ROWAN RESEARCH

DISCOVERY AND INNOVATION AT ROWAN UNIVERSITY

SPRING 2026

MAKING WAVES

Acoustic research is more than meets the ear 18

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SPRING 2026

FEATURES

Ancient climates and mass extinction

Researchers are uncovering new clues about a dramatic chapter in Earth's history. Around 360 million years ago, the planet experienced environmental extremes, including rapid cooling and expanding glaciers. These shifts contributed to major losses of marine life and opened the door for early vertebrates to move onto land.

Supported by the National Science Foundation, geologist Lily Pfeifer leads a team investigating how those changes shaped life during a key evolutionary turning point. "To understand the full range of Earth's natural variability and the extremes that fall outside this range, we need to look deeper into time," Pfeifer said.

To do that, her team studies rock cores drilled from deep beneath the Appalachian Basin in Pennsylvania. These vertical time capsules preserve sediments, chemical clues and fossils that reveal how climate and ecosystems transformed over millions of years.

"When we see evidence of climatic extremes in the past, we need to ask ourselves what the drivers were and how life responded," Pfeifer said. "Answers to those questions can help us understand how Earth's systems interact, which is relevant to understanding our modern (and future) climate.

Above: Pfeifer and her collaborators examine rock cores at the Pennsylvania Geological Survey.

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Cover photo: Ph.D. candidate Chadi Ellouzi displays prototypes of 3D printed lenses designed to direct acoustic waves in a spiral pattern through water. See story, page 18.

RESEARCH **BRIEFS**

Improving reading instruction

Valarie Lee, an associate professor and chair of Rowan's Department of Critical Literacy, Technology & Multilingual Education, is helping teachers—and future teachers—evaluate and improve their instruction through lesson study.

Working with colleague Marjorie Madden, Lee collaborates with educators to plan lessons, observe instruction, and analyze student evidence before revising and reteaching. "We have seen some powerful results. It impacts their instruction. It helps our instruction as we prepare preservice teachers," Lee said.

Her research also examines how lesson study influences Rowan's preservice teachers tutoring K-12 students in the institution's 90-year-old Reading Clinic. Lee's work includes a longitudinal study tracking graduates into their first years of teaching to assess the impact of clinical reading experiences.

By treating teachers as experts and fostering collaboration, Lee's research strengthens literacy education and teacher preparation.

AI-assisted accounting

Tony Lin, an assistant professor in the Rohrer College of Business, is exploring how artificial intelligence can revolutionize accounting, sustainability and business.

"AI became a buzzword in 2022 with the rise of generative AI, which uses probabilistic models to predict what comes next," he explained.

This predictive ability, Lin believes, is especially useful in accounting. "Accounting is about gathering evidence—like invoices and orders—and telling a coherent story. With the right data, AI can help answer key questions: How did we perform last quarter? Are we profitable? What's our outlook?"

Lin is also investigating "agentic AI," systems capable of completing multistep tasks—such as literature review, data analysis and reporting—without human intervention. His research is shaping curriculum to prepare graduates for an AI-driven future.

"Students want meaningful careers or to launch their own ventures," Lin said. "Our job is to ensure their skills match the evolving demands of the business world."

New ways of looking back

The Center for Digital Humanities Research is making history more accessible through innovative digital tools. To help visualize historical change, faculty and student researchers in the Ric Edelman College of Communication, Humanities & Social Sciences are creating interactive maps, timelines, archives and virtual tours.

"For example, my research on Mexico City uses progressive aerial images to show how construction of the National Autonomous University of Mexico in the 1950s transformed the region," said center co-director Jessica Mack.

The center also trains students through courses and a Certificate of Graduate Study program, preparing them to build websites, databases and digital collections while exploring the ethical and societal implications of emerging technologies like artificial intelligence. "You can do digital humanities research without being a computer expert," Mack said. "It's really about asking the right questions and using technology in new ways to answer them."

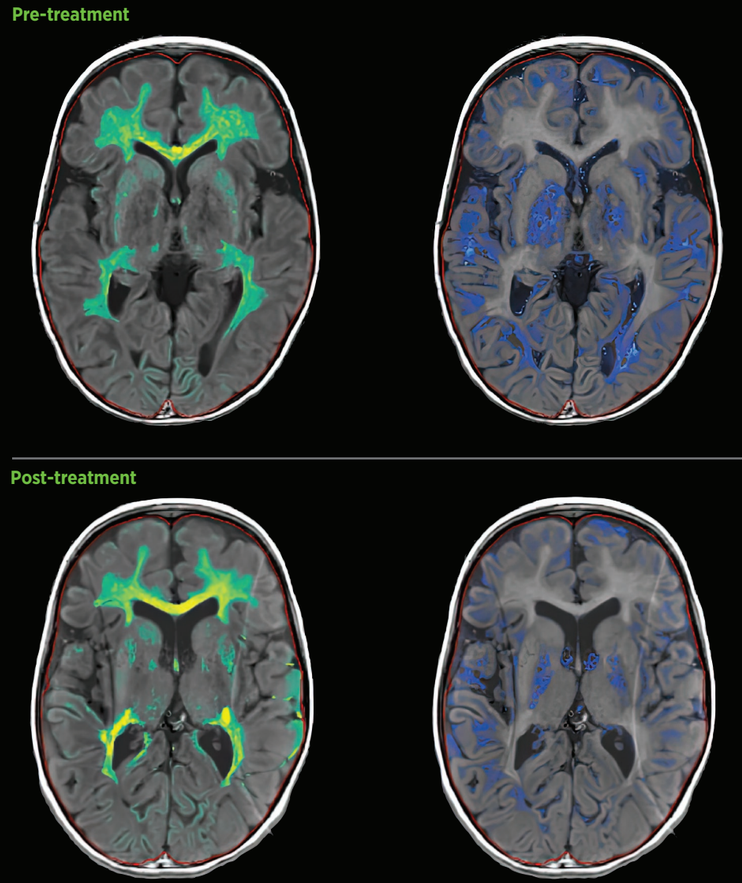
Gene therapy for childhood diseases

For decades, Paola Leone, a professor of neuroscience at Rowan-Virtua School of Osteopathic Medicine, has pursued a cure for Canavan disease. This rare genetic disorder damages the brain's white matter.

In Canavan disease, a natural brain molecule builds up to toxic levels. This buildup prevents the formation of myelin, the protective coating that covers nerve fibers, much like insulation on a wire. The disease also causes extra water to accumulate in the brain, leading to swelling and tissue breakdown. As the damage worsens, children lose motor, cognitive and communication abilities. Most do not survive past age 10.

Now, Leone's persistence has paid off. In a study published in Nature Medicine, her team reported the first gene therapy to restore myelin, reduce toxic buildup and decrease brain swelling. Early-stage clinical study results showed early signs of improved brain development—a milestone once thought impossible.

The therapy, called MYR-101 and developed with industry partners, is a promising shift in the treatment of neurological disorders. "This is the beginning of a new era," Leone said. Leone's team is seeking approval from the Food and Drug Administration and exploring if this approach could help other conditions, including multiple sclerosis.



This image shows pre- and post-treatment brain scans from one of eight participants who received MYR-101 therapy. Baseline scans appear at the top and post-treatment scans at the bottom. Green areas show myelin, the protective coating around nerve fibers, and blue areas show excess water that contributes to swelling. Brighter colors indicate higher levels.

After treatment, all participants showed increased or stable myelin, and seven showed reduced excess water. Together, these changes point to improved brain tissue integrity and progressive normalization of white matter.

Source: Leone, P., Lober, R.M., Francis, J. et al. Oligodendrocyte-targeted adeno-associated virus gene therapy for Canavan disease in children: a phase 1/2 trial. Nat Med 31, 3772–3779 (2025).

New from Jersey

Home to the first light bulb, fiber optics and lasers, New Jersey is a hotbed for invention and big ideas. Through investment in strategic innovation centers, the state aims to spur the economy and drive long-term growth.

Improving lives

Rowan University is helping lead a transformative initiative to accelerate medical technology development and maternal health through two Strategic Innovation Centers (SICs).

The New Jersey Accelerator for Innovation in Medtech (NJ AIM) in Camden and on Rowan's West Campus will support the research, development and commercialization of novel medical technologies and devices. The New Baby New Jersey SIC in Trenton's Maternal and Infant Health Innovation Center will assist early-stage companies advance groundbreaking maternal and infant health solutions.

Operated by Plug and Play, a global startup accelerator, the centers will host two cohorts of at least 25 companies annually, offering clinical expertise, research support and seed funding through Garden State Venture Partners.

Led by the New Jersey Economic Development Authority and regional partners, the initiative positions South Jersey as a leader in medtech innovation, creating new opportunities for startups and economic growth.

Launchpad for innovating aerospace

Rowan University has partnered with the National Aerospace Research & Technology Park (NARTP) and the Atlantic County Economic Alliance (ACEA) to establish a statewide and national academic consortium dedicated to aerospace research, technology and workforce development.

Building on Rowan's longstanding partnerships and projects with the Federal Aviation Administration (FAA), the agreement sets the stage for collaboration among universities, industry leaders and government agencies to accelerate innovation in areas such as advanced air mobility, unmanned systems, aviation cybersecurity and artificial intelligence.

Located near the FAA William J. Hughes Technical Center for Advanced Aerospace and the Atlantic City International Airport, NARTP provides direct access to federal research facilities. The consortium also supports the Aerospace Innovation Center, a Strategic Innovation Center at NARTP, a hub for research, testing and commercialization.

By leveraging Rowan's research capabilities and regional assets, this initiative aims to position New Jersey as a national leader in aerospace technology and economic growth.

From left: New Jersey Congressman Jeff Van Drew, ACEA Chair Michael Viscount, NARTP President Howard Kyle and Rowan University President Ali A. Houshmand pose with a ceremonial agreement creating a new academic consortium for aerospace innovation on Aug. 28, 2025, in Egg Harbor Township, New Jersey.

Supporting startup collaborations

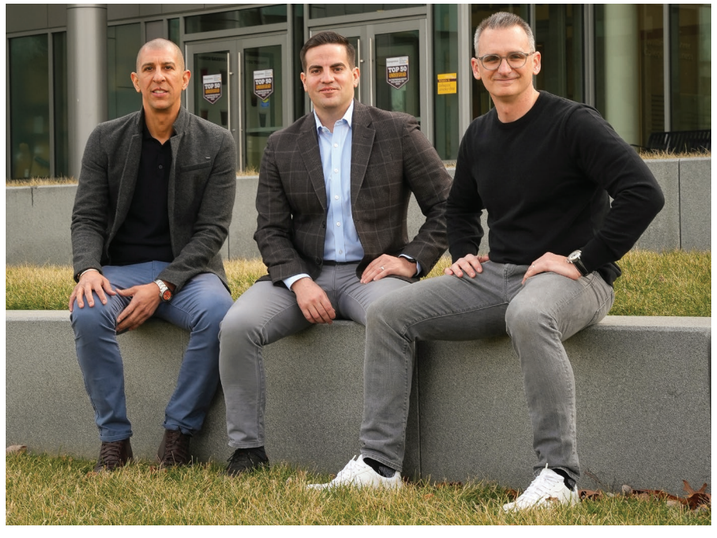
Rowan Innovation Venture Fund has appointed Garden State Venture Partners (GSVP) as its new management team, marking a significant milestone in the $25 million fund's evolution. The move strengthens the fund's ability to scale investments and support commercialization of Rowan-related research and technology.

