SIU Winter 2025

R1 Research

SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

TOP GLASS

Saluki Wins International Glass Art Competition

ALSO INSIDE: Metal AM | Cup of Insight | Clearing the Air

R1 TOP-TIER RESEARCH UNIVERSITY

SIU Winter 2025

Contents

EDITOR
Kim Rendfeld

GRAPHIC DESIGN
Jay Bruce '93, M.S. '16
Nate Krummel '00

PHOTOGRAPHY
Rusty Bailey '90
Benjamin Kumatsey

CONTRIBUTORS
Tim Crosby '05
Andrea Hahn
Tim Obermiller
Pete Rosenbery
University Communications and Marketing staff

VOLUME 1, NO. 2
Winter 2025
SIU Research is published biannually by:
SIU Office of the Vice Chancellor for Research
Woody Hall 350 – Mail Code 6809
Southern Illinois University
900 South Normal Ave.
Carbondale, IL 62901

R1 TOP-TIER RESEARCH UNIVERSITY

ON THE COVER
Nancy Yu (United States), "Crown of Glass: Yang Guifei," flameworked borosilicate glass, 2024. Photo credit: Benjamin Kumatsey.

Costas Tsatsoulis, Vice Chancellor for Research and Graduate School Dean

Dear friends of Southern Illinois University Carbondale:

It is my great pleasure to share with you our Winter 2025 report talking about some of the outstanding work pursued at Southern Illinois University Carbondale. The stories we have selected highlight the breadth of excellence of the creative and scholarly activities of our faculty and students.

In 1950, SIU's then-President Delyte Morris, together with Professor Willard D. Klimstra, established the Cooperative Wildlife Research Laboratory, now known as the Center for Wildlife Sustainability Research. The center, celebrating its 75th anniversary this year, has gained international recognition for its leadership in research. In the following pages, you will learn how the center is facing today's challenge of sustaining both natural systems and social well-being through wildlife management.

You will read about the accolades received by the graduates of SIU's Glass Program, the most recent one awarded to Nancy Yu, one of our M.F.A. students. You will learn our strong push towards translational research and SIU's efforts to build a bioeconomy from food and beverage byproducts — in this case developing a childhood myopia treatment. Other projects include research in correcting defects of metals printed by additive manufacturing; exploring mental health disorders among air traffic controllers; and the work of M.S. Zoology graduate Cristina La who studied pollution threats to endangered smelt.

These are a small part of our overall creative and research activities. SIU's external grant and contract expenditures for FY 2025 totaled $71 million. Top federal funders of grants to SIU were the Department of Health and Human Services, the National Science Foundation, the U.S. Department of Agriculture and the U.S. Department of Education. Top state funders of SIU were the Illinois Department of Economic Opportunity, the Illinois State Board of Education, the Illinois Department of Human Services and the Illinois Department of Natural Resources.

As reported to the National Science Foundation's Higher Education Research and Development (HERD) survey, R&D expenditures at SIU totaled $61.5 million in FY 2024 — leading to SIU's designation as Research 1: Very High Spending and Doctorate Production by the Carnegie Foundation for the Advancement of Higher Education. SIU was also recognized as an Opportunity University, one of only 21 universities in the country with both a Research 1 and Opportunity designations.

I hope that the stories in this report offer you a snapshot of SIU as it continues to excel in its mission to perform research that serves the state and the nation.

With best Saluki wishes,

Costas Tsatsoulis
Vice Chancellor for Research
and Graduate School Dean

METAL AM

SIU Research Team Boosts Metal 3D Additive Manufacturing Reliability

By Tim Obermiller

To many, 3D printing evokes images of desktop gadgets spitting out plastic trinkets. In reality, additive manufacturing (AM) now builds metal components for aircraft engines, medical devices and other intricate parts not easily made with traditional methods. The catch? Tiny, hard-to-avoid defects in printed metals can weaken parts and erode manufacturer confidence. Southern Illinois University Carbondale Professor Sangjin Jung is tackling that reliability problem head-on.

With a new $200,000 National Science Foundation Engineering Research Initiation grant, Jung's two-year project focuses on designing metal parts that stay strong even when small defects inevitably occur — so companies can trust what comes off the printer.

"Real production isn't perfect," Jung said. "Instead of pretending defects don't happen, we build them into the design process and make the part robust anyway."

Jung brings a blend of industry and academic experience to the work. Before joining SIU in 2021 as an assistant professor in the School of Mechanical, Aerospace, and Materials Engineering, he served as a senior research engineer at LG Electronics' Production Engineering Research Institute and as a research scientist at both Carnegie Mellon University and Pennsylvania State University.

