ROWAN RESEARCH

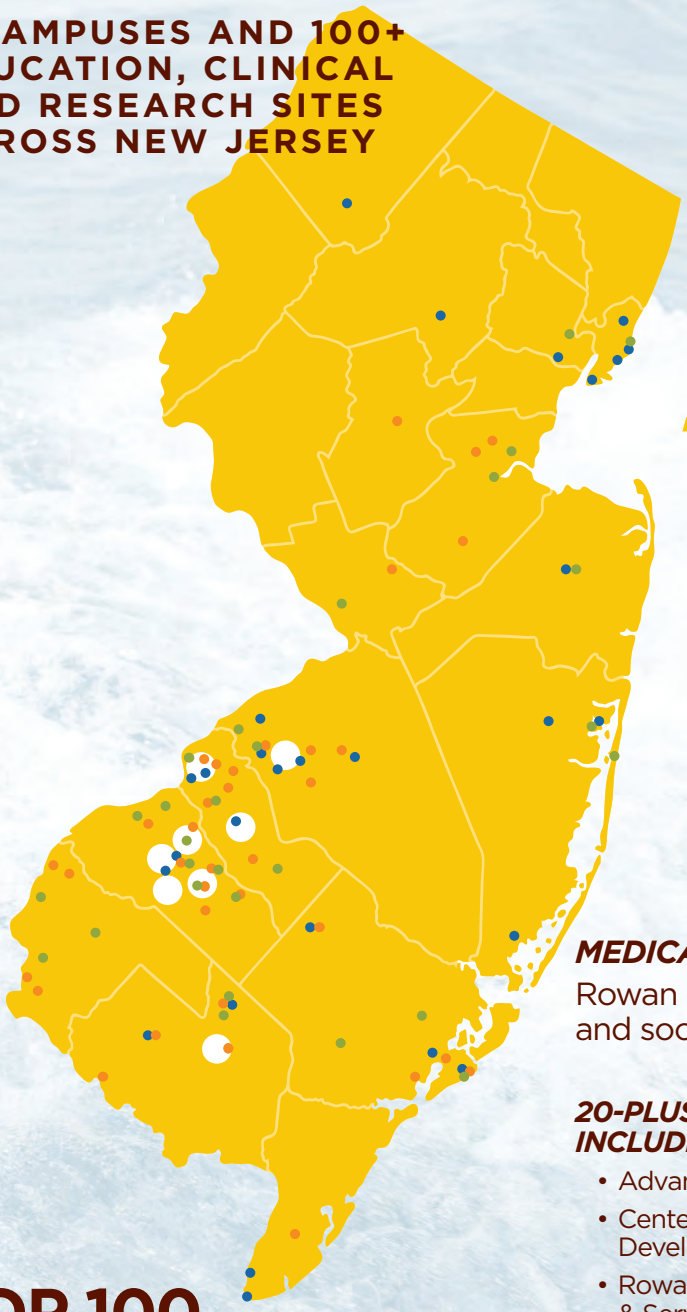
SPRING 2023

FIELD TRIP

Investigating the impacts of sea-level rise and development in coastal environments

A DECADE OF STRATEGIC GROWTH

8 CAMPUSES AND 100+ EDUCATION, CLINICAL AND RESEARCH SITES ACROSS NEW JERSEY



3rd fastest-growing public research university in the nation

2,506 total new faculty lines since FY2010

22,080 total unduplicated enrollment FY22

12 National NSF I-Corps Awards since 2018

30+ Regional NSF I-Corps Awards

10 NSF CAREER Awards since 2012

MEDICAL EDUCATION

Rowan offers both MD and DO degrees and soon will offer the DVM degree

20-PLUS RESEARCH CENTERS AND INSTITUTES, INCLUDING:

- Advanced Materials & Manufacturing Institute
- Center for Cannabis Research, Policy & Workforce Development
- Rowan-Virtua Child Abuse Research Education & Services Institute
- Center for Cybersecurity Education & Research
- Institute for Public Policy & Citizenship
- Rowan-Virtua New Jersey Institute for Successful Aging
- Center for Research & Education in Advanced Transportation Engineering Systems
- Sustainable Facilities Center
- Machine & Artificial Intelligence Virtual Reality Center

TOP 100 NATIONAL PUBLIC RESEARCH UNIVERSITY

(U.S. NEWS & WORLD REPORT 2023 RANKINGS)

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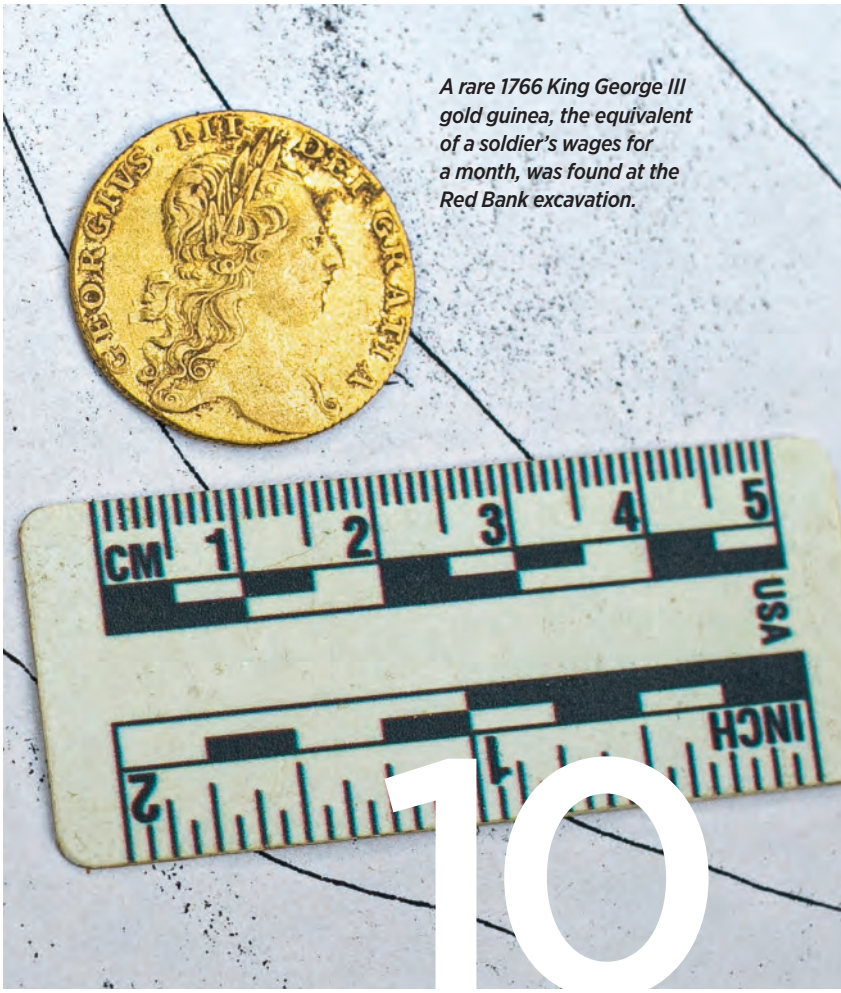
SPRING 2023

FEATURES



A rare 1766 King George III gold guinea, the equivalent of a soldier's wages for a month, was found at the Red Bank excavation.