Three Rowan alumni make up the GSVP leadership team: Michael Connallon Jr., Shawn Hill and Ernest Holtzheimer. Together, they bring decades of financial experience and industry expertise, which they are using to expand the fund's regional footprint and strengthen commercialization pathways for Rowan research innovations.

"This collaboration gives entrepreneurs and researchers across New Jersey much-needed access to capital, expertise and guidance," said Rowan University President Ali A. Houshmand.

Launched with $5 million in 2014 and expanded with a $20 million commitment in 2022, the Rowan Innovation Venture Fund manages 18 active investments. The fund provides early-stage capital to companies led by Rowan students, faculty, alumni and staff, as well as regional entrepreneurs. The portfolio includes health care and biotechnology companies such as MRIMath and ReGelTec, industrial automation company Sojo Industries and beverage company HalfDay, among others.

With GSVP at the helm, the fund aims to drive economic impact further by connecting and investing in the regional innovation ecosystem.



From left: Shawn Hill, Ernest Holtzheimer and Michael Connallon Jr. at Rowan University's Glassboro campus.

Award-winning AI for mapping brain tumors

Nidhal C. Bouaynaya, a leading researcher in artificial intelligence and machine learning at Rowan University, accepted the 2025 Edison Patent Award in Medical Diagnostics.

Bouaynaya and co-inventor Hassan Fathallah-Shaykh developed a patented, cloud-based AI method that accelerates the mapping and measurement of glioblastoma brain tumors, improving cancer surveillance and patient care.

Jointly patented by Rowan University and the University of Alabama at Birmingham, the innovation was one of 12 honored by the Research & Development Council of New Jersey at the state's largest celebration of invention. The Edison Patent Awards recognize breakthroughs that drive progress in medicine, technology and beyond.

Bouaynaya's achievement underscores Rowan's growing impact in AI-powered health care solutions and its role in shaping the future of medical diagnostics.

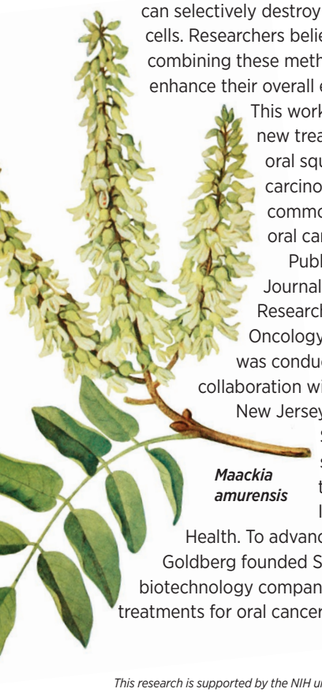
Fighting oral cancer with lasers and lozenges

Rowan researchers have identified two potential strategies for effectively treating oral cancer, both of which target a key protein involved in tumor spread.

Gary Goldberg, a professor of cell and molecular biology in the Rowan-Virtua School of Osteopathic Medicine, and his research team tested two treatments. They evaluated lozenges containing Maackia amurensis seed lectin (MASL)—a plant-derived compound used in traditional medicine—and a laser-based therapy called near-infrared photoimmunotherapy. Both approaches suppressed podoplanin, a protein that enables cancer cells to invade new tissue.

Clinical trials show that MASL is well-tolerated and slows the growth of cancer cells. Additionally, laboratory experiments revealed that laser therapy can selectively destroy malignant cells. Researchers believe that combining these methods could enhance their overall effectiveness. This work may lead to new treatments for oral squamous cell carcinoma, the most common type of oral cancer.

Published in the Journal of Cancer Research and Clinical Oncology, the study was conducted in collaboration with Rutgers New Jersey Medical School and supported by the National Institutes of Health. To advance this work, Goldberg founded Sentrimed, a biotechnology company developing treatments for oral cancer.



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Identifying IBS

Developing a medical test takes years of research, but bringing it to patients requires more than science. A team of researchers, led by Sangita Phadtare, a professor of biomedical sciences at Cooper Medical School of Rowan University (CMSRU), is tackling this challenge.

Currently, IBS diagnosis involves ruling out other conditions, a process that can be stressful and time-consuming.

"A rapid, definitive test would lessen the stress that comes with waiting for a diagnosis and help patients begin managing their symptoms more quickly," Phadtare said.

Phadtare is joined by colleagues, Lark Perez, a professor of chemistry and biochemistry in the College of Science & Mathematics, and Joshua DeSipio, M.D., an associate professor of medicine at CMSRU. Together, they are working to commercialize a rapid test for irritable bowel syndrome (IBS).

The team has applied for patents and co-founded GUTSCI LLC. With support from the National Science Foundation's I-Corps™ program, they are refining their business strategy and exploring customer needs. Their goal: a simple, color-changing test that could be used in clinics—or even at home.

Be humble

We can't know everything—but we can learn to acknowledge that fact. Tenelle Porter, an assistant professor of psychology in the College of Science & Mathematics, studies how people adaptively respond to their limitations through a mindset called intellectual humility.

"We all have pockets of ignorance," Porter said. "Intellectual humility is about cultivating awareness that you may not be considering everything or you might be wrong, so you can listen and try to understand where the other person is coming from."

With support from the John Templeton Foundation and The Brookings Institution, Porter investigates how classrooms can foster intellectual humility. She also explores how different academic disciplines influence this trait. Using surveys, interviews and lab experiments, her work shows that intellectual humility benefits education, science, medicine—and even everyday relationships—by helping people learn, collaborate and communicate more effectively.

Can AI help New Jersey manage its aging bridges?

Repairing bridges is much like a root canal—painful, but sometimes necessary, says Islam Mantawy, an assistant professor in the Department of Civil & Environmental Engineering at the Henry M. Rowan College of Engineering.

Before dentists recommend a root canal, they need data about the extent of the problem, which drives decisions about the timing, scope and type of intervention. Similarly, bridge asset management needs information about the bridge's condition, a forecast about its near-term deterioration potential and whether the fix can wait without jeopardizing safety. Such a delicate balance is necessary to optimize limited budgets.

With support from the New Jersey Department of Transportation's Bridge Resource Program, Mantawy is leading work to develop effective bridge asset management strategies. Using artificial intelligence and machine learning algorithms, his team is addressing data management, predictive modeling and performance forecasting with Nidhal C. Bouaynaya, associate vice chancellor for artificial intelligence and director of the Machine, Artificial Intelligence and Virtual Reality Center (MAVRC).

Such efficiencies come not a minute too soon. New Jersey has 6,827 bridges and maintaining up-to-date information on their condition is time- and resource-intensive. Engineers cull data on each bridge from extensive reports, tracking damage over time to determine when urgent repairs are needed.

The research team will train a machine learning model with images of various kinds of damage, such as spalling (or fragmenting), cracks and corrosion, so it can learn what defects and problems look like. The trained model will then process inspection images and flag potential issues for engineers to review.

Adriana Trias Blanco, an assistant professor in the department, collaborates with Mantawy to use Light Detection and Ranging (LiDAR) technology to create comprehensive "maps" of bridges so every problem can be spotted and tracked over time. LiDAR uses light beams that bounce off an object and measures the time it takes to bounce back. The technology creates large "point clouds," where each point describes a spatial location of the asset and delivers better information about the severity and extent of damaged areas. Using AI will help extract relevant information from these datasets, too.

"Our work is about using human and monetary resources more efficiently," says Mantawy, who is also part of Rowan's Center for Research & Education in Advanced Transportation Engineering Systems. "We want safe and reliable bridges while optimizing how we spend our resources today and minimizing future costs."

New hub

for biomedical research

The Virtua Health College Research Center is located on the southwest portion of Rowan University's West Campus, a growing center for interdisciplinary education, research and technology innovation.

Dianne Langford tours labs nearing readiness for research teams.

Open this spring, the Virtua Health College Research Center at Rowan University marks a major milestone in the University's growing biomedical research enterprise. Located on Rowan's expanding West Campus, the center is strategically positioned near leading industry and research institutions in the Greater Philadelphia region and the mid-Atlantic.

With two floors dedicated to Virtua Health College research and other shared spaces, the facility features large, open-plan laboratories designed to promote collaborations. Expanding upon the cutting-edge research on the Stratford, Sewell and Glassboro campuses, the research center provides additional state-of-the-art lab space and resources for cross-disciplinary collaborations.

Researchers from Virtua Health College of Medicine & Life Sciences will work alongside colleagues from Virtua Health, other Rowan colleges and schools, clinicians and industry partners. Together, they will advance technologies, discoveries and innovative therapies in translational biomedical sciences and engineering, in areas including transplant, regenerative medicine, neuromuscular and orthopedic research.

"A lab is more than benches and beakers. It is an engine that powers discovery," said Dianne Langford, associate vice chancellor for Virtua Health College of Medicine & Life Sciences, dean of Rowan-Virtua School of Translational Biomedical Engineering & Sciences, and professor of neuroscience. "As our scientists, technicians and students work together in these labs, they will test hypotheses, conduct experiments and develop ideas for better diagnostics, treatments and care. Ultimately, we are committed to building knowledge that produces solutions to real-world problems, helping people live with better health."

Langford looks forward to forging innovative, impactful solutions that fill health care gaps and improve the lives of patients and communities. "The new research facility aligns ideas from basic science and early discovery with preclinical studies leading to clinical research for improved patient outcomes," said Langford.

"A lab is more than benches and beakers. It is an engine that powers discovery."

—Dianne Langford

Established in 2021, Virtua Health College of Medicine & Life Sciences represents a historic academic health partnership between Rowan University and Virtua Health, South Jersey's largest health system. Driven by world-class physicians and researchers on the leading edge of science, the college seeks to become a national leader in health care education, discovery and innovation.

Super-powered

Lab advances manufacturing through AI

The rapid development of artificial intelligence and the usability of large language models have promised to transform industries on a large scale but, first, engineers must figure out how to integrate intelligent systems with real-world applications.

To accomplish that goal, Rowan University's Digital Engineering Hub (DEHub) is merging smart technology with advanced manufacturing methods through its new, well-equipped lab.