WHY AM MATTERS — AND WHERE IT SHINES

"One of AM's biggest advantages is design freedom," Jung said, noting that the grant can help position SIU and regional businesses as a hub for additive manufacturing.

Unlike traditional machining, which often limits shapes, AM can create highly complex, lightweight geometries that would be impossible — or prohibitively expensive — otherwise. It's also material-efficient because parts are built layer by layer, generating far less scrap than cutting from a solid block. Add rapid prototyping and localized production, and AM can shorten supply chains while speeding the path from idea to finished part.

> "The research simulates how real-world defects affect performance and then refines the design accordingly."
>
> - Professor Sangjin Jung

These strengths already power sectors that need custom, high-performance components: aerospace and automotive for weight reduction and fuel efficiency, medical for patient-specific implants and prosthetics, and defense and energy for complex, high-duty parts.

"In all these cases," Jung said, "the ability to create tailored, intricate geometries gives AM a clear advantage over traditional methods."

THE PROBLEM: MICROSCOPIC DEFECTS

AM-part defects can spring from many sources — laser power, scan speed, hatch spacing, recoater wear or even powder quality. These flaws don't always show up the same way, which makes performance unpredictable. Current design methods often assume defect-free parts, optimize the geometry accordingly, and then discover real-world issues during testing.

Jung's approach flips that script. His team will model the likelihood and impact of defects inside their simulations, then optimize the design to be defect-tolerant from the start. The goal: reduce trial-and-error in the lab and deliver parts that perform reliably in real manufacturing conditions.

The potential payoff is big. The global AM market is projected to grow to $100 billion by the early 2030s, but that growth depends on proving consistent, certifiable performance at scale. If designs can tolerate real-world variability, manufacturers can move more parts from pilot runs to true serial production — and do it with confidence.

WHAT IT MEANS FOR STUDENTS, COURSES, LABS AND LOCAL INDUSTRY

The grant strengthens SIU's design for additive manufacturing (DFAM) capabilities by leveraging the university's metal 3D-printing facilities. Students will work on interdisciplinary projects that blend simulation, optimization and hands-on printing, thus gaining experience that translates directly to industry needs. Lessons learned will flow into DFAM-related curricula, modernizing courses and labs.

Partnerships are central. The team plans workshops and applied projects with local companies, opening doors for capstone collaborations and internships. The result is a talent pipeline for Southern Illinois industries exploring advanced manufacturing — and a clearer route for companies to apply Jung's research to real AM-production problems.

"The research simulates how real-world defects affect performance and then refines the design accordingly," Jung said. "This will dramatically cut costly experimental iterations while producing designs that align with real manufacturing conditions."

Mechanical engineering master's students Reese Rodely (left) and Kamal Kunwar (right) discuss what they are observing in SIU Carbondale's 3D metal printer.

WHAT SUCCESS LOOKS LIKE

If the approach works as planned, it could shift AM's reputation — from a promising tool that sometimes disappoints to a reliable production technology that consistently yields defect-tolerant parts. That boost in trust could accelerate adoption over the next decade, moving AM from niche use to a mainstream manufacturing strategy, especially for complex, lightweight designs where it already excels.

BOTTOM LINE

SIU's goal is simple and ambitious: design resilience into metal AM from day one, unlock certifiable performance at scale and graduate engineers ready to help manufacturers print — reliably, repeatably and with confidence.

Doctoral student Himal Sapkota prepares data and sets up builds for 3D printing.

WHERE THE WILD THINGS ARE

Center for Wildlife Sustainability Research celebrates 75 years

By Tim Obermiller

For 75 years, Southern Illinois University Carbondale's wildlife research program — founded in 1950 as the Cooperative Wildlife Research Laboratory and now known as the Center for Wildlife Sustainability Research (CWSR) — has stood at the forefront of science, conservation and education.

Launched under SIU President Delyte Morris and zoology Professor Willard D. Klimstra, the program — also known on campus simply as "the Lab"— gained national recognition for its leadership in applied research, graduate training and sustainability innovation. That tradition continues today under its new name, reflecting an expanded mission to integrate wildlife and human needs in a changing world.

In September, SIU marked the milestone and transition to the CWSR with a two-day celebration showcasing both the center's rich history and its cutting-edge research.

"This anniversary was both a celebration and a call to action," said Michael Eichholz, professor of zoology and CWSR director. "It's an opportunity to honor those who built this program while reaffirming our commitment to today's conservation challenges."

In 1994, Jack Nawrot, now senior scientist emeritus, looks over a retired coal mine site as it recovers.

LEGACY OF IMPACT

Over the decades, researchers at CWSR have partnered with state and federal agencies to study species ranging from bobwhite quail and white-tailed deer to bobcats and the endangered Florida Key deer. Today, the center brings in more than $1 million in annual research funding, underscoring its role as a trusted leader in the field. In 2000, The Wildlife Society honored the program with its Group Achievement Award — an international distinction also bestowed on major organizations such as The Nature Conservancy and Ducks Unlimited.

