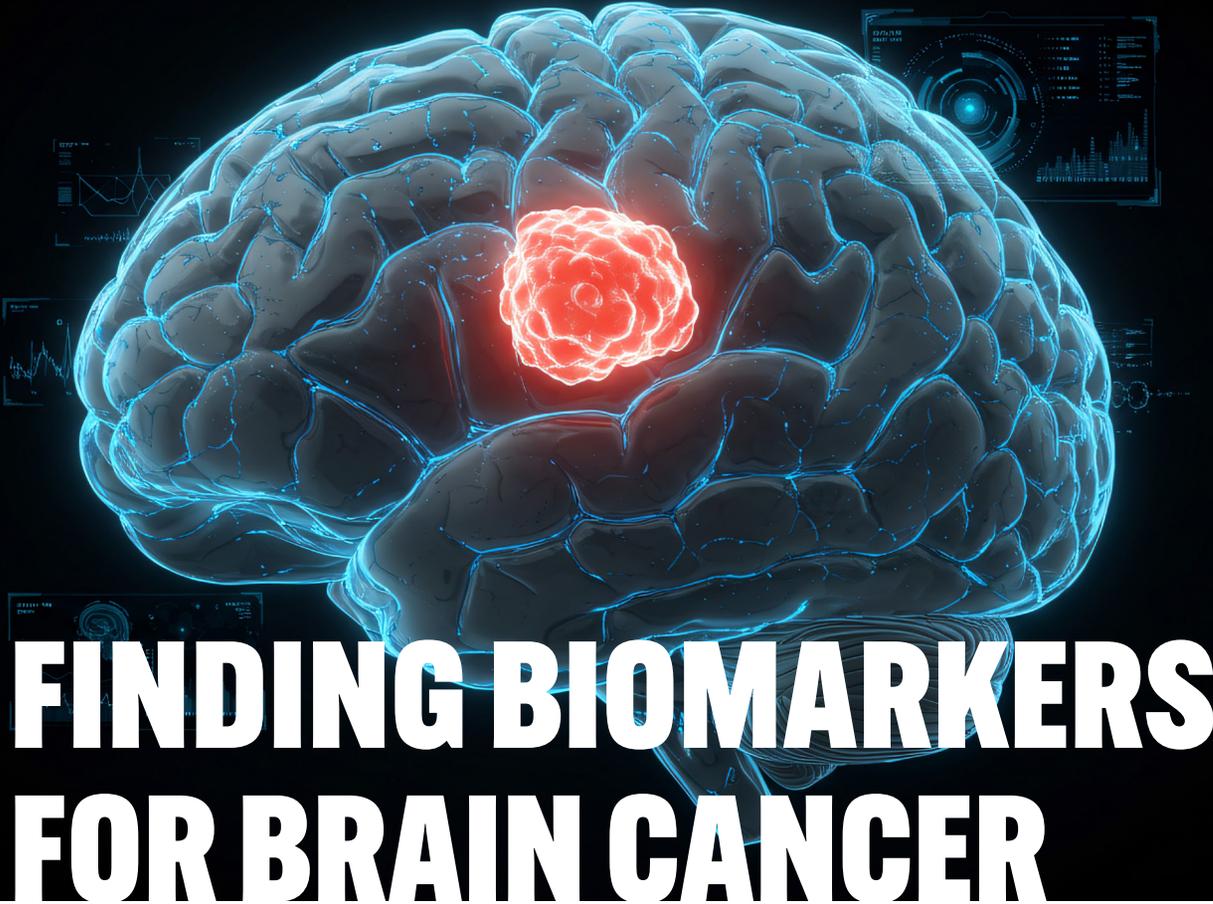


# Weaving DIGITALLY

With support from the Office of the Vice President for Research through the Celebrating University Research Across the Enterprise (CURATE) program in FY25, the SoftLab represents a growing area of innovation within the College of Design. SoftLab draws on faculty research expertise and new approaches to textiles and materials.