Directed by Antonios Kontsos, DEHub can digitize real-world objects, as well as create new objects based on human- or machine-engineered designs.

The lab features 3D polymer and metal printers, 3D scanners for digitizing existing objects, and devices for mechanical behavior sensing and testing. Its key piece of equipment is DMG MORI's LASERTEC 30 SLM US, the first metal additive manufacturing equipment of its kind, capable of producing 3D metal parts while being continuously adjusted for best performance.

Designed and assembled in the United States, this 3D metal printer uses a high-powered laser to melt and fuse thin layers of metal powder to create a solid component. The machine's distinguishing features include its adaptive beam control, improved production process and data interconnectivity, allowing the detection—and correction—of flaws in real time during the construction process.

Director Antonios Kontsos and mechanical engineering senior Sam Menaker work with the lab's key piece of equipment, a 3D metal printer connected to a supercomputer. The team works to integrate intelligent systems with real-world manufacturing methods.

The lab's processing power is fueled by a highly secure computer cluster, capable of receiving and processing terabytes of information instantly.

"We are the first academic research group in the world to connect a supercomputer for this type of machine," said Kontsos, the Henry M. Rowan Foundation Endowed Professor in the Department of Mechanical Engineering. "The data we're collecting—such as part temperature and laser information—is in the order of terabytes, so we need the computational power coupled with live-streaming capabilities to synchronously store and process it."

Focused first on federally funded research for the Defense Advanced Research Projects Agency and the National Institute of Standards and Technology, DEHub aims to work across a wide range of manufacturing sectors, including the defense, manufacturing, pharmaceutical, biotechnology, energy and civil infrastructure, as well as robotics industries.

Interest is already high. DEHub's launch event in August 2025 attracted representatives from companies as far away as California, Texas, Germany and Australia.

"Our horizon is not to improve the local and regional economy only," Kontsos said. "We want to improve the global economy by becoming a resource worldwide for advanced digital engineering applications."

Staff engineer Alex Kinoian measures a 3D printed metal component. Driven by a highly secure computer cluster, the printer uses a high-powered laser to melt and fuse thin layers of metal powder in a process that allows for the detection and correction of flaws during the production process.

Developing taste

How molecular signals in infant tongues shape how we eat, taste and speak

During her postdoctoral research, Archana Kumari read a blog post by an oral cancer patient taking medication that disrupted taste. At Thanksgiving dinner, the patient couldn't detect the subtle saltiness of the gravy or the sweet notes of the candied yams.

"It was so awful to read," said Kumari, now an assistant professor of neuroscience at Rowan–Virtua School of Osteopathic Medicine. The story stayed with her and eventually helped shape the direction of her scientific career.

She began working to understand the role of a cell-signaling pathway known as Hedgehog signaling and how it might contribute to taste disturbances experienced by cancer patients treated with Hedgehog-inhibitor drugs.

"Taste is being altered in so many medical conditions, not just from anti-cancer drugs," Kumari said. "I really wanted to do something meaningful."

How cell signals influence tongue development

Cell-signaling pathways are a series of chemical reactions inside a cell that control its function. First discovered in fruit flies, the Hedgehog pathway is essential for numerous processes in embryonic development, including formation of the tongue. The pathway is named after the Hedgehog gene. Fly larvae lacking this gene develop a short, spiky appearance that resembles a hedgehog.

"We know that Hedgehog signaling plays a vital role in taste organ development before birth and it maintains them in adulthood," Kumari said. "But there is a critical gap in our understanding of its role in tongue and taste organ development after birth in juvenile stages."

Then working with her team at the University of Michigan, Kumari returned to study the tongue with a fresh perspective. She began investigating underexplored components of Hedgehog signaling from birth through adulthood, identifying genes not previously studied in the tongue. What particularly fascinated her were the dynamic changes in these signaling components after birth and their biological relevance.

That curiosity broadened her focus beyond taste organs to the tongue as an integrated, multifunctional organ.

Children with lesions on the top or back of their tongues often face significant challenges with eating and speaking. Although the structural and developmental changes of the tongue are well-documented, the signaling pathways guiding those changes remain poorly understood, slowing progress in addressing pediatric tongue disorders.

Children with lesions on the top or backs of their tongues often face significant challenges with eating and speaking.

With support from the National Institutes of Health, Kumari is leading research to fill this gap. She uses mouse models that allow researchers to delete individual genes one at a time and watch how each change affects the tongue structure and architecture of taste-organ tissues.

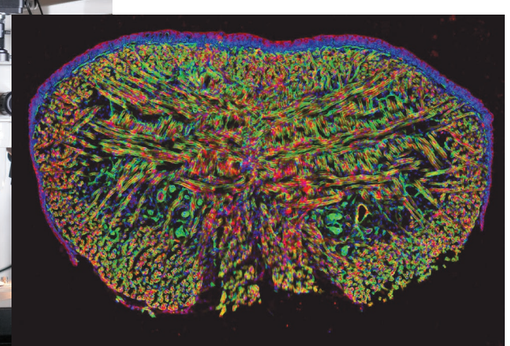
Her work poses a fundamental question: Can the tongue still perform its functions—taste, speech, and movement—without specific genes?

"This can tell us whether a gene is essential," she explained, "or whether it simply provides a supporting role."

By uncovering how Hedgehog signaling works in the developing tongue, Kumari hopes to clarify why tongue disorders occur in children in the first place.

"A clearer understanding of these biological signals," she said, "could one day help doctors move beyond treating symptoms and toward more effective, targeted care."

Archana Kumari



A closer look
Below: A microscopic cross-section of a mouse tongue stained to highlight its tissue layers. The outer layer, called the epithelium, is reinforced with keratin and protects against friction. Beneath it lies the lamina propria, a layer of connective tissue that provides support, followed by thick bundles of skeletal muscle fibers that enable movement and flexibility. Sore spots and other lesions frequently develop on the thinner epithelial areas, especially on the sides and underside, which are more susceptible to irritation.

This research is supported by the NIH under Award Number R01DC022319. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Engineering hope for high-risk pregnancies

Rachel Riley recognized a gap. Now, she's working to improve outcomes for patients long overlooked by research.

As a nanoparticle engineer, Rachel Riley is driven to support patients who have long been underrepresented in research, especially during pregnancy and adolescence.

Historically excluded from clinical trials due to safety concerns, pregnant patients experiencing complications often have few treatment options, said Riley, an assistant professor of biomedical engineering in the Henry M. Rowan College of Engineering.

"There's understandably so much regulation around this vulnerable population of patients," Riley said. "They're more sensitive populations to treat, but that doesn't mean we shouldn't provide options for diseases that currently have none."

The lack of scientific understanding around pregnancy hit Riley hard during her postdoctoral research at the University of Pennsylvania, where she worked to develop lipid nanoparticle platforms to treat fetal genetic diseases.

Midway through that work, she experienced her own unexplained hardships surrounding pregnancy while starting her family.

"That was the hardest time of my life," Riley said. "There's just so little known and so few options around the entirety of pregnancy. Why are some pregnancies healthy and some not? If we can't answer these basic biological questions, how can we hope to treat these patients? Just so little is known."

Rachel Riley (right) with doctoral student Liza Guner at the Joint Health Sciences Center in Camden, New Jersey.

> "Patients want a treatment option, and we hope to provide that."
>
> —Rachel Riley

When Riley returned to Rowan University, her alma mater, in 2020 to launch her own lab, she recruited a team of graduate and undergraduate researchers to pursue those unanswered questions. Their work to develop nanoparticle-based therapeutics focuses not only on conditions affecting pregnancy, but also on pediatric and gynecological cancers.

Riley's Innovative nanoMedicines for Prenatal and Cancer Therapy (IMPACT) Lab develops gene therapies using lipid nanoparticles (LNPs)—tiny, fat-based particles that can encapsulate nucleic acids. These organic chemical compounds carry genetic information and instructions for human cells. They can also be prepared in a lab and used as therapeutics to treat the underlying causes of disease. LNPs are a widely used and highly adaptable technology, best known for enabling the rapid development of the Moderna and Pfizer SARS-CoV-2 vaccines.

Seeking areas where new discoveries could have the greatest impact, the team is investigating preeclampsia and other hypertensive disorders of pregnancy. These conditions contribute to the nation's rising maternal and infant mortality rates, and—if untreated—double the lifetime risk of cardiovascular disease and stroke for affected patients.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

Building on foundational work with her first two Ph.D. graduates, Samuel Hofbauer and Rachel Young, and other students in her lab, Riley earned a five-year National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award. The project uses LNPs to explore how placental development shapes maternal and fetal health. The award supports basic research aimed at transforming how preeclampsia is studied and treated through new types of LNPs engineered to travel to the placenta—an organ that remains poorly understood.

"The placenta is incredibly fascinating because it is the only tissue that develops into a fully functional organ in adulthood. The only other type of new tissue that develops in adulthood is tumors, but these are extremely unorganized and dysfunctional," said Riley. "When healthy, the placenta is highly functional, controlled and well organized, but biological dysregulation during placenta development leads to adverse pregnancy outcomes."

Advancing academic discoveries into clinical treatments requires commercialization, Riley noted. To that end, she and Young founded a startup, HeraNano Therapeutics, with support from the New Jersey Economic Development Authority, with the goal of eventual commercialization of their therapeutics for women's health applications.

"Currently, we are developing cutting-edge approaches to enable gene therapies and hope to raise additional capital to expand our pipeline and drive progress towards patient impact," Riley said.

Inspired by her students and the urgent need for new therapies, Riley remains determined despite the scientific and regulatory challenges ahead.

"Patients want a treatment option," Riley said, "and we hope to provide that."

Targeting preeclampsia

The more Rachel Young studies the placenta, the more she's fascinated by its development, its capabilities and its mysteries.

Once an early-stage embryo implants itself in the uterine wall, for example, the organ grows "seemingly out of nowhere," said Young. Complicated in its cellular structure, the placenta develops from the embryo itself and can weigh three to five pounds at delivery.

"I think it's amazing the human body does that," Young said. "It makes sense there are challenges with developing treatments because it is so complex."

Responsible for sustaining life for roughly 40 weeks, its proper development is a critical component of a healthy pregnancy—yet, few researchers are pursuing work to improve placental health and development.

That gap has left room for Young to step in. Well before completing her Ph.D. studies in 2025 under the direction of her mentor, Rachel Riley, Young knew she wanted to pursue research that could make a meaningful impact on women's health.

Rachel Young

Encouraged by their early research, Riley and Young co-founded HeraNano Therapeutics to develop a first-in-class treatment for preeclampsia, a pregnancy complication caused by problems in the developing placenta. Based at Rowan University, the startup company received initial funding from the New Jersey Economic Development Authority.