Student training has been at the heart of the center's mission from the very beginning. More than 2,500 undergraduates have gained hands-on research experience, while about 450 graduate students have earned advanced degrees. The center's impact is especially visible close to home in Southern Illinois, where early faculty pioneered mined-land reclamation techniques that transformed abandoned coal mine sites into vibrant ecosystems.

"The region's restored natural areas are the direct result of those early leaders recognizing that retired surface mines could be reborn as productive landscapes for fish and wildlife," said Eichholz.

FROM SPECIES COUNTS TO ECOSYSTEM THINKING

Wildlife research has shifted dramatically since the center's founding. In the 1950s, the focus was on managing individual species. By the 1980s, attention had broadened to ecosystems and predator-prey dynamics. Today, conservation faces an even greater challenge: balancing the needs of wildlife with those of a growing human population under the pressures of climate change.

"Wildlife management has gone from managing individual populations, to ecosystem-level dynamics, to today's challenge of sustaining both natural systems and social well-being," Eichholz explained.

Today, CWSR works not only with scientists and agencies, but also with landowners, industry and communities.

SCIENCE ON THE FRONT LINES

Faculty and students are working on projects that span conservation, public health, energy and recreation, including:

- Inspiring future scientists: At SIU's Touch of Nature Outdoor Education Center and the Green Earth Pyles Fork Nature Preserve, faculty and graduate students are developing camps and mentorship programs to spark interest in environmental careers. The goal: help rural and underrepresented middle schoolers envision themselves as future conservation professionals.
- Public health and landscapes: In Southern Illinois, where four eco-regions converge, researchers study how habitat management can reduce the spread of tickborne diseases. With climate change and rising outdoor recreation increasing human exposure, this work has direct implications for both conservation and public health.
- Recreation and wildlife: By fitting white-tailed deer with GPS collars, researchers are examining how the animals respond to newly built mountain biking trails. The findings will help land managers strike a balance between recreational access and conservation needs.

GRADUATE STUDENTS AT THE CORE

Graduate students are central to CWSR. "We try to instill a culture of collaboration and cooperation," CWSR Director Eichholz said. "Students learn more from one another and from working across multiple projects."

For Ph.D. student Ellen Audia, that collaborative model has shaped both her research and her career path. Her dissertation focuses on bobcats recolonizing north central Illinois — landscapes once lost to intensive agriculture. By studying how these animals adapt to fragmented habitats, her work will help guide conservation not just for bobcats, but for other midsized predators facing similar pressures.

Ellen Audia studies one of the bobcats recolonizing north central Illinois.

She credits CWSR with providing the mentorship and training needed to take on such a complex project. "I've learned so much about project management, study design, analysis and writing from faculty and fellow graduate students," she said. "My experience here has given me a lot of confidence as a researcher and made me excited to apply what I've learned as I continue my career as a research scientist. I feel proud to be part of the CWSR community and legacy, and to be surrounded by so many bright and accomplished scientists."

LOOKING AHEAD

As CWSR celebrates its diamond anniversary, its leaders are candid about the challenges ahead. Climate change and invasive species pose significant threats, and keeping the public engaged with wildlife will be critical to ensuring that resources remain available to address them.

"Our new emphasis on sustainability, and our attempts to work more with private landowners and industry to integrate both the needs of wildlife and the needs of a modern society, make us different from other wildlife programs," Eichholz said.

Associate Professor of Zoology Guillaume Bastille-Rousseau noted that SIU's inclusion on the Carnegie Classification of Institutions for Higher Education's lists for Research 1 and Opportunity Colleges and Universities underscores the center's unique role. "CWSR really embodies that," he said.

He added that the center's reputation extends well beyond Carbondale, "In conversations with collaborators, it often feels like being connected to the center comes with a kind of trust — that we get the job done." As an example, Bastille-Rousseau pointed to his leadership over the past five years of a 48-year Illinois Department of Natural Resources project, a partnership that reflects the center's continuity and reliability across decades.

That spirit of trust and endurance is central to this year's milestone. With its strong foundation and commitment to collaboration, the Center for Wildlife Sustainability Research is poised to continue shaping conservation for generations to come.

A Cup Of Insight

SIU Brewing Cheaper, Cleaner Myopia Treatment

By Tim Obermiller

If it seems like more children are wearing glasses, you're not imagining it. By 2050, scientists project about 50% of the world's population will be nearsighted. As families and clinicians look for ways to slow that trend, a team led by Southern Illinois University Carbondale researchers has developed a cleaner, lower-cost process to make 7-methylxanthine (7-MX), an oral drug used in Europe to treat childhood myopia.