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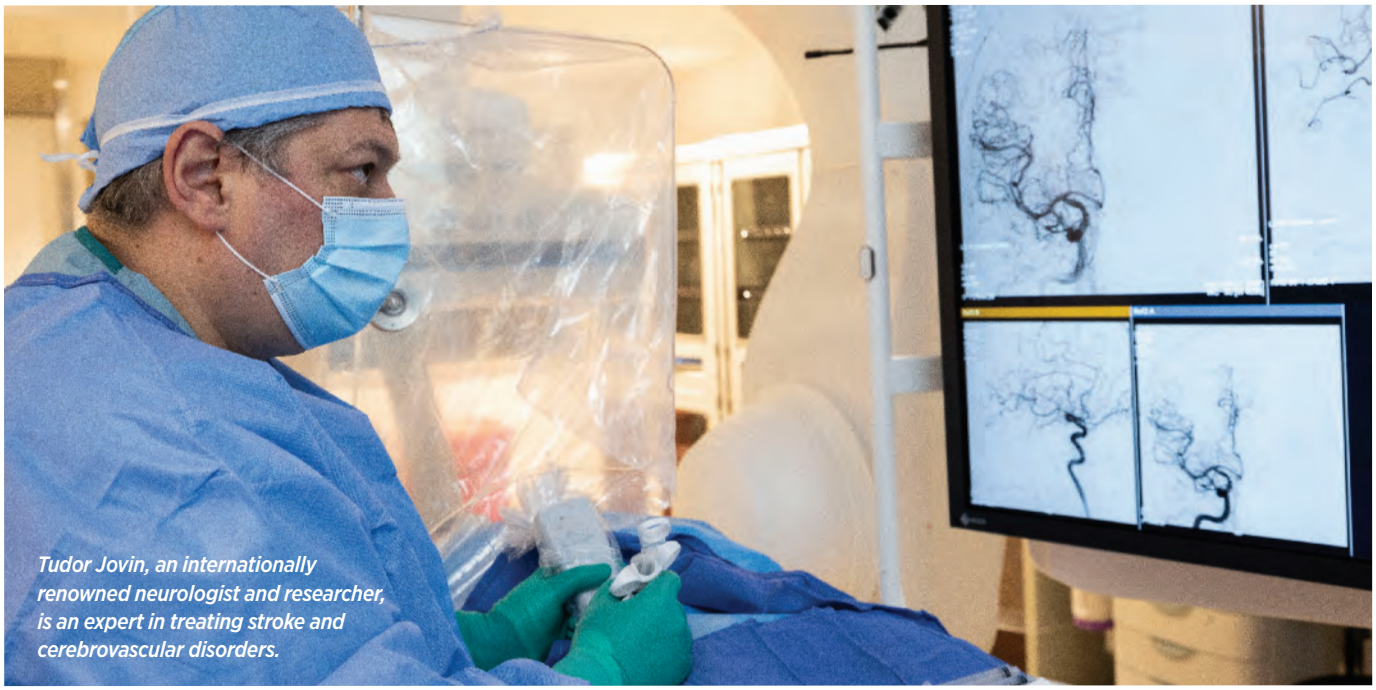
research@rowan.edu

Cover photo:
Charles Schutte, Ph.D., assistant professor of environmental science, collects samples in the salt marshes of the Edwin B. Forsythe National Wildlife Refuge, near Stafford Township, New Jersey.

BRIEFS



Tudor Jovin, an internationally renowned neurologist and researcher, is an expert in treating stroke and cerebrovascular disorders.

SURGERY FOLLOWING STROKE IMPROVES OUTCOMES

Stroke expert Tudor Jovin, MD, chair of the Department of Neurology and professor of neurology at Cooper Medical School of Rowan University, is co-principal investigator and lead author of a study on the effects and risks of an innovative surgical procedure treatment following a rare but often fatal type of stroke.

According to the authors of the study published in The New England Journal of Medicine, thrombectomy, a type of surgical procedure to remove a blood clot from a blood vessel, is more effective than medication at treating acute basilar artery occlusion, or BAO, strokes.

Most patients presenting with BAO are treated medically with intravenous, clot-busting medications, often with poor results. A randomized, five-year trial conducted in China found that the thrombectomy procedure led to a higher percentage of patients with good functional status at 90 days compared to patients who received medical therapy only.

"Recognizing the effectiveness of this treatment may lead to it being used sooner and more frequently in BAO stroke patients, giving physicians more clinical options," said Jovin, who is also medical director of the Cooper Neurological Institute at Cooper University Health Care. "Widespread use of endovascular thrombectomy in these types of stroke could save many lives."

EARTH-FRIENDLY CHEMICAL ENGINEERING EARNS AWARDS

In recognition for her work to advance eco-friendly practices, Kirti Yenkie, Ph.D., an assistant professor in the Department of Chemical Engineering, received the 2022 Environmental Division Early Career Award of the American Institute of Chemical Engineers. The award honors professionals with fewer than 12 years of service who have made outstanding contributions to the field of environmental chemical engineering.

Yenkie dedicates her research to process systems engineering principles in environmental sustainability and health care. Yenkie and her collaborators use mathematical modeling and forecasting to answer difficult questions concerning topics like wastewater treatment, waste management and cancer diagnostics.

Yenkie was awarded a grant from the Environmental Protection Agency to determine still-unknown properties of novel chemicals to evaluate whether they are safer and more eco-friendly substitutes for commonly used chemicals. The $315,000 funding is one of the first pollution-prevention grants awarded under the Bipartisan Infrastructure Law.

Kirti Yenkie searches for eco-friendly solutions before problems arise.

ROWAN EXPANDS INNOVATION FUND TO $25 MILLION

Launched with $5 million in 2014 to boost visionary ideas, the Rowan Innovation Venture Fund recently received an additional $20 million from the Rowan University Foundation to back a pipeline of evolving businesses from within and outside the Rowan community.

So far, the fund has seeded 14 South Jersey-based and regional startups, many led by Rowan students and faculty. Rohrer College of Business alumni Mike Lombardo '18 and Kayvon Jahanbakhsh '19 received $75,000 in seed funding to help create their innovative gut-healthy, prebiotic iced tea company, HALFDAY.

"At $25 million, the Rowan Innovation Venture Fund is among the largest venture funds from a public university in the region," said Rowan University President Ali A. Houshmand. "As Rowan grows, part of our mission must be to support innovators with the ideas and ability to launch businesses, create jobs and improve our community."