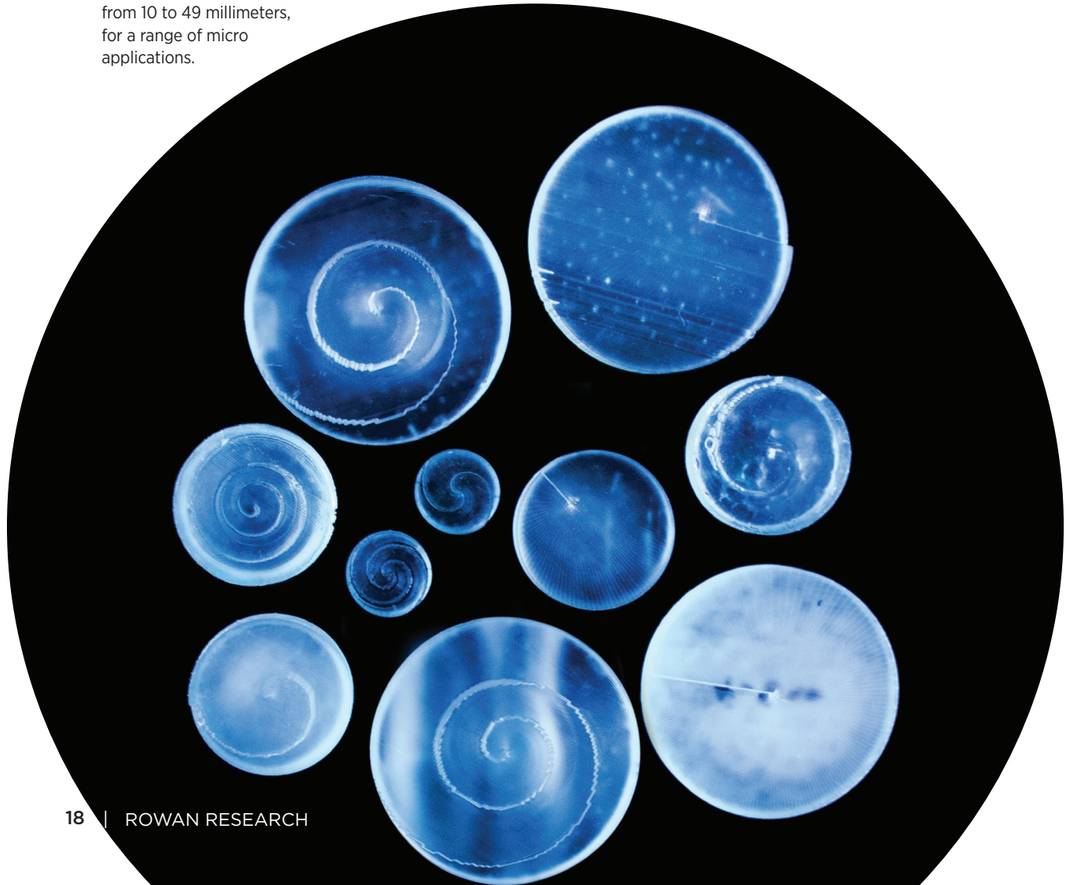
Standard treatments for preeclampsia include beta-blocker medications to address the mother's high blood pressure, but these don't treat the underlying cause and are often ineffective, especially in severe cases.

Using lipid nanoparticles to carry instructions to the placental cells, HeraNano's founders are working on a therapeutic that will cause the organ to dilate constricted blood vessels in order to improve circulation to the developing fetus.

"I just hope our research can really make a difference and address the need," Young said. "That's what keeps me going."

Making Waves with acoustics

How a mechanical engineering expert turns sound science into breakthroughs for robots, infrastructure and health care



The lab team experiments with 3D printed acoustic lenses, with sizes ranging from 10 to 49 millimeters, for a range of micro applications.

A love of music fueled an early interest in acoustics research for Chen Shen, an assistant professor in the Department of Mechanical Engineering at the Henry M. Rowan College of Engineering.

Acoustics are like ripples in water. Sound waves behave similarly, spreading and interacting with obstacles.

However, unlike in music, acoustics are not limited to only audible sound, points out Shen, who has won awards and published dozens of papers for his groundbreaking work in basic science and real-world applications of acoustic waves.

With support from the National Science Foundation's Faculty Early Career Development Program (CAREER) Award, Shen searches for ways to fine-tune the direction and intensity of sound waves. Because the pattern of waves depends on the medium through which they move, simply changing the material isn't always enough to get the desired result. Instead, Shen fine-tunes acoustic waves by developing novel structures through which they can travel and change in desired ways.

Imagine changing the shape of a musical instrument to alter its sound, rather than changing the material it's made of.

"Developing specific structures provides greater freedom of control because you don't always find the material properties you want. Harnessing structures and the way they interact with acoustic waves gives us different propagation patterns that we can then use to facilitate different applications," Shen says.

Steering acoustic waves for real-world applications

One of these applications is using acoustic waves to power microrobotic "swimmers," potentially for monitoring aquatic environmental conditions. Traditional actuators—the components that make robots move—don't work for microrobots because they're mechanically complex and difficult to miniaturize. Acoustic propulsion is a viable alternative.

Key to the process is an acoustic "vortex," a spinning sound wave that transfers energy to the robot to make it move. A 3D printed component Shen and his team developed acts as an "acoustic lens," focusing the sound waves into a small area and pushing the robot.

Shen attached the acoustic lens to the robot along with a miniature piezoelectric transducer, a tiny device that turns electricity into ultrasound waves. By adjusting two sound-generating devices placed at right angles to each other, Shen can steer the robot like a remote-controlled boat.

For environmental monitoring, users apply sensors to the robots, including acoustic ones, which can detect varying conditions, like the presence of foreign materials or humidity.

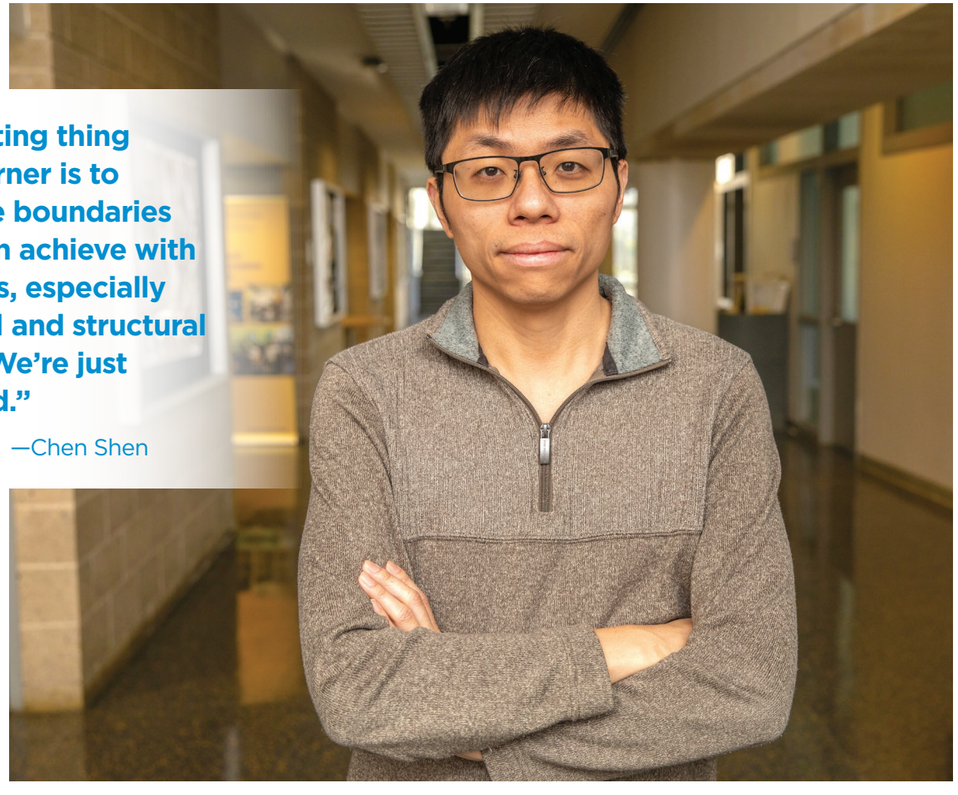
"I really like this research because it's a good demonstration of how we can build on fundamental science knowledge to develop interesting applications," Shen says.

Just as acoustic waves can move tiny robots, they can also be manipulated to tame unwanted noise.

The principle of using specially designed structures to modify acoustic waves also found use in a compact multiresonator duct silencer that Shen and his research team developed. The 3D printed "folded" silencer uses many tiny traps to quiet a wide range of noises while letting air flow freely.

Acoustic waves as diagnostics

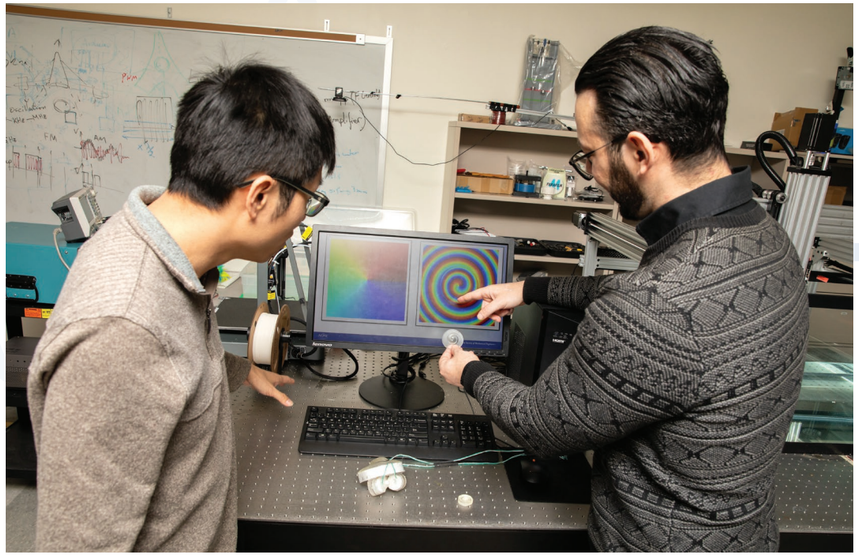
Beyond noise control, acoustics have other applications as Shen and team have shown. Screening of cell and tissue samples to diagnose cancers or other illnesses is laborious and time-consuming. But acoustic waves can help sort cells by exploiting differences in cell behavior that lead them to be sorted in easily identifiable ways.



"The most exciting thing around the corner is to really push the boundaries of what we can achieve with acoustic waves, especially for biomedical and structural applications. We're just getting started."

—Chen Shen

Chen Shen studies acoustic wave propagation to develop new structures for applications in sensing, acoustics and health care.