At the heart of this study is a significant innovation: a common microbe engineered to turn caffeine from spent tea leaves and coffee grounds into the medicine with near-perfect precision — for a tiny fraction of the current cost, less than $0.35 per gram compared to $700 per gram. The team's findings were published in the high-impact, peer-reviewed journal *Green Chemistry*, published by the Royal Society of Chemistry, and featured on its back cover.

"We've developed a green manufacturing platform that could one day help treat millions of children," said Lahiru N. Jayakody, associate professor in SIU's School of Biological Sciences and the Fermentation Science Institute, where the study was launched.

"Under current conditions, we estimate the daily dose of 7-MX could be produced for well under a dollar. Our goal is to make this therapy widely accessible as clinical adoption grows."

The process is "green," Jayakody explains, because it starts with byproducts (glycerol from biodiesel and recoverable caffeine from spent tea and coffee) and replaces harsh chemical steps with a biological conversion that makes almost no waste. After fermentation, the drug crystallizes simply by cooling, which cuts down on solvent use and waste disposal. Taken together, those choices point to a cleaner, more circular supply chain — and a smaller environmental tab per dose.

CREATING TINY MICROBE FACTORIES

The study was conceptualized and designed by Jayakody, while SIU Ph.D. candidate Bhagya Jayantha led the experimental design and execution. Collaborators at the University of Alabama ran biochemical assays on feedback inhibition, and a Penn State researcher led the techno-economic and life-cycle analyses.

The team engineered the bacterium *Pseudomonas putida* — a common, nonpathogenic soil microbe widely used in biotech — so it works like a tiny factory. Think of it as a careful craftsperson: it takes in caffeine and trims it to exactly 7-MX, then stops — instead of making a messy mix of byproducts. To keep production steady, the team fed caffeine gradually (a fed-batch strategy, like topping off a gas tank as you drive) and tuned the cell's internal metabolic balance so the chemistry runs cleanly.

"What excites me is how the same engineering playbook can turn everyday leftovers into something that helps people," Jayantha said. His graduate research — supported by a grant from the Environmental Research & Education Foundation (EREF) — aims to create a circular economy that reduces waste and reliance on conventional plastics. "We're showing that biology can deliver a valuable pharmaceutical ingredient with precision, using inexpensive inputs and far less waste."

Myopia that worsens in childhood raises the risk of problems later in life, including retinal detachment and glaucoma. While 7-MX isn't a cure — and medical practice varies by country — clinicians in parts of Europe use it to help slow progression alongside lenses and lifestyle measures. If the use of 7-MX expands, a clean, affordable, scalable supply of the active ingredient will matter to families and health systems.

"This is very similar to the insulin story in industrial biotechnology," Jayakody said. "Once biology proved it could make a complex medicine more cleanly and at scale, access and affordability changed for the better."

FROM LAB TO MARKET: WHAT COMES NEXT

The 7-MX project is part of SIU's wider push to build a circular bioeconomy from food and beverage byproducts. A related effort led by Jayantha aims to upcycle food waste into biodegradable packaging. In parallel, the myopia-drug work shows that caffeine recovered from waste tea and coffee sources can feed the same microbial platform — turning discarded brew waste into a health care ingredient.

Industry partners are helping push these efforts forward. The study is part of Green Tea to Green Plastic, a collaboration supported by Green Core LLC (Japan) and ITO EN (North America) INC through the Japanese beverage company ITO EN, LTD. Long-term collaborative goals include development of biodegradable packaging and other sustainable materials.

"We're extremely proud of this collaboration," said Yosuke Jay O. Honjo, president and CEO of ITO EN (North America) INC. "It shows how industry and academic partners can move faster together — taking what many view as waste and turning it into new value. Projects like this support our sustainability roadmap by exploring practical ways to create value from byproducts and reduce environmental impact. Consumers may not see the science, but they feel the results: cleaner processes, better products and less waste."

Building on these industry ties, the SIU team and collaborators are now focused on the bridge from research to real-world use. Next steps include refining solid and staged feeding strategies, cutting water and energy use and validating solvent-free product recovery to keep the footprint small. The group is also testing the platform with larger volumes of tea and coffee waste while maintaining high selectivity.

Stepping back, these moves push the project beyond one process to a broader mission: building capacity for sustainable biomanufacturing at scale. In practice, that means talent development. SIU's Fermentation Science Institute — working with the Gower Translational Research Center, the BioLaunch Lab and external partners — prepares students from strain design to scale-up and technology transfer.

"Our students learn the full path," Jayakody said. "Design the biology, run the process, analyze cost and footprint and align with an industrial partner. That's how you prepare the workforce that will build the next generation of sustainable biomanufacturing."