Rowan alumni founded HALFDAY, a company producing healthy iced teas.

Erik Brewer (left) and Anthony Lowman receive the 2022 Edison Patent Award in Biomaterials.

ROWAN INVENTORS RECEIVE EDISON PATENT AWARD FOR CHRONIC BACK PAIN TREATMENT

Two Rowan University inventors received the Research & Development Council of New Jersey's 2022 Edison Patent Award in Biomaterials for devising a new, minimally invasive treatment for chronic back pain. Anthony Lowman, Ph.D., provost and senior vice president for academic affairs, and Erik Brewer, Ph.D., a senior lecturer in the Henry M. Rowan College of Engineering, won the prestigious award for their U.S. patent, "Cross-Linked Hydrogels and Methods of Making the Same."

Using this patented technology, ReGelTec, Inc., developed HYDRAFIL™, a hydrogel that is heated and injected into a spinal disc using a fine-gauge needle. In recent clinical trials, patients reported their chronic pain levels decreased by more than 80% three months after the procedure.

The Edison Patent Award recognizes exceptional inventors and researchers across the state, based on the significance of the problem addressed, its utility and socioeconomic value, novelty and commercial impact.

SUSTAINABLE, INCLUSIVE EDUCATION

Consultant to the United Nations. Co-designer of international training modules implemented in Ghana and Rwanda. Professor in residence at Bowe Middle School in Glassboro. Wherever he's working, making inclusive education a reality on a global scale is the mission of Brent C. Elder, Ph.D., associate professor of interdisciplinary and inclusive education. Elder's research focuses on sustainable inclusive education in under-resourced schools, disability, poverty and education.

Inclusive education can work even in the world's most under-resourced schools, said Elder. He's seen it succeed firsthand in Kenya and Cambodia, where he has served as a consultant and collaborator.

"The work is about building inclusive schools and communities that lead to better opportunities for students with and without disabilities," said Elder, co-founder of Tangata Group, which works to develop local projects supporting access to advocacy, education, law reform and sustainable development for people with disabilities. "We have to hold each other up as we work together to create a world where everyone belongs."

Brent Elder's research examines the intersections of disability, poverty and education.

BRIEFS

PUTTING THE 'A' IN STEAM: DANCE COLLABORATES WITH ENGINEERING FOR MAINSTAGE PRODUCTION

For the first time, Rowan University's College of Performing Arts and the Henry M. Rowan College of Engineering collaborated to create "Exo-skin-esphere," an experimental performance examining the way the human body impacts technology by merging dancers with exoskeletal suits.

Leslie Bush, adjunct professor in the Department of Dance, and Mitja Trkov, Ph.D., associate professor in the Department of Mechanical Engineering, worked together to devise a plan to track dancers' movements and use that information to control other technology. Bush brought her cast to the lab where they wore sensors and wires for Trkov's team to track and collect data. The team tailored technology used in Trkov's slip-and-fall prevention research to detect the motion of the dancers and inform a new algorithm. The adjustment enhanced the system from detecting motion and kinematics in 2D to 3D.

According to Trkov, the collaboration revealed an unexplored area with opportunities to expand the project in the future. For Bush, it offered a testament to the importance of integrating the arts with innovative, experimental work.

Sophomore dance major Valentina Giannattasio performs her solo during the dance production, "Exo-skin-esphere."

MACHINE LEARNING CAN HELP PREDICT DEFECTS, FRAUD AND CANCER

When Shen-Shyang Ho, Ph.D., looks at a graph, he sees more than abstract data points. In the dynamic graphs he studies, the computer science researcher sees complex networks that change over time. For nearly 20 years, he has studied and developed machine-learning technologies for detecting anomalies.

"Anomalies are deviations from the normal," explained Ho. Many anomalies are undesirable, such as financial fraud, suspicious behavior, manufacturing defects and abnormal findings on medical tests.

With a grant from the National Science Foundation, Ho is focusing on new approaches for detecting and predicting anomalies in dynamic graphs that continuously evolve.

"The earlier you can detect or predict anomalies, the better because you can start mitigation efforts," Ho said. "If the anomaly isn't detected until later, you might not have time."

Data-driven approaches to detect and predict anomalies benefit numerous industries. Early detection reduces financial costs, while preemptively identifying issues such as public health concerns, disease progression and manufacturing defects.

Shen-Shyang Ho is an associate professor in the Department of Computer Science.

ON YOUR MARKS, GET SET...

Women between the ages of 40 and 60 face unique life and health challenges. Their doctors often tell them to get more physical activity to improve their heart health and reduce their risk for cardiovascular disease. However, many women don't have time for physical activity due to work and family caregiving responsibilities.

Danielle Arigo, Ph.D., an associate professor of psychology, runs the Clinical Health and Social Experiences Lab, which focuses on understanding psychological and social influences on health and health behavior, particularly among women.

With funding from the National Institutes of Health, her research aims to determine how the introduction of physical-activity monitoring impacts the amount of physical activity a person performs, as well as how to improve the accuracy of data collected in such research.

Danielle Arigo's research focuses on the physical activity levels of women in midlife.

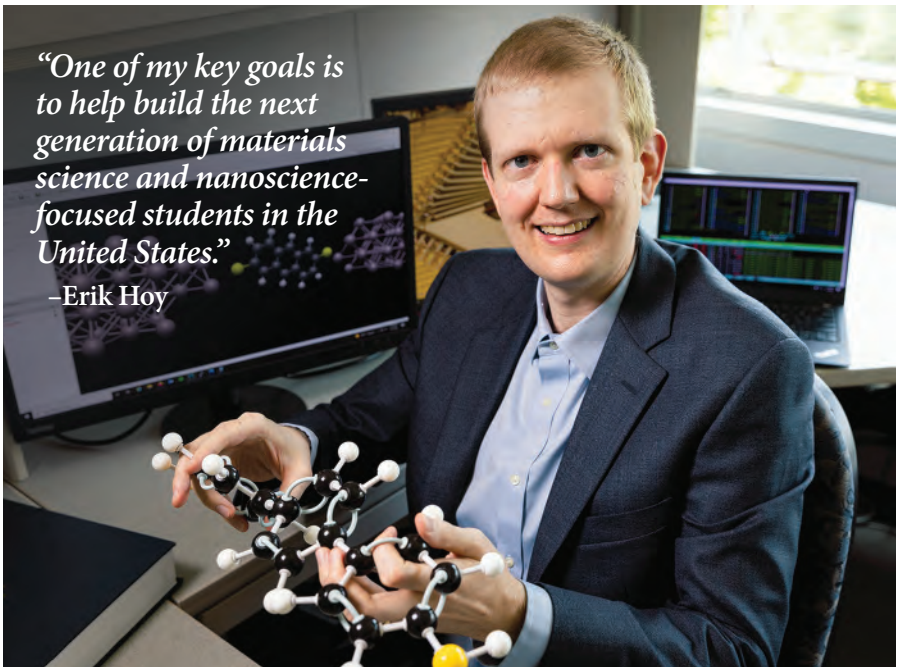
GUT CHECK: AN INSIDE LOOK AT HONEY BEES

Svjetlana "Lana" Vojvodic Kruse, Ph.D., has spent her lifetime fascinated by honey bees. A faculty researcher in the Department of Biological & Biomedical Sciences, she's investigating the importance of gut bacteria on bee behavior and genetics.