Ph.D. student Chadi Ellouzi (right) shows Chen Shen a 3D printed acoustic lens that can spin sound waves. Their research has shown acoustic waves can propel a miniature robotic swimmer through water.

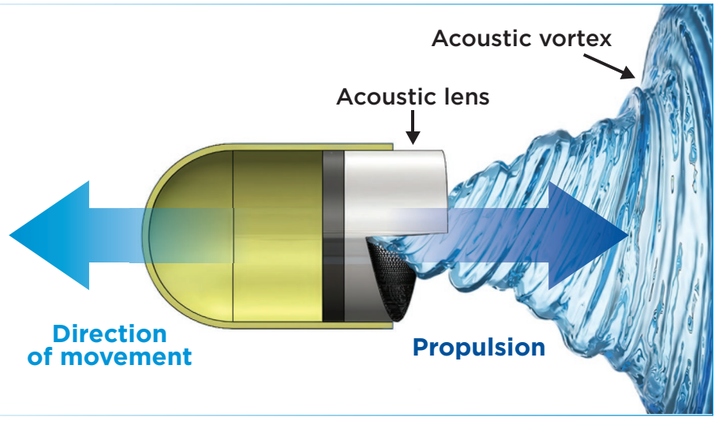
And similar to the way physicians use ultrasound imaging to look inside the body, engineers can use elastic waves—sound waves that travel through solid materials—to find damage within public bridges and roads. By interacting with cracks and voids within materials, these waves could lead to fast and accurate diagnoses, even of problems beneath the surface.

For Shen, the harmony between science and sound continues to inspire discoveries that go far beyond music.

"The most exciting thing around the corner is to really push the boundaries of what we can achieve with acoustic waves, especially for biomedical and structural applications," Shen says. "We're just getting started."

Moving with sound-driven flow

The microrobotic swimmer is fitted with a 30-millimeter lens that directs waves into a small area. The energy from the concentrated waves creates an acoustic vortex, or spinning sound wave, that propels the tiny robot forward through the water. The vortex provides the push, so the robot does not need a physical propeller.



Source: Adapted from C. Ellouzi, N. Andrianto, G. Vosgerichian, et al. "Miniature Robotic Swimmer with Precise 2D Motion Control via Acoustic Vortex-Induced Propulsion." Adv. Sci. (2025): e15389.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

Muscle matters

Finding a treatment for age-related muscle loss

Kleiton Silva investigates the cellular drivers of age-related muscle loss.

In the second half of adulthood, the human body naturally loses muscle mass and strength. This process accelerates late in life and can lead to debilitating weakness. Exercise is an excellent approach to counter this decline, but working out isn't realistic for everyone.

Kleiton Silva, an assistant professor of biomedical sciences at Cooper Medical School of Rowan University, is focused on developing a drug to help. His lab, supported by funding from the National Institutes of Health (NIH), is seeking a new way to intervene in cellular changes that lead to age-related muscle loss and dysfunction, known as sarcopenia.

"I am not trying to replace exercise, but to find something that makes it more feasible and more effective," Silva says. "I'd like to find something that can help elderly people who are affected stand up and say, 'I feel better, I can exercise now.'"

The loss of muscle tissue and strength can accompany conditions such as cancer, chronic kidney disease and heart failure. However, this deterioration occurs on its own in sarcopenia, through different changes to muscle cells in otherwise healthy older people.

Those affected slowly lose the strength they need for routine tasks and become vulnerable to dangerous falls and bone fractures. Exercise and improvements to diet are the only established treatments for it; the Food and Drug Administration has not approved any drugs to treat sarcopenia.

The condition's link to aging means the toll is almost certain to grow. U.S. Census Bureau projections indicate that, by 2050, the number of Americans 65 and older will increase by nearly 30 percent.

Research indicates that in sarcopenia—and aging in general—the cells' ability to break down and recycle waste through a process called autophagy declines. Without adequate autophagy, debris accumulates, leading to damaging inflammation.

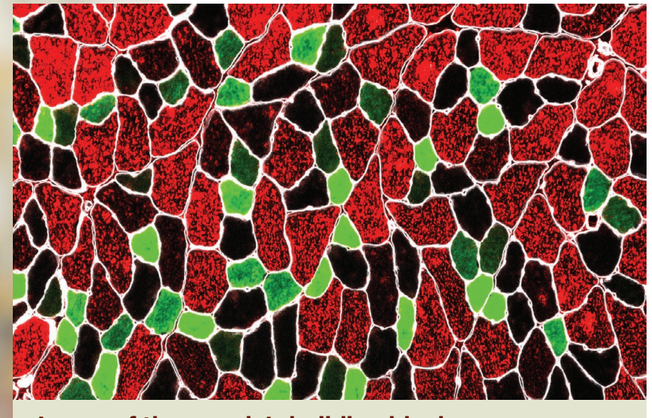
After he began studying sarcopenia, Silva identified a method to activate autophagy. A preliminary study combining exercise with a drug that specifically targets autophagy looked promising. His team documented improvements in strength and endurance, which researchers found were accompanied by an increase in a molecule called orosomucoid 1 (ORM1).

Two NIH grants will allow him to follow up on these findings. A four-year grant covers research exploring the suppression of autophagy. It also funds experiments testing the combined effects of enhanced autophagy and endurance exercise over a longer period.

Experiments funded by a three-year grant focus on ORM1 and will investigate its potential as an anti-sarcopenia drug. Both NIH-funded studies are being conducted using translational models.

Even if ORM1 turns out to have promise as a drug, it will not prevent sarcopenia, Silva says. That's because muscle loss is a natural process of aging. Ultimately, Silva hopes such a therapy could help people maintain better health.

"People are living longer, but we do not want to live longer in a bed," he says. "We want the elderly to enjoy their grandchildren, traveling—everything they worked for when they were younger."



A map of the muscle's building blocks

This image, captured by Thuan T. Tchen, a Ph.D. student in the Silva Lab, shows a microscopic cross-section of the tibialis anterior muscle from the lower leg of an aging mouse. The muscle fibers are stained to highlight different types: myofiber type 2a (green) supports endurance and steady movement, while type 2b (red) powers quick, forceful actions. Laminin (white), a protein that helps hold fibers together, outlines each fiber. Aging muscle loses mass and undergoes cellular-level structural changes. As shown in this image, the fibers of aging muscles become unevenly sized and spaced, often with irregular borders.

Research reported in this publication was supported by the NIH under Award Numbers R15AG095821 and R16GM159126. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

No foot, no horse

Redefining evidence-based equine care

The 18th century proverb "no foot, no horse" points to a long-recognized link between hoof health and overall equine well-being. Yet scientific research and records have not kept pace.

Shreiber School of Veterinary Medicine is changing that, led by Patrick Reilly, an assistant professor and expert farrier with 35 years of specialized blacksmithing and equine foot management.

As urbanization and transportation advancements replaced the horse's role in everyday American life, scientific studies in the field of farriery—the shoeing and managing of horses' feet—have stalled. For more than a century, farriers were not part of veterinary education, leading to a lack of standardized training and limited research to guide equine care where it matters most—the hoof.

"In the first semester of the first year, we've already passed that average many times over," Reilly says, referencing the one cumulative hour of education U.S. veterinary students receive on managing horses' feet.

"We have plenty of anecdotes and opinions, yet in the last 50 years, we have just 157 peer-reviewed research projects focused on farriery," Reilly notes. "Comparatively, equine imaging for instance has more than 4,000. Because of this lapse, we must go back to the beginning to build that foundation for understanding."

At Shreiber School, New Jersey's only veterinary school, that foundation includes hands-on clinical field experience for students and research that merges a traditional craft with modern technologies.

Reilly's research focuses on preventing and treating laminitis, a painful disease in which the bone within a horse's hoof displaces. It's the second leading cause of death among horses. Through a Morris Animal Foundation grant and in collaboration with the University of Calgary's Veterinary School, Reilly is using artificial intelligence to monitor gait symmetry, identifying and measuring subtle movement changes that are easy to miss.

A group of nine farrier researchers from around North America will use smartphone video to evaluate and measure gait changes in horses after trimming and shoeing. Researchers will use the new information to generate a database of gait parameters to help hoof care providers, owners and veterinarians identify early indicators of lameness and improve the overall care and welfare of horses.

Reilly's influence extends beyond research and academia. The Horseracing Integrity and Safety Authority (HISA), the group that oversees thoroughbred horseracing around the U.S, invited him to help revise national regulations, many of which lacked farrier oversight. He worked to update rules to include horseshoe specifications and inspections, a process that can be dangerous for officials. To reduce the risk and increase accuracy, Reilly is collaborating with Rowan biomedical engineering students to develop a diagnostic platform horses can stand on. The system will evaluate and assess the horseshoe against HISA standards for safe, consistent and objective measurement every time.

Gait evaluation, a core component of modern farrier research, provides critical data for understanding hoof function and early indicators of lameness.

Of the 36 U.S. veterinary schools accredited by the American Veterinary Medical Association, only six have a farrier. Shreiber School is shaping the future of veterinary education and animal health care by providing hands-on clinical experiences and cross-disciplinary collaboration.

"We fault people in farriery for being non-academic and not having accredited degrees," Reilly says, "but we also have zero institutions in the U.S. that offer farriery as an accredited degree." A conundrum, he adds, and an opportunity.

Reilly envisions farriery evolving into a profession rooted in academics and evidence-backed research. Anchored at Shreiber School, he aims to build a global hub for equine foot research and training.

The art of research

The painstaking work of science and creative inquiry can sometimes result in thought-provoking or even awe-inspiring imagery.

Whether it's a graphic of spinning ocean surface currents, a map of neural connections in the brain of a fruit fly, or a photograph capturing a supernova, images produced through research can be powerful expressions of discovery.

To celebrate the artistry of scientific research and creative inquiry underway on its campuses, Rowan University launched its inaugural Art of Rowan Research Contest for students.

Their work offers an insider's view on research and wonder.

Pachycephalosaurus wyomingensis

1st place

Rylie Jacobs, a biomedical arts and visualization major, used pen and ink to bring life to a long-extinct animal. Her award-winning submission, *Pachycephalosaurus wyomingensis*, was the result of an assignment for her course, "Introduction to Natural Science and Zoological Illustration," taught by Professor Ethan Geehr.

"Our professor asked the class to choose a dinosaur or prehistoric animal skull to illustrate that we found interesting at The Academy of Natural Sciences of Drexel University," Jacobs said. "We were then asked to reconstruct what the dinosaur would have looked like when living."

Jacobs researched images and articles about fossils and anatomy to create an accurate representation of the Late Cretaceous species, which lived between 100.5 million and 66 million years ago.

Judges said her work was detailed, realistic and intricate, demonstrating skill in illustration.