The digital knitting machine plays a central role in this research. Jennifer Meakins (College of Design) uses the machine to develop complex weaved materials and create designs that incorporate wiring for electronic knitwear. Her research centers on craft and textiles, and she teaches through the act of making materials. Her work treats the construction of a textile as a form of design practice, and she approaches knitting as a tool that can support many different disciplines.





# FINDING BIOMARKERS FOR BRAIN CANCER

With support from the National Cancer Institute, UK Markey Cancer Center researchers discovered a genetic biomarker that could help identify patients with glioblastoma most likely to benefit from the cancer drug bevacizumab.

Brain tumors from patients treated with bevacizumab who lived longer were more likely to have a genetic change called CDK4 amplification. This suggests that testing for the molecular marker could help oncologists identify patients most likely to respond well to bevacizumab treatment.

“The findings could help oncologists make more informed treatment decisions for glioblastoma patients, potentially sparing those unlikely to benefit from unnecessary side effects while

ensuring those who might respond get access to the drug,” said John Villano (College of Medicine).

Glioblastoma accounts for 15% of all brain tumors and is the most aggressive form of brain cancer, with patients typically surviving less than 15 months following diagnosis.

Bevacizumab, one of the medications commonly used to treat recurrent glioblastoma, works by blocking blood vessel growth in tumors. For many patients, its use has been associated with increased progression-free survival and improvement in symptoms and quality of life. However, there has been no way to predict which patients would benefit most from treatment.

## EMPOWERING DENTISTS TO REDUCE OPIOID PRESCRIPTIONS

One of the leading prescribers of opioids to young adults are dentists and oral surgeons. With \$1 million from the National Institute of Dental and Craniofacial Research (NIDCR), Marcia Rojas-Ramirez (College of Dentistry), below left, and Doug Oyler (College of Pharmacy) teamed up to implement an intervention strategy with dental providers to reduce the number of opioid prescriptions they write after dental procedures.



# Spinning CARBON from waste

With funding from the Department of Energy, researchers at the UK Center for Applied Energy Research (CAER) are turning Kentucky waste coal into valuable carbon products.

Kentucky is the seventh-largest coal-producing state.

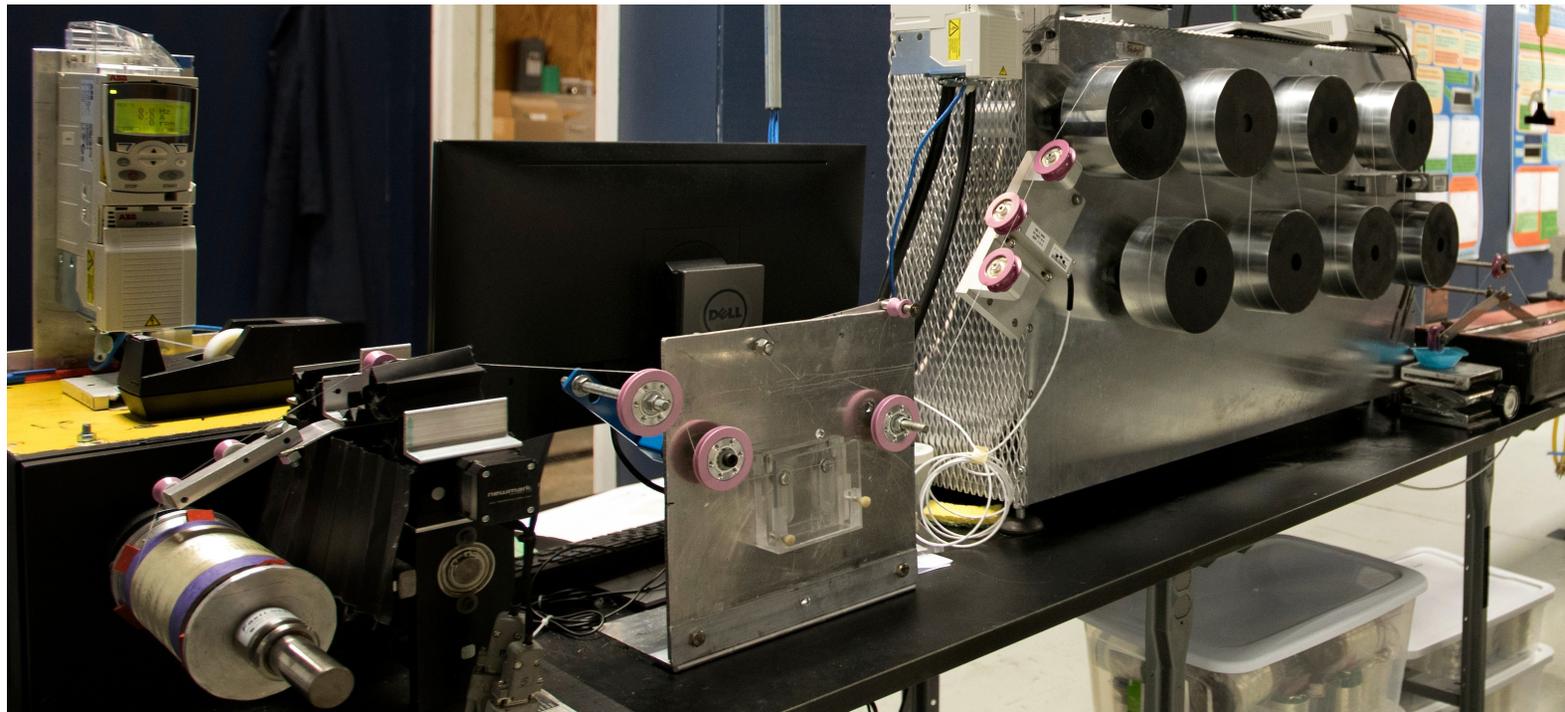
After mining, coal is sent to a preparation plant and readied for shipment. A stream of coal unsuitable for transportation, called waste coal, is produced and stored onsite.