"Until recently, we did not know that gut microbes have a larger function that goes beyond food digestion and activating the host's immune system," Kruse said. "With some experimental creativity, my students and I have been able to show that gut microbial communities can impact individual learning and social interactions in honey bees."

Understanding how the honey bee interacts with its symbiotic gut bacteria could lead to better honey bee management and practices. Kruse's work might also lead to better understanding how gut bacteria impacts human biology.

Tags on honey bees enable researchers to track individual behavior.



Erik Hoy is an assistant professor of chemistry and biochemistry.

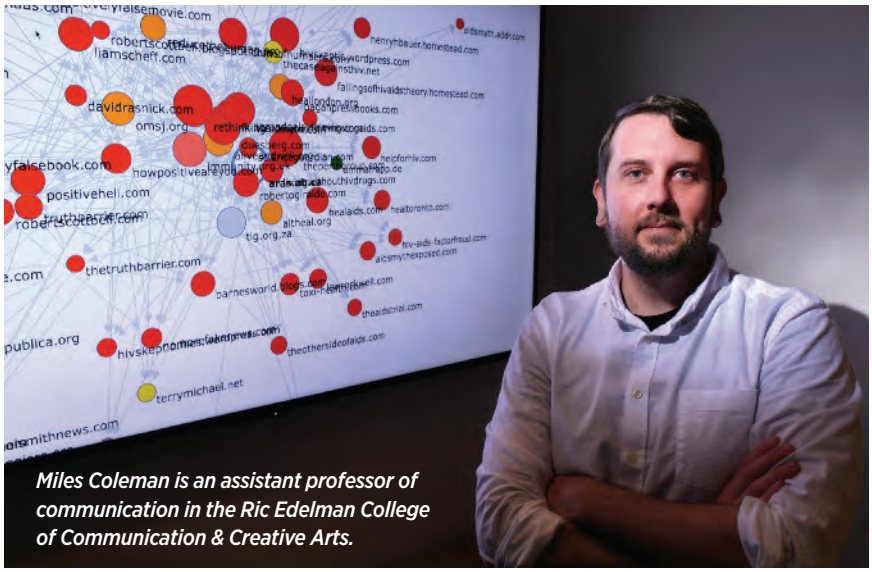
MAKE WAY FOR THE NEXT GENERATION OF NANOSCALE ELECTRONICS

Following a global semiconductor shortage, Congress enacted federal legislation to promote a national network for microelectronics research and development.

Supported by a National Science Foundation grant award, Erik Hoy, Ph.D., and his team are partnering with researchers from Butler University to develop new computational tools to enhance studying nanoscale devices on a molecular level. One of the project's objectives is to make these tools readily available to any researcher.

"The classical computing architectures are starting to reach their development potential," said Hoy. "What we're looking to contribute to is the next generation of computer architectures."

BRIEFS



Miles Coleman is an assistant professor of communication in the Ric Edelman College of Communication & Creative Arts.

WHY IS SCIENCE DENIALISM SPREADING?

The spread of misinformation is a problem intensified by web features and the ease with which people can share their views. Miles Coleman, Ph.D., studies the ways people accept or reject claims of science, technology and medicine. He researches methods for approaching problems of science denialism online, such as dismissing established medical standards like the efficacy of vaccinations and the origins of AIDS.

"The internet forms these enclaves for people to believe whatever they want," Coleman said.

Using programmed bots to dive deep into the web where misinformation has a medium to thrive, Coleman follows patterns of science-denialist messages posted online. "My research builds out literacies to help people to know and live well by countering the tactics used by science-deniers to entice people into their belief bubbles," Coleman said.

WE HAVE A BUG PROBLEM

Bacteria rapidly evolve and can become resistant to new drugs, including antibiotics. To target these "superbugs," Valerie Carabetta, Ph.D., is leading a $1.8 million research project to find new ways to attack them.

Carabetta, assistant professor of biomedical sciences at Cooper Medical School of Rowan University, received a Maximizing Investigators' Research Award from the National Institute of General Medical Sciences.

Valerie Carabetta works with a student in her lab.

She is working to understand protein acetylation in bacteria and the underlying mechanisms that control it. She hopes to identify novel enzymes involved in regulating or controlling these processes, research that could lead to the development of a new class of antibiotics.

"There are already patients in hospitals who have untreatable infections," Carabetta noted. "For these reasons, an important goal of my research is to discover if drugs that target acetylation can be used to treat problematic bacterial infections."

'WE NEEDED TO TREAT THEM'

Richard T. Jermyn, DO, has spent his career caring for underserved and often stigmatized patients, beginning with palliative medicine for patients with HIV and AIDS. Jermyn's focus shifted to pain management, not only for HIV patients, but also for patients living with chronic pain.

The rise of the opioid epidemic prompted Jermyn to expand his practice to individuals in need of treatment for substance use disorder, including vulnerable patients living in communities with limited access to care.