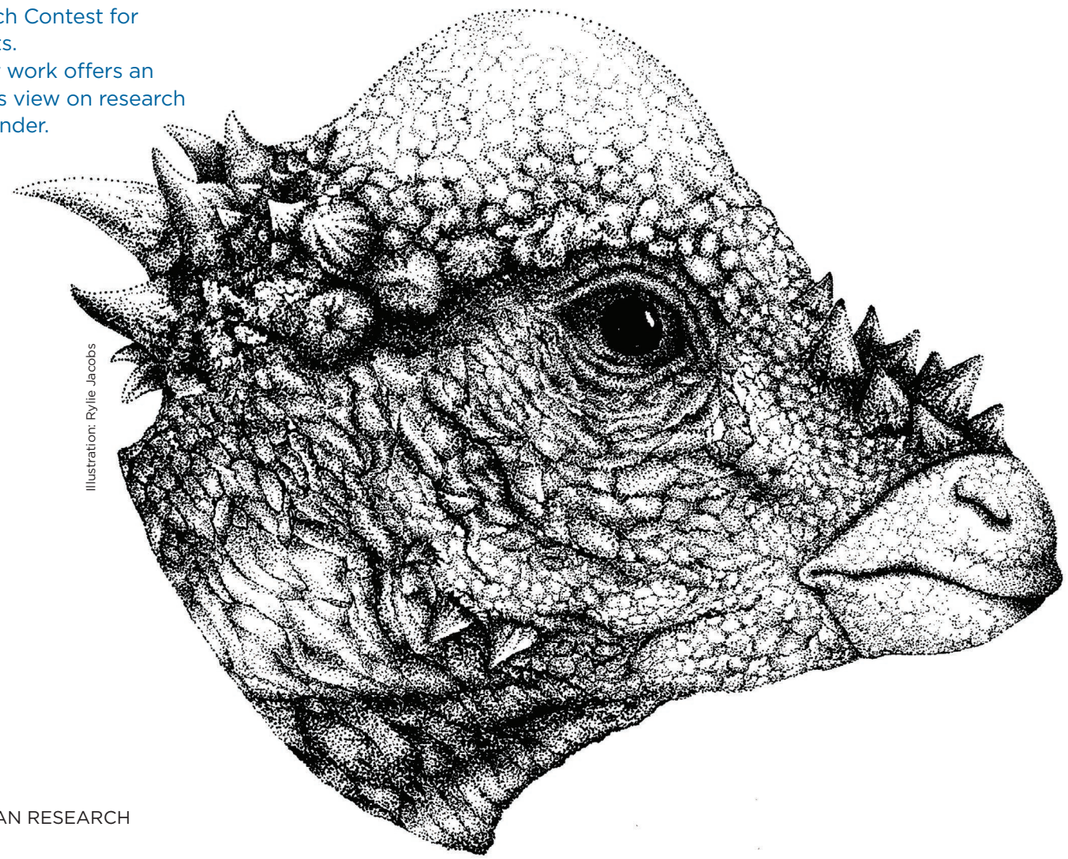
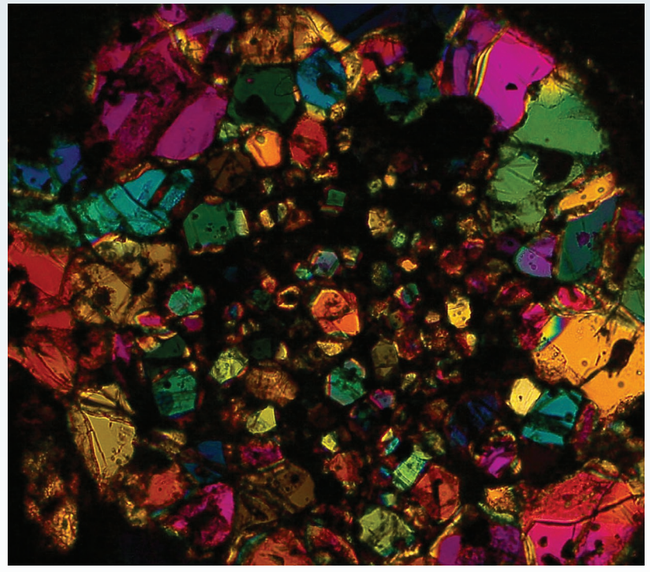


Illustration: Rylie Jacobs



Graphic: Scarlett McCourt

Meteorite Mosaic - NWA 3118

2nd place

Scarlett McCourt, an honors geology major, revealed the stained-glass appearance of high-pressure minerals contained within a Northwest African meteorite. To achieve the image, she shaved a thin section from the meteorite, mounted it onto glass and then placed it under a microscope.

Viewed at 4 to 10 times magnification and using cross-polarized light, the colors and textures tell a story about the meteorite's composition, formation and thermal history.

"Meteorites can tell us the story of the solar system's origins, since they formed before the planets, around 4.6 billion years ago," McCourt said. "High-pressure mineral phases give important insight into the meteorites' thermal history, and can oftentimes act as an indicator of an impact event between two asteroids. These minerals are also important to understand the mechanisms inside the deeper portions of the Earth's mantle, which has very high temperatures and pressure systems. The minerals we focus on include olivine, wadsleyite and ringwoodite."

Her principal investigator is Harold Connolly Jr., founding chair of Rowan University's Geology Department, along with research geologist Cari Corrigan and meteorite curator Tim McCoy, both of Smithsonian's National Museum of Natural History.

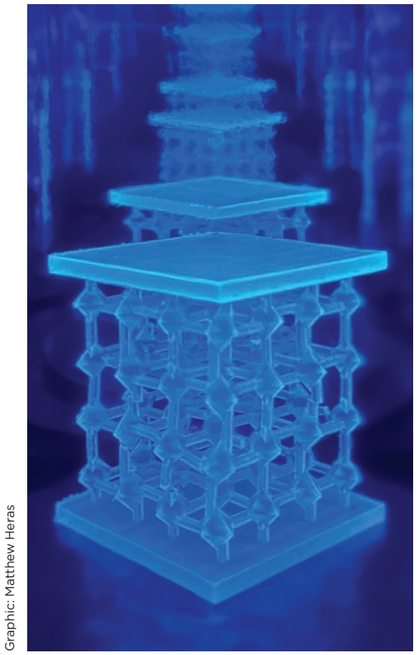
Infinite Projections

3rd place

Matthew Heras, a mechanical engineering graduate student, photographed the striking mirror image he noticed during the UV curing process of a 3D printed photopolymer resin structure.

Captured with an iPhone in portrait mode, Heras' image, "Infinite Projections," offers a peek inside the lab of Behrad Koohbor, an associate professor of mechanical engineering. Judges appreciated the image's sculptural form and use of color to create a mood and generate curiosity in the viewer.

"The purpose of this structure is to absorb kinetic energy during a high velocity impact," Heras said. "Initially, this structure did not have such a complex lattice. The first design was a two-dimensional extrusion of a rotating square model, which has existed for roughly 25 years. I designed this new model to be a 3D projection of that original structure. As the squares are projected and rotated into a higher dimension, they become octahedrons."



Graphic: Matthew Heras

Nutritionally Savvy

How tech training helps older adults manage their health

Dara LoBuono remembers when her maternal grandmother, a southern Italian known for her cooking, refused to drink anything but Sprite in her 90s. It was LoBuono's first glimpse at how age can change a person's taste and nutrition preferences.

Now a registered dietitian and an assistant professor of nutrition and dietetics at the Rowan-Virtua Rita & Larry Salva School of Nursing & Health Professions, LoBuono focuses on helping older adults improve their health. Many experience declining muscle mass and slowing digestion, along with issues like a fixed income and difficulty getting to the grocery store.

Her latest effort is GoldenBytes, a free, undergraduate-run program for people 60 and older at libraries in New Jersey's Cumberland and Salem counties. The communities in these counties have high rates of obesity, limited access to health care and low health literacy.

Funded by the New Jersey Health Foundation, the research program's goal is to improve nutrition literacy by teaching older adults to use tech tools to help manage their health. LoBuono's research shows that tech, including smartphones and online services, can support independence and improve health, but many older adults may not know how to access or use them.

GoldenBytes has covered topics including how to sign up for food assistance, how to order grocery deliveries with Instacart, how to access a patient portal for medical records, take advantage of telemedicine and how to find accurate health information online.

The older adults appreciate learning from college students in a "reverse mentoring" dynamic, LoBuono says. And the student instructors, who take implicit bias assessments as part of a secondary research question about student attitudes toward aging, are developing lesson plans and handouts. "Without all of our students being so responsible and patient," LoBuono says, "the project wouldn't be the same."

Participant Aleasa Hogate, 91, of Pennsville, says she was motivated to get to the Elmer Library for GoldenBytes sessions even when she had to deal with some transportation headaches. "They were teaching people not only how to use their cell phone, but also how to eat right," she says. "I'm a diabetic. I thought, 'Double whammy!'"

Hogate has since learned how to find and access government services, enlarge the text on her cell phone screen, and even take videos—though she still needs some practice with turning the camera off. "I got wonderful help… I can do a lot more," she says. "The students were all so kind."

Hogate worked closely with Monique Peña, an undergraduate who manages the Elmer Library branch of the program. Two weeks after Peña showed Hogate how to use Instacart, Hogate returned to the library excited to tell Peña that she had ordered her own food delivery. "I thought that was really cool," Peña says. "It's important to build self-confidence with these participants."

Peña also worked with a participant who has Alpha-gal syndrome, an allergy to red meat that develops after a tick bite. "I learned a lot about applying nutrition knowledge in the real world," she says, "and tailoring nutrition education to their needs."

Though she plans to work in community nutrition after pursuing her master's in nutrition and dietetics at Rowan, Peña says she hadn't considered working with an older adult population. GoldenBytes has changed her perspective on that—and made her rethink the perception that older adults "don't want to change."

"In my work with them I learned that they want to learn everything new," she says. "That stereotype is misleading, and it makes me sad, because they're always willing to learn."

LoBuono looks forward to more progress. "We had way more interest than I thought we would get, which is awesome," she says. "It doesn't surprise me to see so many motivated older adults that want to learn and stay relevant. People want to age in place and want to stay independent."

Student Monique Peña (left) and Dara LoBuono help Aleasa Hogate use her smartphone.

Aging in the U.S.

Population growth projections

- The number of adults 85 and older will more than double between 2022 and 2040.
- By 2040, the number of adults 65 and older is projected to exceed 78 million, accounting for 22 percent of the population.

Chronic health conditions in adults 65 and older
(as of 2022)

- Obesity: **30%**
- Diabetes: **20%**
- High cholesterol: **48%**
- Hypertension: **59%**

Sources: U.S. Census Bureau, The Administration of Community Living, 2023

To seek and destroy

Synthetic compounds called PFAS are contaminating our water. Solutions are at hand.