More than four billion tons of waste coal are estimated to exist across Kentucky.

Home to the largest carbon fiber spinline at any academic institution in

North America, CAER is a global leader in carbon fiber research. High-value carbon fiber is used in aircraft, automobiles, sporting goods and other high-performance materials. CAER is working toward a cost-competitive, domestic supply chain for carbon fiber and graphite, taking an environmental liability and turning it into a sought-after material.

"Lightweight carbon fiber composites hold such promise across a wide spectrum of manufacturing sectors, and we know carbon fiber is going to play an increasingly important role in advanced manufacturing," said Matthew Weisenberger (CAER).





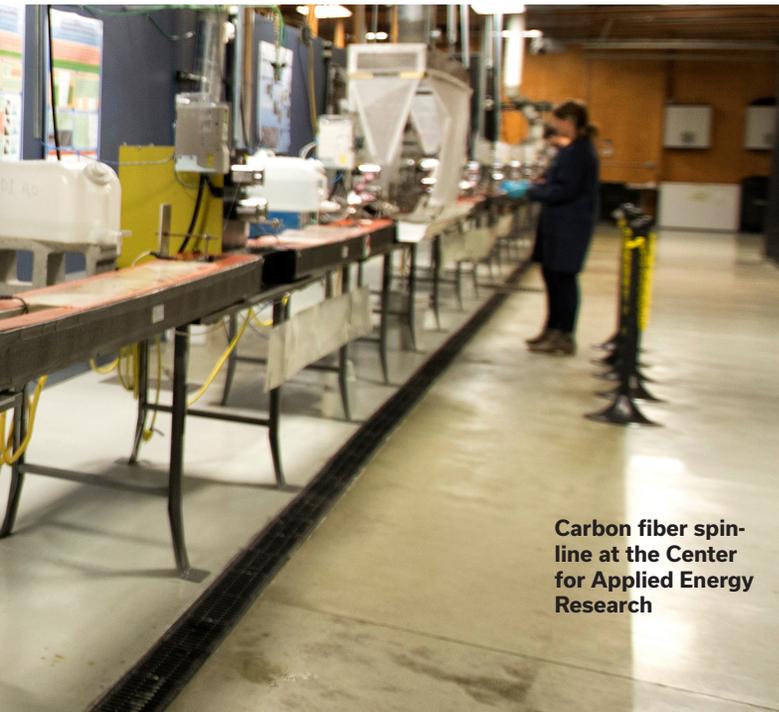
## USING LESS, GETTING MORE

Mining engineer Rick Honaker (Pigman College of Engineering) is developing a more environmentally friendly way of processing coal and then recovering the energy-relevant byproducts.