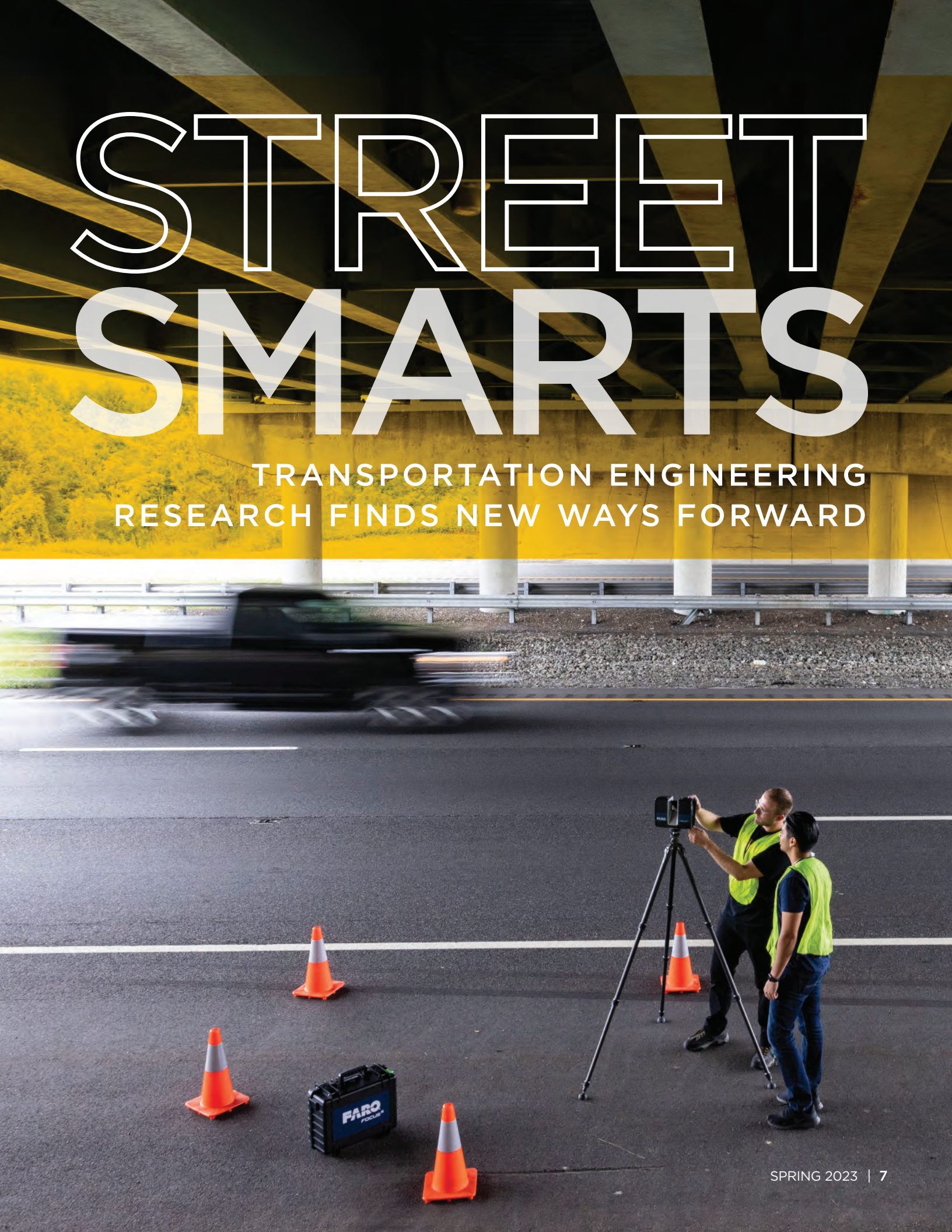
"When we found people with substance abuse, we needed to treat them," said Jermyn.

A pioneer in treatment, education and research in pain management, Jermyn was the first in the nation to establish a curriculum for prescribing opioids for medical students at Rowan-Virtua School of Osteopathic Medicine, Stratford. He has received numerous grants from federal and state institutions to conduct studies on patient safety around opioids, safe prescribing, neuropathic and HIV pain, and non-pharmacological approaches to pain.

Richard Jermyn and his team at the Rowan-Virtua NeuroMusculoskeletal Institute undertake clinical practice, community outreach and research in the form of investigations and clinical trials.

STREET SMARTS

TRANSPORTATION ENGINEERING RESEARCH FINDS NEW WAYS FORWARD



Previous page:
Using a terrestrial laser scanner, students collect point cloud data to create a digital 3D representation of a bridge. The technology returns millions of measurements, allowing engineers to analyze the bridge's structural integrity.

Senator Cory Booker (right) visits a CREATES lab with Yusuf Mehta (center), director of CREATES .

WHEN THE DEPARTMENT OF DEFENSE wanted new paving materials for bridges, airstrips and roads in the Arctic region, the Army Corps of Engineers began working closely on nearly two dozen projects with Rowan University's Center for Research & Education in Advanced Transportation Engineering Systems (CREATES).

When New Jersey's Office of the Attorney General needed hard numbers on distracted drivers, it sent the assignment to CREATES—and followed up on researchers' recommendations.

And when the state's Department of Transportation required the development of innovative technologies and pavement research, CREATES was selected to take the multi-year job.

Since CREATES opened in 2016, its researchers have attracted millions of dollars in grant-funded transportation research projects from federal, state and local government agencies, as well as private industry.

Using a Superpave gyratory compactor, a master's student in the Department of Civil & Environmental Engineering compacts warm mix asphalt for a project funded by the Department of Defense. Warm mix asphalt can be mixed at a lower temperature, reducing air emissions during production.

Yusuf Mehta, Ph.D., a civil and environmental engineering professor in the Henry M. Rowan College of Engineering and the director of CREATES, leads the ongoing research at the center, along with its associate director, Ayman Ali, Ph.D. The work also provides hands-on research experience for post-doctoral associates and graduate and undergraduate students.

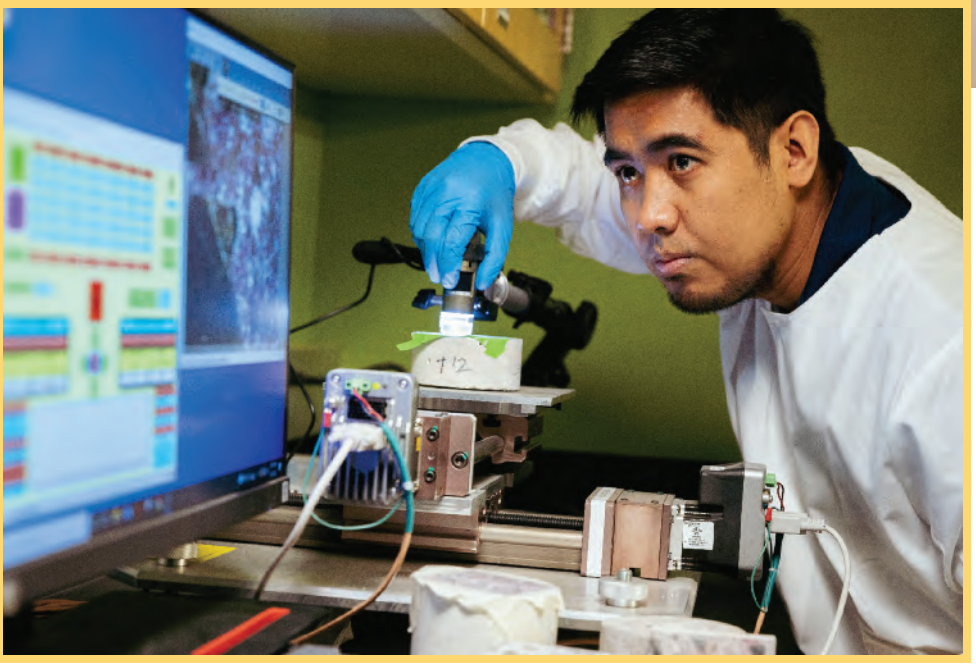
The center's clients "want solutions that are economical, practical, sustainable, high performing, and implementable," Mehta said.