Clean drinking water is one of life's most basic needs. In New Jersey, it's a precious resource threatened by decades of industrial pollution, including from contaminants called PFAS (per- and polyfluoroalkyl substances).

A class that includes thousands of human-made chemicals, PFAS have been widely used in consumer products since the 1940s because they repel oil, water and heat. Since they don't break down easily in nature, PFAS can be found everywhere scientists look: in water, soil, animals, even food crops. Their presence in the human body has been linked to cancer and problems with the immune response and in pregnancy, among other issues.

From designing sensors to restoring ecosystems, Rowan University researchers and their students are searching for inexpensive ways to seek—and destroy—these persistent chemicals in the environment and protect human health.

Where do PFAS go?

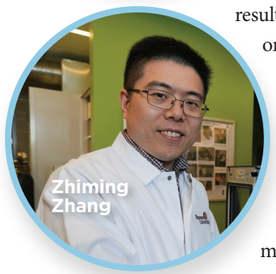
Thivanka Ariyarathna, an assistant professor of environmental studies in the School of Earth & Environment, monitors the fate and transport of contaminants in freshwater and marine coastal environments.

Her work goes beyond detection. Ariyarathna studies how PFAS behave in soil and water, how they move, and where they accumulate. As part of her work, she's studied stormwater runoff in Camden, New Jersey, where heavy metals and pollutants from flooded city streets flow into nearby rivers and creeks.

She has also partnered with researchers at Stockton University to study PFAS accumulation in finfish and shellfish. Their goal: to better understand how these chemicals move through aquatic ecosystems—and what that means for people who rely on them for food.

Thivanka Ariyarathna

Dongmei Dong



Zhiming Zhang

"Only through continued research can we determine how widespread the problem is and what to do about it," Ariyarathna says. That could mean setting new guidelines for seafood consumption or even restricting harvests in contaminated areas.

When it comes to pollution, Ariyarathna is clear: "If we don't monitor the water, we won't know what's in it."

Devising a better detection method

Traditional methods of measuring the levels of PFAS in water are time-consuming, expensive and require special training.

Dongmei Dong, an assistant professor in the Department of Physics & Astronomy in the College of Science & Mathematics, is developing a less expensive, portable and easier-to-use method to detect even trace levels of PFAS. Her lab's interdisciplinary solution borrows from chemistry, electrical engineering and materials science. The basic idea is that PFAS in the water interact with the sensor material to produce an easily measurable output.

Dong's team is working on a new sensing system designed to quantify PFAS contamination in water through a simple, real-time electronic response. The device produces easy-to-interpret results, enabling rapid and reliable on-site monitoring.

The sensor material allows users to confirm results through multiple detection cues when it comes into contact with PFAS. Such a unique design, especially at extremely low concentrations, makes the sensor even more accurate. The lower cost—around $100 compared to traditional methods that can run into the millions—is another key advantage.

Equally important, says Dong, the underlying physics in the detection of PFAS can be applied to monitor other chemicals with only minor modifications to the sensor.

Persistent does not mean invincible

Though popularly called forever chemicals, PFAS can be removed from the environment and broken down. Researchers are hunting for better, cost-effective methods for doing so.

Zhiming Zhang, an assistant professor of civil and environmental engineering in the Henry M. Rowan College of Engineering, is devising new methods for removing PFAS from soil and water.

In studies of New Jersey stormwater runoff, he and colleagues identified multiple PFAS compounds, among which the concentrations of PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonic acid) has far exceeded the Environmental Protection Agency's four parts-per-trillion maximum contaminant level for drinking water.

His group is testing ways to remove these contaminants, including breaking them down with bacteria or specialized oxidation treatments (chemical reactions which transform the compounds into less toxic or harmless substances). They are also experimenting with filtering PFAS out of water by, for example, binding them onto materials leftover from the treatment of drinking water, which would otherwise go to a landfill.

Of course, PFAS aren't the only industrial contaminants spoiling soil and water. Beyond these chemical compounds, Zhang's team is extracting toxic lead from soil with a noninvasive perennial called vetiver grass, along with the use of biodegradable agents that aid this process. Over three years, this method cut the lead in a community garden plot in Jersey City down to about one-fourth its original concentration.

After completing a remediation project like this one, they recycled the plants' lead-containing roots by turning them into a charcoal-like product known as biochar which may be used to filter contaminants, such as heavy metals, from wastewater. The leaves, which uptake very little lead, are used to make bioethanol, a type of fuel.

The use of the entire vetiver plant after soil lead extraction aims to form a circular economy model—and it's an example of smart innovations that advance science and protect human health.

"We try to minimize waste and make the most use of the resources we have during the environmental protection process," Zhang says.

The puzzle of human development

Biologist finds a new approach to understanding asymmetry.

Imagine a line running down the middle of your body, dividing it into halves that, on the outside, mirror one another. But inside, they do not. Your heart sits to the left, accommodated by your slightly smaller left lung. Your spleen, part of your immune system, and stomach are to the left, while your liver is to the right.

This internal asymmetry arises early during embryonic development. Disruptions to it can have serious, even deadly consequences.

To understand how things might go wrong, Natasha Shylo, an assistant professor of biological and biomedical sciences in the College of Science & Mathematics, received support from the National Institutes of Health (NIH) to explore left-right asymmetry development in animals. The grant builds on her previous work with veiled chameleons.

"In my postdoctoral research, I found that, in establishing left-right asymmetry, chameleon embryos do something very different from humans," Shylo said. "It's interesting in itself, but this difference also gives us the opportunity to study this developmental process from a new angle."

For a brief period of early development, an embryo's left and right sides are perfectly symmetrical. Then a temporary organ called the left-right organizer kicks off a process that will complicate the body plan. In humans, mice and some other animals, this organ possesses hair-like motile cilia that generate a leftward movement, followed by the release of calcium, which serves as a signal, on the embryo's left side.

"People may assume left and right fall in place automatically, but that's not the case," Shylo said.

Understanding congenital birth defects

Problems with left-right organization cause congenital birth defects, the leading cause of infant mortality in the United States, according to the U.S. Centers for Disease Control and Prevention. The heart—which starts as a tube that loops asymmetrically—is particularly vulnerable. Infants born with these heart malformations often need surgery and frequently do not make it out of childhood. The spleen, intestines, liver, and other parts of the body may also be affected.

As a postdoc at the Stowers Institute for Medical Research, Shylo received NIH support for work leading to her discovery that chameleons lack the cilia credited with initiating left-right asymmetry in humans. Chameleons aren't unique. Scientists think that the majority of four-limbed animals, including other reptiles, also lack these cilia.

"The big question is, well, how do they establish left-right asymmetry?" Shylo said.

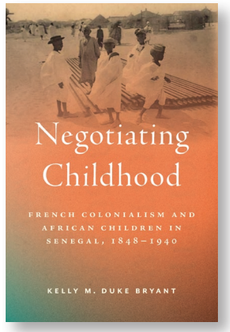
Her NIH grant, which kicked in when she joined Rowan's faculty, is making it possible for her to look for an answer. She intends to compare processes she sees in chameleons with those in chickens, which also do not use hair-like cilia at this point in development.

While her research will shed light on how animals, including humans, position their organs, a more fundamental question remains: "Why does it matter if our heart and stomach are on the left and our liver is on the right?" she said. "We don't know."

Natasha Shylo holds a chameleon egg against a bright light to examine its interior. Called candling, the technique is used to observe the egg's contents without breaking its shell.

This research is supported by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the NIH under Award Number R00HD114881. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Books



Negotiating Childhood: French Colonialism and African Children in Senegal, 1848–1940

Kelly M. Duke Bryant, Associate Professor of History

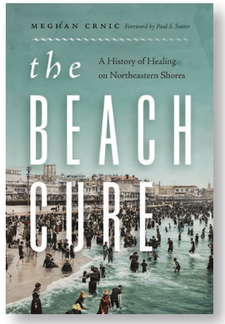
University of Massachusetts Press

From 1848 to 1940, colonial child protection policies and African children's responses transformed ideas of childhood in the French colony of Senegal. These interactions created new ways of defining, measuring, documenting and experiencing what it meant to be a child. Bryant shifts the focus from British colonial contexts to a French colony, tracing childhood from the post-emancipation period through the 1930s. This perspective complicates accepted timelines of child protection in colonial Africa and challenges assumptions about children's history. Drawing on diverse sources, Bryant examines children's experiences in spaces of French discipline and surveillance, including wardship courts, schools, reformatories and vaccine clinics. The book reveals how these spaces reordered African childhood and how children shaped and limited French efforts to impose order, while also historicizing identity documentation and questioning the naturalness of childhood itself.

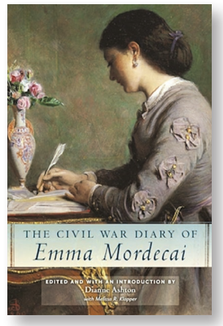
The Beach Cure: A History of Healing on Northeastern Shores

Meghan Crnic, Associate Director of the Edward D. Viner Center for Humanism

University of Washington Press



By the late 19th century, America's Northeastern coastline had shifted from a place of peril to a prescribed remedy. Doctors in major cities recommended seaside visits for ailments such as tuberculosis, rickets and exhaustion, believing in marine medication—the healing power of sun, sea air and saltwater. Meghan Crnic traces how these ideas fueled the rise of health resorts and hospitals in destinations like Atlantic City and Coney Island. Even as germ theory and laboratory science advanced, faith in nature's restorative power endured, shaping medical practice and leisure culture. "The Beach Cure" offers insight into the history of environmental health and the enduring connection between well-being and natural landscapes.



The Civil War Diary of Emma Mordecai

Dianne Ashton, Professor Emeritus of Philosophy and World Religions, and Melissa R. Klapper, Professor of History

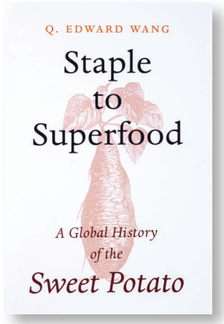
NYU Press

Emma Mordecai lived an extraordinary life as a Jewish woman in the antebellum South, where Jews represented less than 1 percent of the population. Unmarried in a culture that valued marriage, she remained committed to her Jewish faith while embracing Southern values and conforming to the expectations of white women, even holding enslaved African Americans. Her diary provides a rare account of Civil War life from a Jewish woman's perspective, detailing her daily experiences and evolving views on Confederate nationalism, Southern identity, and women's roles during the war. It chronicles her hospital visits, food shortages, Jewish observances, local events, nearby battles, and the effects of emancipation, offering a compelling portrait of a unique historical figure.