Honaker is using carbon dioxide emitted near operating mines and processing operations to reduce the energy consumed during grinding by more than 50% while improving the recovery of critical energy-rele-

vant minerals by 20% or more. The ultimate goal of the project is to get more minerals by using less energy and releasing less carbon dioxide.

The Department of Energy funded the project focused on applications involving ore sources of rare earth elements and copper — materials essential to modern technologies, clean energy and economic security but vulnerable to supply chain disruptions.



Carbon fiber spinline at the Center for Applied Energy Research

## CONTAINING FUSION POWER

UK leads a project with \$2.3 million in funding over four years from the U.S. Department of Energy Advanced Research Projects Agency-Energy (ARPA-E) to develop materials critical to commercializing fusion power.

The award is part of the Creating Hardened And Durable fusion first Wall Incorporating Centralized Knowledge (CHADWICK) program. The goal is to discover or develop a class of first wall materials — materials that form the inner wall of a fusion reactor and contact the plasma — that will maintain performance over the lifetime of a fusion power plant.

The multi-institutional team, led by UK's

John Balk (Pigman College of Engineering), will explore manufacturing processes to strengthen that first wall.

This project aims to solve the challenge of containing a plasma at more than 100 million degrees Celsius — essentially a mini-star — in a fusion reactor.

Currently, no materials exist with the level of endurance that would make fusion power plants commercially viable.

"This is a great opportunity to solve one of the challenges in radiation-heavy industries: how to enhance thermal conductivity without sacrificing material strength," Balk said.



# Music, Movement **AND MEMORY**

Alaine Reschke-Hernández (College of Fine Arts) leads a team studying a music therapy intervention for people with severe dementia. Her previous research in care facilities revealed layering of musical stimuli, coupled with purposeful activity matched to participants' cognitive capacity, shows promise in regulating emotion and reducing agitation. The research is supported by the National Institute of Aging Alzheimer's Disease Research Center at the Sanders-Brown Center on Aging and the team includes co-investigators Erin Abner, Fredrick Schmitt and Linda Van Eldik (Sanders-Brown Center on Aging).

## FELLOWS

- The National Academy of Inventors named **Dibakar Bhattacharyya** (Pigman College of Engineering) a Fellow.
- The American Statistical Association named **David Fardo** (College of Public Health) a Fellow.
- The American Psychological Association named **Cassandra Gipsen-Reichardt** (College of Medicine) a Fellow.
- The American Association for Cancer Education (AACE) named **Nathan Vanderford** (Markey Cancer Center) a Fellow.
- The American Phytopathological Society named **Paul Vincelli** (Martin-Gatton CAFE) a Fellow.

# NSF CAREER AWARDS

- Diana Byrne (Stanley and Karen Pigman College of Engineering)
- Xu Jinn (Pigman College of Engineering)
- Xin Liang (Pigman College of Engineering)
- Alexandra “Zan” Paterson (Pigman College of Engineering)
- Christopher Shepard (Martin-Gatton College of Agriculture, Food and Environment)
- Ishan Thakkar (Pigman College of Engineering)
- Yang Xiao (Pigman College of Engineering)
- Biyun Xie (Pigman College of Engineering)



Zan Paterson (College of Engineering) received the Defense Advanced Research Projects Agency (DARPA) Young Faculty Award and an NSF CAREER award.

# HONORS



■ **Matthew Bush**, above, (College of Medicine) received the Presidential Early Career Award for Scientists and Engineers (PECASE) from NSF.

■ **Lisa Cassis** (College of Medicine, former Vice President for Research) received the Robert R. Ruffolo Career Achievement Award in Pharmacology from the American Society for Pharmacology and Experimental Therapeutics.