A critical part of the testing and evaluation relies on the center's Heavy Vehicle Simulator (HVS), the only such device at a college or university in the northeastern United States.

Housed at Rowan University's South Jersey Technology Park through a cooperative agreement with the Army Corps' Cold Regions Research and Engineering Laboratory, the $3 million machine can simulate decades of vehicular traffic on highways and airplane runways in less than half a year while controlling temperature and other environmental conditions.

For 22 hours a day, the HVS grinds two giant tires back and forth beneath its stationary body, applying 9,000 pounds of load to a 25-foot section of pavement below. The machine pauses only for necessary maintenance or repair. Researchers collect data throughout, ending the tests once the pavement breaks down. ●

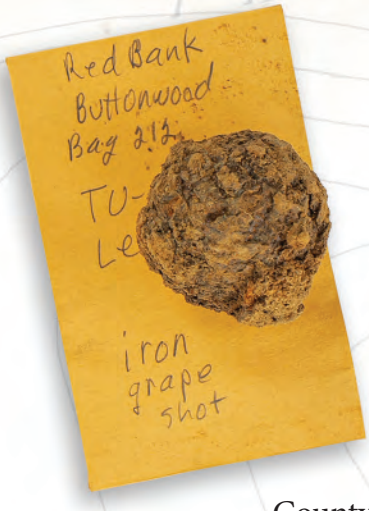
For a Department of Defense project, a sophomore majoring in civil and environmental engineering performs a thermal stress restrained specimen test on an asphalt mix with a high elastic binder designed to withstand low temperatures. The test measures the asphalt's susceptibility to cracking at low temperatures.



A doctoral student in the Department of Civil & Environmental Engineering measures air voids in concrete containing porous aggregates. Researchers use the data to analyze the concrete's permeability and strength.

What we didn't know

REVOLUTIONARY RESEARCH AT RED BANK BATTLEFIELD



THE DISCOVERY—equal parts stunning, overwhelming and sad—took a Rowan researcher's work as a public historian in a decidedly unexpected direction.

In the summer of 2022, Jennifer Janofsky, Ph.D., a professor of history, led a series of four public digs on a quarter-acre parcel of land at Red Bank Battlefield Park in National Park, New Jersey. Funded by grants from the New Jersey Historical Commission and Gloucester County, 100 members of the public dug for pieces of pottery, ammunition, flatware and other items that would help them learn more about the soldiers who fought in the Revolutionary War-era Battle of Red Bank.

Forensic specialists Anna Delaney and Stuart Alexander review information on site. Because human remains were found on the site, New Jersey State Police were called in.

An impacted musket ball from the Fort Mercer Trench excavation during the Red Bank Battlefield Archaeology Project.

But on the final day of digging, a member of the public made a startling discovery: a human femur. Further investigation by archaeologists uncovered what forensic scientists say are the remains of 15 humans—likely Hessian soldiers—killed at the battle on Oct. 22, 1777.

The remains were unearthed by archaeologists, led by Wade Catts, president and principal archaeologist for South River Heritage Consulting. They were turned over to New Jersey State Police Forensic Anthropologist Anna Delaney, who is extracting DNA from the remains—femurs, skulls, teeth—to identify their origin.

Skeletal assessment, isotopic, genetic and radiological analyses are ongoing to provide in-depth analysis of the human remains to gather biological data and indicators of life history, health and disease, and other factors. This spring, a bioarchaeology laboratory in California will further evaluate the samples.

Eventually, Janofsky is hoping the remains can be identified and that descendants of those who lost their lives on the battlefield can be found.

During the battle, which Janofsky explains was the greatest upset victory of the American Revolutionary War, outnumbered-but-emboldened American defenders defeated Hessian soldiers fighting for the British Crown.

The Hessians, some 2,000 soldiers strong, suffered heavy casualties—approximately 377. The Americans, integrated regiments of Black and white soldiers fighting for freedom side by side, numbered 500. Fourteen Americans were killed. The battle was a key defense for Americans to delay the British from advancing supplies up the Delaware River to Philadelphia.

"We didn't anticipate exhuming human remains. That was not the goal," said Janofsky, who secured grant funding to conduct the public digs on the Fort Mercer Trench, an area of the battlefield recently acquired by Gloucester County.

"We're hoping that eventually, perhaps, we can find some of these individuals," said Janofsky. "If we can extract their stories, and if we can tell their stories, it lets us put a name to a face.

"And that, to me, is a very powerful moment in public history."

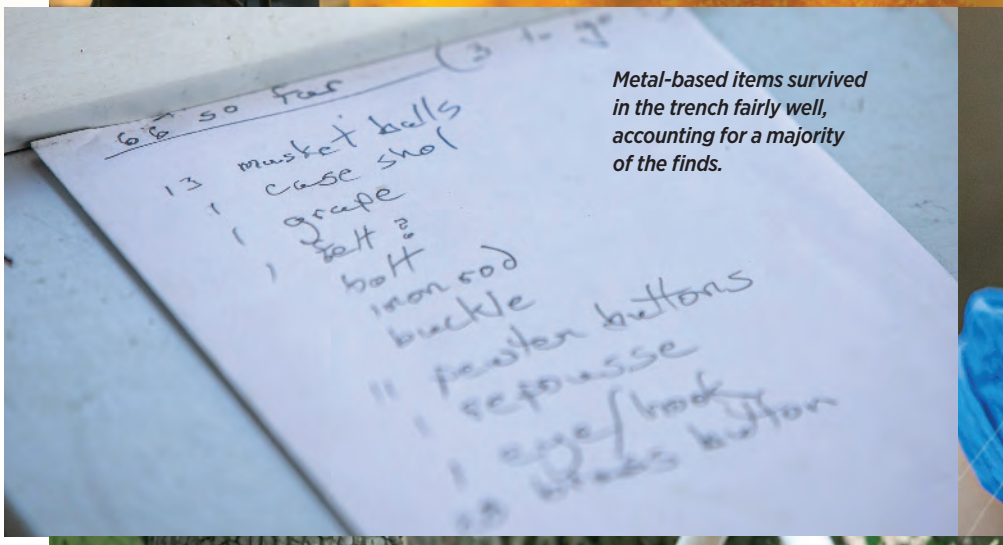
Equally powerful, Janofsky said, is that the public and Rowan students were intimately involved in the discovery. Over four days, volunteers shoveled dirt and screened and washed artifacts as they learned about archaeology. A 50-year-old union electrician uncovered the first of the human remains.

Before the remains were discovered, just 4½-feet deep, the public's big find was an extremely rare 1766 King George III gold guinea—the equivalent of a month's pay for a soldier.

"Literally hundreds of hours were committed in volunteer service to this project," said Janofsky. "Working with the public and getting them excited about the historical process is my goal.