Jayantha said that broader lens is what drew him to his current research focus. "I'm motivated by the idea that yesterday's leftovers can become tomorrow's solutions — medicines, materials and more," he said. "Caffeine to 7-MX is one example, but the same toolkit can unlock value across many waste streams."

Top Glass

Saluki Wins International Glass Art Competition

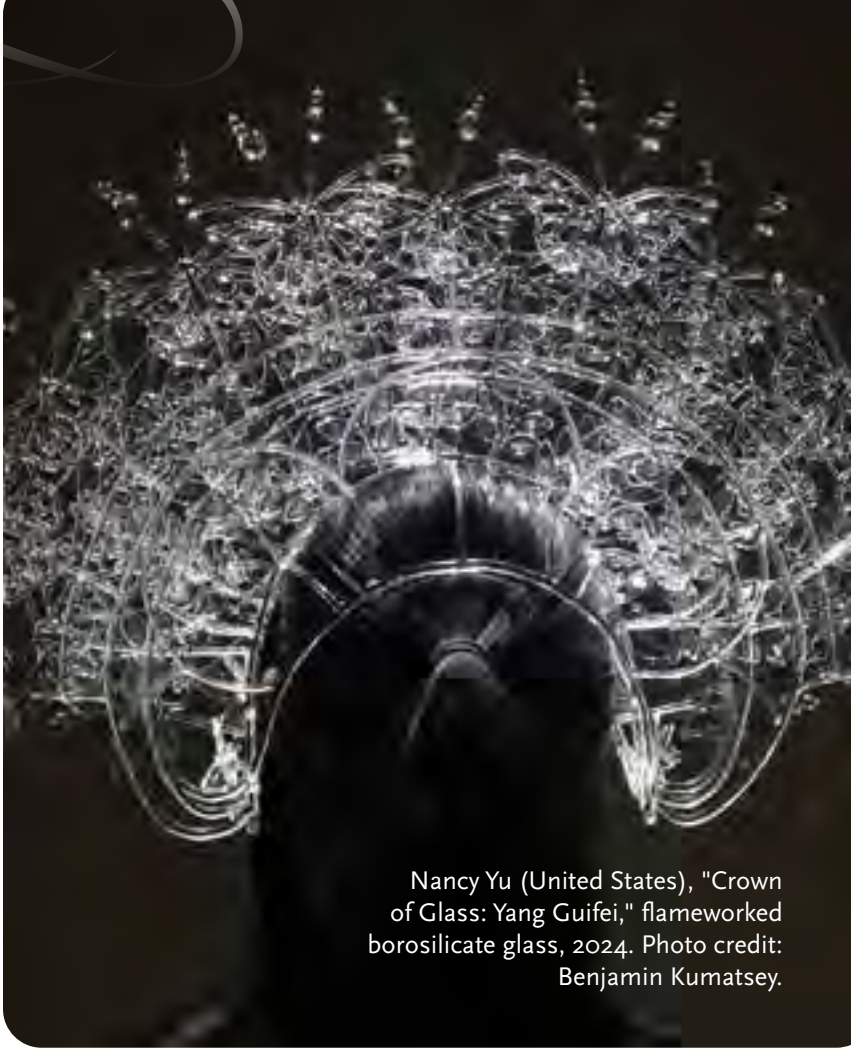
By Pete Rosenbery

An intricate glass headdress by a Southern Illinois University Carbondale Master of Fine Arts student that represents desire, glory and the emptiness that they can bring, recently earned top honors in a student exhibition at the international Glass Art Society (GAS) conference.

"Crown of Glass: Yang Guifei" by Nancy Yu earned first place in the organization's Evolution 2025: A Showcase of Emerging International Talent. The conference was May 14-17 in Arlington and Fort Worth, Texas.

"I was very honored to win the competition as there were many strong works," said Yu, who is from Australia and living in Carbondale while at SIU. "It was good to see different techniques and experiments that were happening out there."

Guifei (719-756) was known as one of the Four Beauties of the Tang dynasty, and her story has been told in many Chinese operas, poems and dramas. Headdresses were worn by women of rank in imperial China and traditionally indicated social status and power. For elite women, Yu said, "the headdress embodied authority but also fragility, reminding us that this privilege came with the constant threat of losing favor. The delicate designs on the 'Crown of Glass' shows the precarious balance between beauty and constraint, as if the wearer's identity and value are bound to the object itself, evoking reverence but also a latent unease."



Nancy Yu (United States), "Crown of Glass: Yang Guifei," flameworked borosilicate glass, 2024. Photo credit: Benjamin Kumatsey.