■ **Gary Ferland** (College of Arts and Sciences) received the Catherine Wolfe Bruce Gold Medal from the Astronomical Society of the Pacific.

■ **David Hardesty** (Gatton College of Business and Economics) received a Lifetime Achievement Award from the American Marketing Association.

■ **Frank X Walker** (College of Arts and Sciences) received the PEN/Voelcker Award for Poetry from PEN America.

# SANDERS-BROWN CELEBRATES 40

“We’re not yet at a cure. But, mark my words, when that cure comes, Sanders-Brown will have played a vital role in advancing it.”

**Greg Jicha,  
Sanders-Brown  
Center on Aging**

The newly renovated Sanders-Brown Center on Aging science and lab building opened this year in Lexington.

The Sanders-Brown Center on Aging celebrated its 40th consecutive year of funding as a National Institute on Aging Alzheimer’s Disease Research Center (ADRC) in 2025. It is one of only 37 designated ADRCs in the United States and one of only 9 to be continuously funded. Sanders-Brown investigates the causes of Alzheimer’s disease and related dementia, advances early detection tools

and treatments, and trains future scientists.

“From debunking early myths about what causes dementia to identifying new diseases that mimic Alzheimer’s, our scientists and clinicians have changed what the world knows about the aging brain,” said Linda Van Eldik, Sanders-Brown Center on Aging director. “We couldn’t do what we do without the community.”

# FIGHTING CANCER WITH A GOLDEN BULLET



“By creating compounds that remain stable in the body and specifically target cancer cells’ energy source, this opens the doors for the development of new and more effective treatments.”

**Samuel Awuah**, College of Arts and Sciences

UK researchers have developed a new class of gold-based compounds that show promise in fighting various types of cancer.

A study by Samuel Awuah (College of Arts and Sciences, Markey Cancer Center) showed the compounds could kill cancer cells by disrupting energy production.

The new compounds work by targeting and shutting down mitochondria, which generate energy for cells. In lab tests, they were effective against several types of cancer cells, including those from breast, ovarian and lung tumors.

The study builds on research that shows auranofin — a gold-based drug approved by the FDA in 1985 for treating rheumatoid arthritis — has potential as a cancer therapy.

The research team designed the new compound to be more stable in the body through a chemical process they refer to as “stapling.” This method joins gold molecules to other chemical structures in ways that help them resist breaking down inside cells.

Awuah’s work is part of an \$11.2 million Centers of Biomedical Research Excellence (COBRE) grant from the National Institutes of Health.

# REBUILDING RURAL RESEARCH

The University of Kentucky Research and Education Center in Princeton, Ky., celebrated 100 years of research in 2025.

The focal point for the Martin-Gatton College of Agriculture, Food and Environment's work in Princeton, the center's research has shaped farming practices with landmark contributions to no-till farming, double-crop systems, integrated pest management and soil reclamation. Its work in dark-fire tobacco, fruit production, beef cattle nutrition and forage systems has helped Kentucky producers.

The center, which is nearly 1,600 acres, lost almost all of its facilities and research-grade equipment in a 2021 tornado. Despite the destruction, more than 200 research projects continue, and all buildings are expected to be completed by 2026.



## BY THE NUMBERS

**\$496.9M**

total awards (Fiscal Year 25)

**\$255.3M**

federal awards (FY25)

**\$937M**

statewide economic impact  
(FY24)

**\$527.7M**

R&D expenditures (FY24)

**4,712**

jobs across Kentucky (FY24)

**2,376**

jobs directly supported by  
research (FY24)

**\$2.2M**

license income

**154**

patent applications filed

**61**

new patents issued  
worldwide

**1,898**

active research awards

**2,867**

scholarly publications

**67th**

among 681 institutions  
(HERD\*)

**45th**

among 422 public  
institutions (HERD)

\* The National Center for Science and Engineering Statistics (NCSES) publishes the Higher Education Research and Development (HERD) Survey each year, ranking the top universities based on research expenditures.



Ilhem Messaoudi  
Acting Vice President for Research  
University of Kentucky

311 Main Building  
Lexington, KY 40506  
[research.uky.edu](http://research.uky.edu)