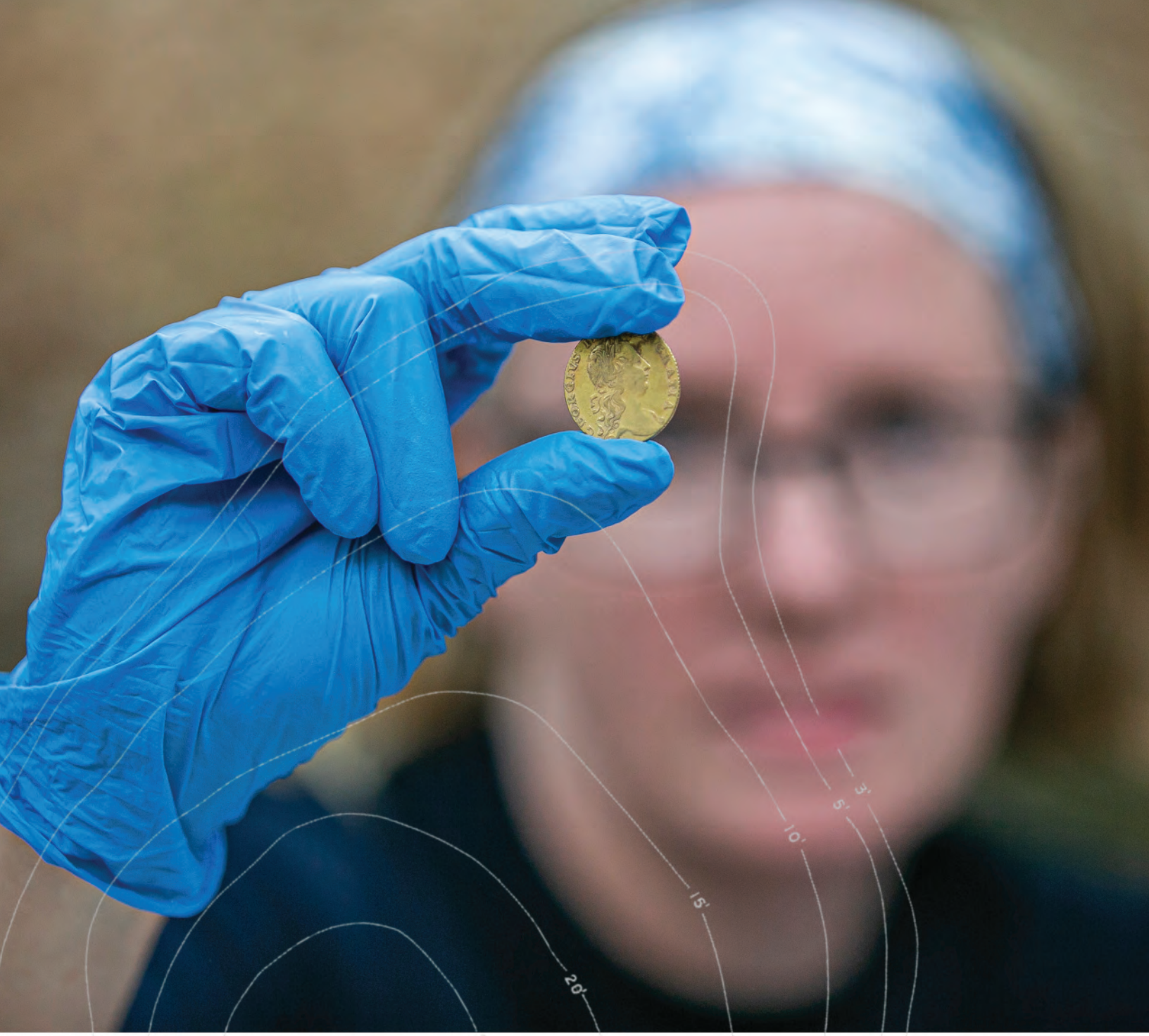
"To have people hold history—raw historical material—in their hands is an absolutely transformative moment. You can see the connection with the past."

Since the discovery, Janofsky has secured funding from the New Jersey Historical Commission, the New Jersey Humanities Council and Gloucester County for more archaeology studies at the battlefield. The funds also will help her develop teaching tools and interpretive projects for the public.



Metal-based items survived in the trench fairly well, accounting for a majority of the finds.

Volunteers Lou Iocona and Joe Reilly help document the excavation.



Jennifer Janofsky holds a rare 1766 King George III gold guinea, the equivalent of a soldier's wages for a month, unearthed at the excavation. It might have been hidden in a boot or sewn into a garment whose materials decayed underground.

In May, Janofsky and Catts, an adjunct at Rowan, will present an Archaeology Field School for Rowan history, archaeology and anthropology majors. Funded by the Rowan University's College of Humanities & Social Sciences, the field school will teach undergraduates about archaeology field methods and public history practices.

In addition to presenting her research nationally, Janofsky, ever the public historian, frequently speaks to school and community groups about the discovery of the remains and the battlefield's history.

Later this year, Janofsky and Catts will present their research at the 19th annual Seminar on the American Revolution at Fort Ticonderoga, a premier conference for scholars focused on the military, political, social and material culture of the American Revolution.

"To have people hold history—raw historical material—in their hands is an absolutely transformative moment. You can see the connection with the past."

— Jennifer Janofsky

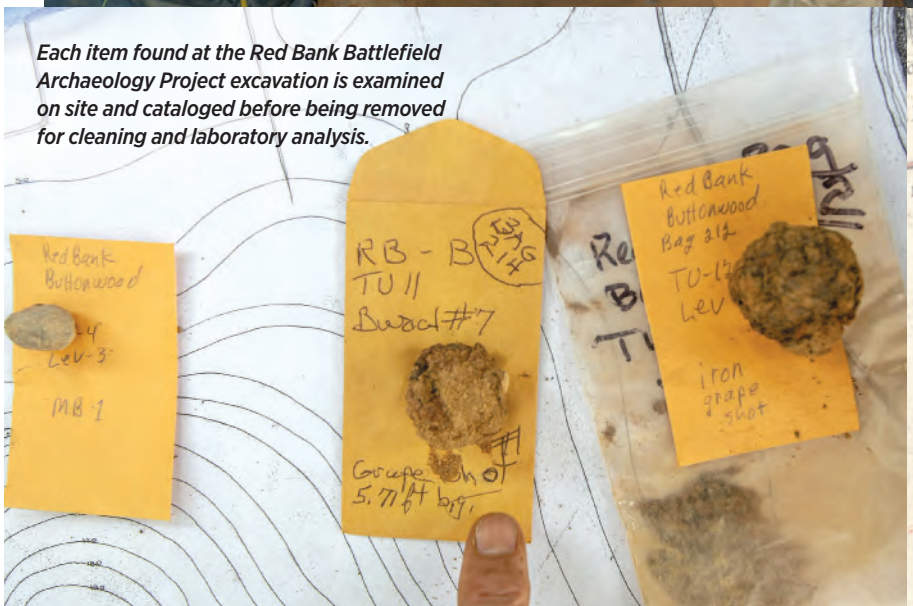
There's more to discover at Red Bank, Janofsky said. She's hoping subsequent public digs will unearth items that can be connected to the integrated regiment of American soldiers who fought in the War for Independence.