INSPIRED BY TANG DYNASTY BEAUTY

Yu drew inspiration for the work from Chinese opera, particularly *Drunken Concubine*, which is centered on Yang Guifei, whose beauty is said to have contributed to the fall of the Tang dynasty.

The glass headdress was made using "flameworking methods with delicate borosilicate glass rods."

The piece took a little over a month to make because "there are a lot of details attached to it," Yu said, adding that flameworked clear glass is a material "that mirrors the fragility of identity and history.

"Hubris, the idea of chasing after dreams, desire and the illusory nature of it all has always fascinated me, because it is fulfilling and empty at the same time," Yu said. "On one hand, it is what you believe you wanted all along, yet once you get it or a taste of it, you realize it may not have been what you envisioned all along, and while it is still beautiful, it's also a little bittersweet."

The headdress "represents that sense of desire, glory and emptiness of it all. When you wear it, it feels heavy not because it is physically so but because there's a psychological weight due to fragility. I'm interested in the idea of invisible struggles and yearning."

Yu, a Chinese-Australian artist, received her bachelor's degree at the University of Sydney's Sydney College of the Arts in Australia, and she expects to earn her M.F.A. in Spring 2026. She was attracted to SIU's glass program because Jiyong Lee, a professor in the School of Art and Design "is teaching here, and I had long admired his work even before I started working in glass."

Lee said he's excited by Yu's artwork and her win. Yu has created "a series of sculptures that address various thoughts about her Chinese heritage, sense of displacement and loss of cultural identity," Lee said. "She has created a few wearable sculptures that explore the concept of identity."

ONE OF MANY SUCCESSFUL GLASS PROGRAM STUDENTS

Lee said that Yu is just the latest M.F.A. student from SIU's glass program to earn accolades at the conference. Hoseok Youn, a 2021 graduate, was selected as an emerging artist in GAS' 2023 conference and demonstrated glassblowing this year. Youn is currently having a solo exhibition in St. Louis and completing several public and private collections. Eriko Kobayashi, a 2022 graduate, won top honors at the 2022 conference, and Sadhbh Mowlds, a 2022 M.F.A. graduate, was selected an emerging artist at the 2024 conference in Berlin.

"We are proud of the success of our students and alumni from the glass program," Lee said. "This success is a reflection of the hard work our students put into their practice and their willingness to take risks and grow. We create an environment that encourages curiosity, experimentation and mutual support. We're a small program, but that gives us the opportunity to work closely with each student and really focus on their development — not just technically, but artistically and personally. It's encouraging to see their efforts recognized beyond the studio."

Clearing THE AIR

SIU research focuses on air traffic controllers' mental health

by Pete Rosenbery

Research by Southern Illinois University Carbondale aviation and psychology faculty may shed light on mental health concerns of the nation's air traffic controllers (ATC) as they face high-pressure working conditions and staffing shortages.

The goal is to fill a research gap within an integral part of the aviation industry and provide potential recommendations to improve the controllers' mental health and reduce attrition rates.

"Exploring Mental Health Disorders Among Air Traffic Controllers" by Amy Rutledge, assistant professor; Matthew Romero, associate professor; and Elliott Benton, assistant instructor, all in SIU's aviation management program, included findings from their anonymous survey of 92 air traffic controllers from the U.S. and throughout the world. The December 2024 paper showed higher levels of moderate to severe anxiety and depression than in the general population.

Rutledge, Romero, Benton and Stephanie Chambers-Baltz, a clinical assistant professor in SIU Carbondale's School of Psychological and Behavioral Sciences, are continuing to investigate and analyze survey findings from the study that began in Summer 2024. They plan to finish that phase later this year.

While the Federal Aviation Administration is paying more attention to mental health concerns, Rutledge, a former air traffic controller in the Marine Corps, said mental health issues "are prevalent but nobody talks about it." Controllers who fear losing medical clearances can be conditioned to answer questions "so that we seem OK." Even if controllers get special waivers from the FAA to receive psychological evaluation and counseling, they won't have their job during that time or will be relegated to an administrative position at a much lower salary.

Chambers-Baltz said the challenge is being able to treat varying levels of mental health concerns without controllers worrying about damaging their careers if they access help.

"It's like a culture of avoiding mental health care because of the job consequence," she said. "How do you design well-being interventions that are kind of like therapy — but aren't — so that you can prevent people from developing mental health issues? What can be done at an organizational level to protect that, and then what are the individual things people can do to take care of themselves?"

PROVIDING INSIGHT INTO CONTROLLERS

Romero hopes their work demonstrates that there are controllers who struggle and the varying factors that contribute to that. The bulk of the aviation mental health research has been geared toward pilots.

"We want to find out through the data if we can associate something we collected that could influence or be associated with controllers' anxiety or depression," he said.