Staple to Superfood: A Global History of the Sweet Potato

Q. Edward Wang, Professor of History

Columbia University Press



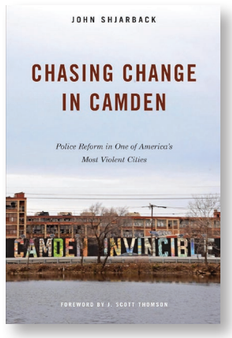
Sweet potatoes were among the American crops Christopher Columbus brought back to Europe, where they were thought to be an aphrodisiac. In China, this versatile root became a staple that fueled rapid population growth. Introduced to Japan to stave off famine, sweet potatoes later sustained the country's imperial expansion. Hardy and adaptable, they have long been cultivated as a subsistence crop in Southeast Asia, Africa and Oceania. Today, Western health experts tout the sweet potato as a superfood—a term for foods high in nutrients. "Staple to Superfood" explores the sweet potato's rich history and global influence. Wang traces its journeys through trade and cultural exchange, showing how this resilient crop transformed agriculture, cuisine and social structures worldwide while shaping identities and food systems.

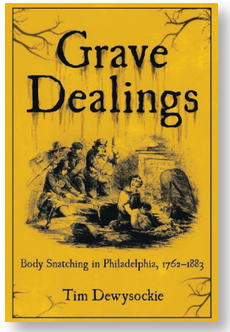
Chasing Change in Camden: Police Reform in One of America's Most Violent Cities

John Shjarback, Associate Professor of Law & Justice

Temple University Press

In the 1990s and 2000s, Camden, New Jersey, across the river from Philadelphia, was often ranked among America's most dangerous cities. The bankrupt city dissolved its police department and, in 2013, the Camden County Police Department was created, shifting engagement and trust-building. Violent crime and murder dropped significantly, but concerns about force and aggressive practices persisted. Shjarback examines how the department reformed and whether it offers a model for other cities. He analyzes successful policies, from innovative training to technology and evidence-based strategies, and explains how reforms evolved amid community backlash. The book concludes with threats to accountability and lessons for cities seeking effective police reform.





Grave Dealings: Body Snatching in Philadelphia, 1762–1883

Tim Dewysockie, Library Applications Support Specialist

Brookline Books

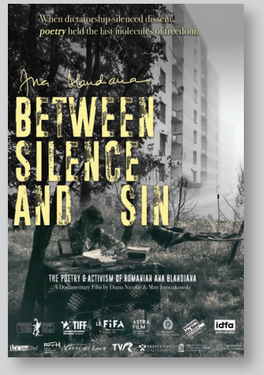
Philadelphia's emergence as a center of American medical education relied on practices long hidden from public view. In the 18th and 19th centuries, as the nation's first medical schools expanded, legal sources of cadavers proved insufficient. The resulting demand gave rise to body snatching—a clandestine practice that supplied teaching hospitals while provoking widespread anxiety. "Grave Dealings" examines this formative but fraught period, tracing how physicians, city institutions and body snatchers navigated surveillance, public outrage and the law. Drawing on archival records, cultural responses and evolving burial protections, the book situates body snatching within broader debates about medical authority and the treatment of human remains. Its findings examine the enduring ethical questions that continue to shape medical practice today.

Documentaries

Between Silence and Sin

Diana Nicolae, Professor of Radio, Television & Film, and Matt Jozwiakowski

The documentary "Between Silence and Sin" examines the life and work of Romanian poet Ana Blandiana, who was censored and banned under the Communist regime. The film portrays her ongoing fight to uncover the truth about the past and defend democracy. Through archival footage and personal testimonials, it contrasts the poet's sensitivity with her strength as a truth-seeker. Blandiana's poetry, written over eight decades, punctuates the narrative, highlighting the tension between art and propaganda. The documentary underscores the role of art as a nation's last refuge against oppression and explores the enduring power of writing in the face of authoritarianism. As governments worldwide challenge free speech, Blandiana's story resonates as a timely reminder of courage and conviction. "Between Silence and Sin" has been featured internationally in over two dozen film festivals.



Without Arrows

Jonathan Olshefski, Professor of Radio, Television & Film, Delwin Fiddler Jr. and co-director Elizabeth Day

First Run Features

Filmed over 13 years, "Without Arrows" chronicles the vibrance and struggles of a Lakȟóta family. Delwin Fiddler Jr., a champion grass dancer from the Cheyenne River Sioux Tribe, left his reservation as a young man to escape a trauma that splintered his family and built a new life in Philadelphia. A decade later, he abandons it all and returns home to fulfill his mother's ambition of carrying on the legacy of their thiyóšpaye (extended family). Accepted by film festivals in Canada, Australia and across the U.S., the award-winning film premiered on the Public Broadcasting Service's Independent Lens series.

FACTS AT A GLANCE

Top 100 national public research university

U.S. News & World Report 2025 Rankings

#1 fastest-growing public research university in the highly competitive Northeast, top 10 in the nation

The Chronicle of Higher Education Almanac 2025

25+ research centers and institutes, including:

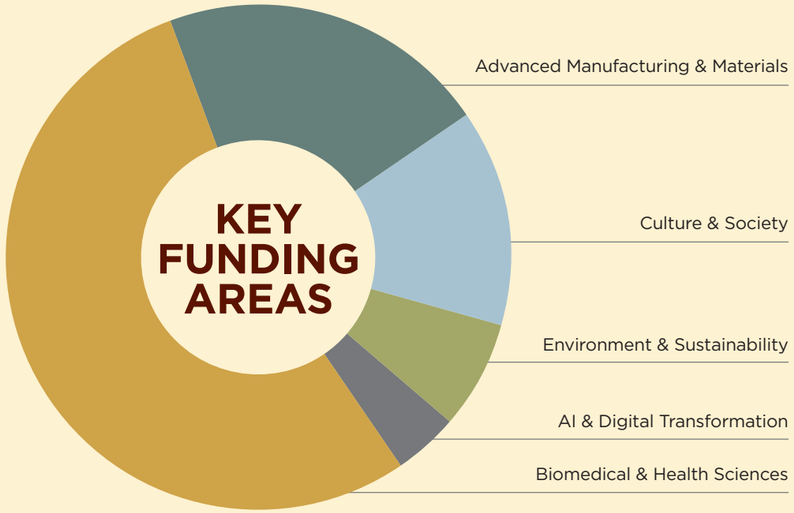
- Advanced Materials & Manufacturing Institute
- Center for Research & Education in Advanced Transportation Engineering Systems
- Rowan-Virtua Child Abuse Research Education & Service Institute
- Machine & Artificial Intelligence Virtual Reality Center
- Rowan-Virtua New Jersey Institute for Successful Aging
- Institute for Public Policy & Citizenship
- Digital Engineering Hub

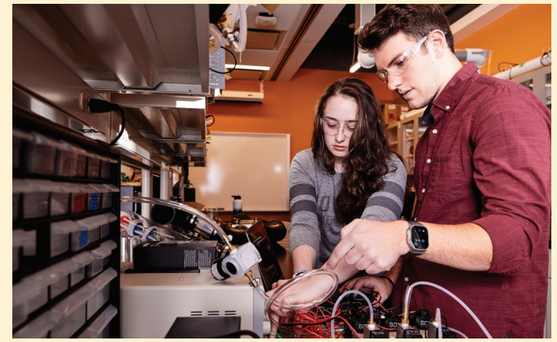
24,215

total unduplicated enrollment FY25

$2.9B

estimated annual economic impact statewide





1 of 2

Rowan is one of only two public universities in the nation to grant D.V.M., D.O. and M.D. degrees. Through its three medical schools, Rowan is driving growth in health care education, innovation and research, while providing excellent primary and specialty care.

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1ST

School of Veterinary Medicine in New Jersey

19

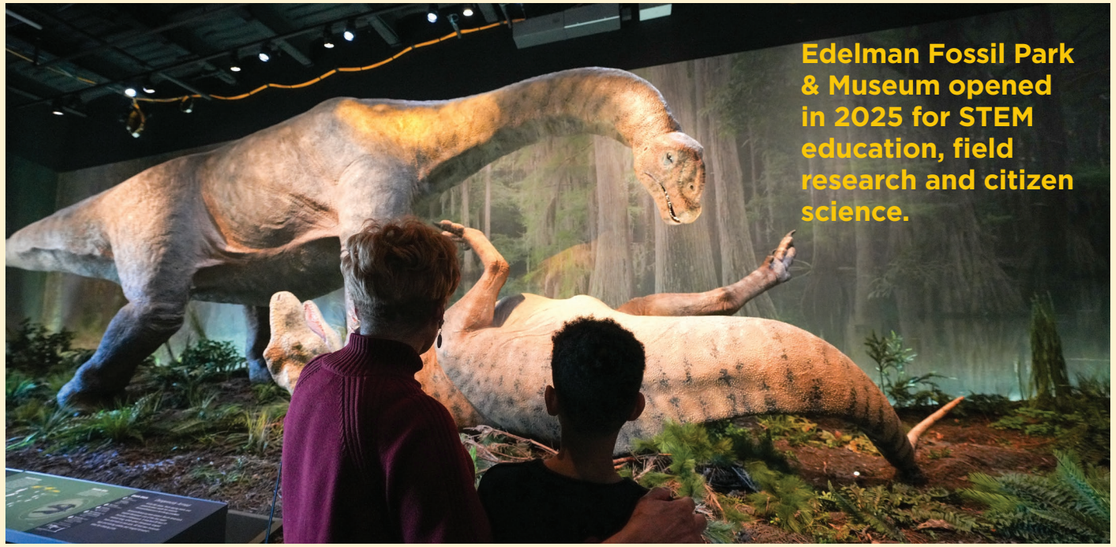
NSF CAREER Awards

17

NSF National I-Corps Awards

100+

education, clinical and research sites across New Jersey



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From the field to the lab.
Watch

Rock record: Glacial geology research tracks ice sheet retreat

Kelsey Barker is uncovering clues from the Last Glacial Maximum, a period ending about 20,000 years ago when ice sheets blanketed much of North America and sea levels were 400 feet lower.

Focused on the Laurentide Ice Sheet's retreat from the Northeastern U.S., her work could improve climate risk communication and sea-level rise projections. Barker collects boulder and bedrock samples from glacially polished surfaces, analyzing isotopes formed by cosmic radiation to determine how long surfaces have been exposed—essentially dating the ice sheet's disappearance.

"We're already seeing impacts from climate change," Barker said. "We're not trying to avoid it anymore; we're preparing for it."

A New Jersey native who began college as an education major, Barker is the first Ph.D. candidate in the School of Earth & Environment. She hopes to inspire future generations of geoscientists. Her advice to students: "Find something you love and put everything into it."