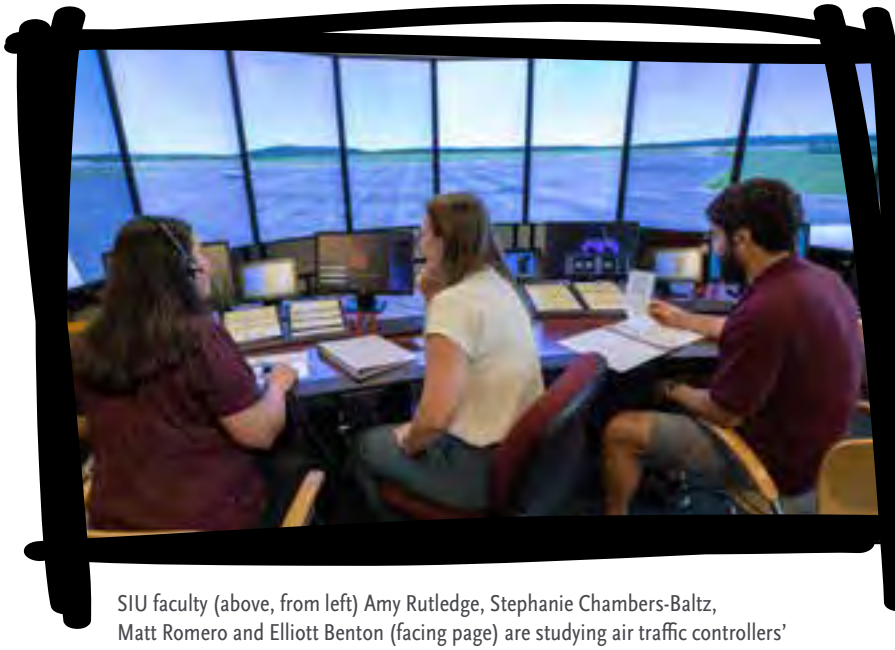
Chambers-Baltz said it would also be good to see if there is a link between understaffing and the likelihood of depression and anxiety within the study group compared to places where air towers are fully staffed, "so you start to predict if there is understaffing, this [depression and anxiety] is going to be the result within your employees."

Benton was an air traffic controller for 20 years in the Air Force and has been a controller at Southern Illinois Airport for six years. He hopes the research brings awareness to an issue not many want to discuss.

"Everyone has mental health issues. It doesn't matter if you are a pilot, a controller or do a regular ordinary job. Life affects us all the same way," Benton said, noting that learning how to cope with issues such as family relationships, death and financial issues is important, as bad coping mechanisms can lead to worsened mental health.

He hopes the research "brings out and lowers the stigma of mental health issues and allows people who are in aviation the opportunity to go out and seek counseling so that they can remain [in the aviation field]. The healthier we are mentally, the better we are going to perform in life and at work."

Even with the stress, being an air traffic controller is "the best job in the world," Benton said. "Look where we work. You have a 360-degree view of the world."



SIU faculty (above, from left) Amy Rutledge, Stephanie Chambers-Baltz, Matt Romero and Elliott Benton (facing page) are studying air traffic controllers' mental health with a goal of providing recommendations to improve their mental health and reduce attrition rates. (Photos by Russell Bailey).

FAA LOOKS TO ADD CONTROLLERS

With a need for about 3,000 more air traffic controllers nationwide, U.S. Department of Transportation Secretary Sean Duffy in May outlined the FAA's plans to boost air traffic controller hiring over the next several years. That includes financial incentives and bonuses for controllers to stay until they reach the mandatory retirement age of 56.

Because of training backlogs, the FAA is increasing training with its Enhanced Air Traffic-Collegiate Training Initiative (AT-CTI). ATC candidates will receive the same curriculum and advanced training technology offered during three to five months at the agency's Air Traffic Controller Academy in Oklahoma City, before they report to an FAA facility for up to three years to gain on-the-job experience and become certified professional controllers.

SIU is working to gain approval to offer the FAA's CTI and enhanced AT-CTI for Fall 2026.

At SIU, about 70 students are working to earn an air traffic control minor — with the majority being aviation flight students. Understanding aviation from the controller's perspective is key "because it gives them the other side of the picture and helps them to be better and safer pilots," Rutledge said.

In the classroom, SIU aviation faculty emphasize to students the importance of developing good coping mechanisms for their careers.

"I see our role here for them is to coach them into being healthy adults," Romero said. "We have them for a few years, and then we know that they are going to have long, lucrative careers if they can sustain a healthy lifestyle."

Saving the smelt

Cristina La, who recently earned her master's degree from SIU Carbondale, shows off samples in the lab. *(Photo by Russell Bailey)*.

(Below) La and her teammates collect samples. *(Photo courtesy of Robert Miller from ICF International)*.

SIU grad's research illuminates pollution threats to endangered California fish

by Tim Obermiller

The Sacramento Deep Water Ship Channel was still and quiet as the boat cut through the morning fog. For Cristina La, then a graduate student at SIU, this was the moment she had been preparing for over months of planning and lab work. Somewhere below the boat swam the last remaining stronghold of California's delta smelt — a tiny, silvery fish whose decline has become a warning signal for the entire Sacramento-San Joaquin Delta ecosystem.

"It's surreal going into the actual field portion when coming from a different state," La recalled. "All of these mythical locations we'd discussed for months just suddenly materialize in front of you. And then you realize — this is it. This is where you have to get it right."

La's master's research was part of a collaborative project focused on the Sacramento Deep Water Ship Channel, one of the few remaining habitats for delta smelt and longfin smelt—small, sensitive fish whose decline signals broader ecosystem disruption in the San Francisco Estuary. Working with researchers from the University of California, Davis and the California Department of Fish and Wildlife, she helped collect and analyze hundreds of samples of sediment, suspended solids and zooplankton across multiple field studies in 2023 and 2024. La also played a key role in coordinating sampling efforts and processing samples in SIU's lab.

The results were striking: contaminants such as DDE, phenanthrene, fluoranthene, pyrene and chrysene turned up in every sample, with the highest concentrations in suspended solids. Many of these pollutants are known to harm wildlife and people, causing problems like cancer, reproductive issues and damage to organs. The research team's findings suggest that fish like the delta smelt face their greatest exposure in the water column — the vertical section of water where they swim and feed — particularly when ship traffic or storms stir up bottom sediments and release contaminated particles into the water.

La's work contributed to one of the most detailed contaminant profiles of the Sacramento Deep Water Ship Channel to date, providing data that will help guide management decisions aimed at protecting both wildlife and the millions of people who rely on the San Francisco Estuary for water. She has already published one paper from this research in the international, peer-reviewed journal "Environmental Pollution" and is preparing a second manuscript that will combine results from multiple sampling events, ensuring that her findings reach the broader scientific community.

GROWING AS A SCIENTIST

La was part of SIU's Lydy Research Lab, which she joined in June 2022 as a research assistant while pursuing her master's degree in zoology. Under the mentorship of her adviser, Michael Lydy, distinguished professor of zoology, she learned the fundamentals of environmental toxicology.

"The Lydy Lab was the perfect place to grow as a scientist," La said. "I gained confidence in my skills — from designing projects and developing methods to running extractions — but I also learned how critical communication and collaboration are. I didn't just learn techniques in isolation; I learned how to contribute to a bigger scientific effort."

Housed within SIU's Center for Fisheries, Aquaculture, and Aquatic Sciences, the Lydy Lab offers students access to expansive research ponds, wet-lab space, a closed-cabin research vessel and state-of-the-art toxicology facilities. La said those resources, paired with mentorship from faculty and senior scientists, gave her the tools and confidence to take on ambitious research questions.

MAPPING CONTAMINANTS

La's research became the foundation of her master's thesis and was key to her earning her M.S. in zoology in May 2025.

The science was rigorous, but La says the fieldwork shaped her just as much. With her collaborators, she spent 12- to 15-hour days riding up and down the channel, coring sediments, pulling zooplankton nets and filtering water — often under shifting weather and tight time windows.

"Sampling days were always entertaining," she said. "Whether it was a team of two or four, you have these long boat rides to get to know each other and keep morale up. By the time we finally met the UC Davis team in person, we already felt like a well-coordinated unit."

La's deep familiarity with the project design made her a key voice when decisions had to be made in the field — an experience that strengthened her confidence and leadership skills.

REPRESENTING SIU ON A NATIONAL STAGE

La's success was more than personal — it was a reflection of the training she received at SIU.

"The experience taught me persistence, problem-solving and how to collaborate across institutions," she said. "I felt a real responsibility to represent SIU well. The trust my collaborators put in me meant a lot — and showed me just how well SIU prepares its students to step into those roles."

Mentorship was key to that preparation. In addition to Lydy, La credits SIU senior scientist Kara Huff Hartz and other members of the lab for helping her refine her research questions, troubleshoot problems and present her work with confidence.

After graduating in May 2025, she moved to Colorado, where she hopes to work in environmental analysis and risk assessment before eventually pursuing a Ph.D. in environmental toxicology.

"The lab, field and mentorship experiences I gained at SIU were all important," she said. "I don't think I could separate them in terms of what best prepared me for my next steps."

Tim Crosby contributed to this report.

siu.edu/research

Southern Illinois University
CARBONDALE