"Currently, we don't have great material culture representing the Black soldiers who fought at Red Bank," said Janofsky, noting that the 500-member regiment included approximately 50 Black soldiers.

"What makes this a particularly interesting moment in Revolutionary War history is the number of Black troops who participated in the battle. You had a fully integrated fighting force at the Battle of Red Bank. Side by side, people of African descent, with white soldiers, defended the fort. They were fighting for freedom." ●

Uncovering and handling an artifact takes time and attention to detail. It is critical to unearth the item intact and also to keep it from being contaminated with researchers' DNA.

While most of the work in the trench required careful manual labor with hand tools, the team used a metal detector and ground penetrating radar at key points in the Red Bank Battlefield Archaeology Project.



Each item found at the Red Bank Battlefield Archaeology Project excavation is examined on site and cataloged before being removed for cleaning and laboratory analysis.

AN INVESTMENT IN THE SCIENCE AND ENGINEERING OF MEDICINE

Mohammad Abedin-Nasab and his team demonstrate the precise alignment of a long bone fracture using Robossis, a surgical robot.

IN HIS LAB overlooking Camden, Mohammad Abedin-Nasab, Ph.D., is developing Robossis, an intelligent surgical robot to help surgeons align long bone fractures using a minimally invasive procedure. It's the kind of traumatic injury that now requires brute strength and sometimes more surgeries to properly repair.

To fine-tune the device to meet clinicians' needs, the Rowan University biomedical engineer and his team are working closely with Sean McMillan, DO, chief of orthopedics at Virtua Willingboro Hospital. They plan to roll out the robot's second generation in 2023, one designed to meet FDA approval for clinical trials.

"We will be the first team in the world to make this a reality, which will deliver much better care to patients," Abedin-Nasab said.

The device is an example of the biomedical advances made possible through scientific collaboration and an investment in research. And at Rowan, it's just the beginning of a new era.

> "WE WILL BE THE FIRST TEAM IN THE WORLD TO MAKE THIS A REALITY, WHICH WILL DELIVER MUCH BETTER CARE TO PATIENTS."
>
> *— Mohammad Abedin-Nasab, Ph.D.*

Since announcing the creation of a unique academic health partnership in January 2022, Rowan University and Virtua Health, South Jersey's largest health system, have established a fast-growing medical college to recruit, train and

develop future doctors, nurses, nurse practitioners, allied health professionals and biomedical researchers.

The partnership has led to an $85 million gift from Virtua and a $125 million commitment from Rowan University to establish the new college and its initiatives.

The Virtua Health College of Medicine & Life Sciences of Rowan University includes the Rowan-Virtua School of Nursing & Health Professions, the Rowan-Virtua School of Osteopathic Medicine, and the Rowan-Virtua School of Translational Biomedical Engineering & Sciences (TBES), now under development. The new school plans to hire 50 new faculty researchers within the next decade and build a research center on Rowan's West Campus.

REIMAGINING HEALTH CARE

Already, Virtua cardiologists, surgeons, transplant specialists and other physicians have begun meeting with Rowan biomedical engineers and scientists to discuss research related to cardiovascular medicine, transplantation and regenerative medicine, and health equity.

During evening roundtable discussions and brainstorming sessions over dinner, they have imagined the first steps toward distinguishing South Jersey as a regional hub for innovation, research and clinical discovery.

Sebastian Vega, a biomedical engineer advancing medicine, works in his lab at the Joint Health Sciences Center in Camden. His team recently created a new class of hydrogels that can be delivered via a syringe to locally regenerate bone without the need for surgery.

Virtua's investment "is going to do for this college what Henry Rowan did for Rowan University," said Rowan University Provost Tony Lowman. "We're building an academic health partnership to educate and train tomorrow's doctors, nurses and health care professionals—one that will quickly become a leading source of innovation and clinical discovery."

Future physicians and clinical researchers at the Rowan-Virtua School of Osteopathic Medicine study human anatomy using advanced medical imaging technology.

A NEW LINE OF ATTACK AGAINST PEDIATRIC CANCER

Many cancer treatments, like chemotherapy and bone marrow transplants, are invasive and may have severe, adverse side effects.

Rowan University researchers are working to develop less invasive and personalized treatment options for pediatric acute myelogenous leukemia (AML), with support from a recent grant awarded by the N.J. Department of Health's New Jersey Commission on Cancer Research. The project is led by Rachel Riley, Ph.D., an assistant professor with dual appointments in Rowan's Department of Biomedical Engineering and the Rowan-Virtua School of Translational Biomedical Engineering & Sciences.

Riley's team is developing lipid nanoparticles as vaccine platforms to treat pediatric AML, the second most-common type of pediatric cancer. Lipid nanoparticles, which are ultra-small fatty acid particles, have been used as drug delivery platforms for gene therapies and vaccines, most recently in the Moderna and Pfizer COVID-19 vaccines.

In this approach, lipid nanoparticles will deliver genetic

"Cross-discipline collaboration is one of the core principles guiding Virtua Health's academic affiliation with Rowan University," said Reg Blaber, Ph.D., executive vice president and chief clinical officer for Virtua Health. "We stand to learn and gain so much from one another, and that will ultimately translate to enhanced care and improved experiences for the communities that we serve."

FUTURE DEVELOPMENT

Such ambition requires space. To accommodate the new biomedical research school, Rowan is planning to build a five-story research tower connected to a new veterinary school and adjacent to Rowan's South Jersey Technology Park. Slated to open in fall 2025, the combined facility will feature large, modular laboratories. The open-plan concept is designed to showcase scientific discoveries to patients, funders and the clinical population.

"We're building something entirely new and exciting here in South Jersey," said Mark Byrne, Ph.D., founding dean of Rowan-Virtua TBES. "The integration of medicine, nursing, research and clinical practice opens so many possibilities for scientific inquiry and invention."

While much work remains to make the school a reality, exciting research is already underway in Rowan's biomedical engineering labs. Down the hall from Abedin-Nasab's robotics team, others are working at the cellular level.

A team led by Rachel Riley, Ph.D., is engineering new drug-delivery platforms to advance prenatal medicine. Nichole Daringer, Ph.D., and her students are creating novel synthetic biology tools that can be utilized for safer and more effective cancer treatments. Sebastián Vega, Ph.D., and his lab are developing new biomaterials for use in orthopedic tissue engineering.

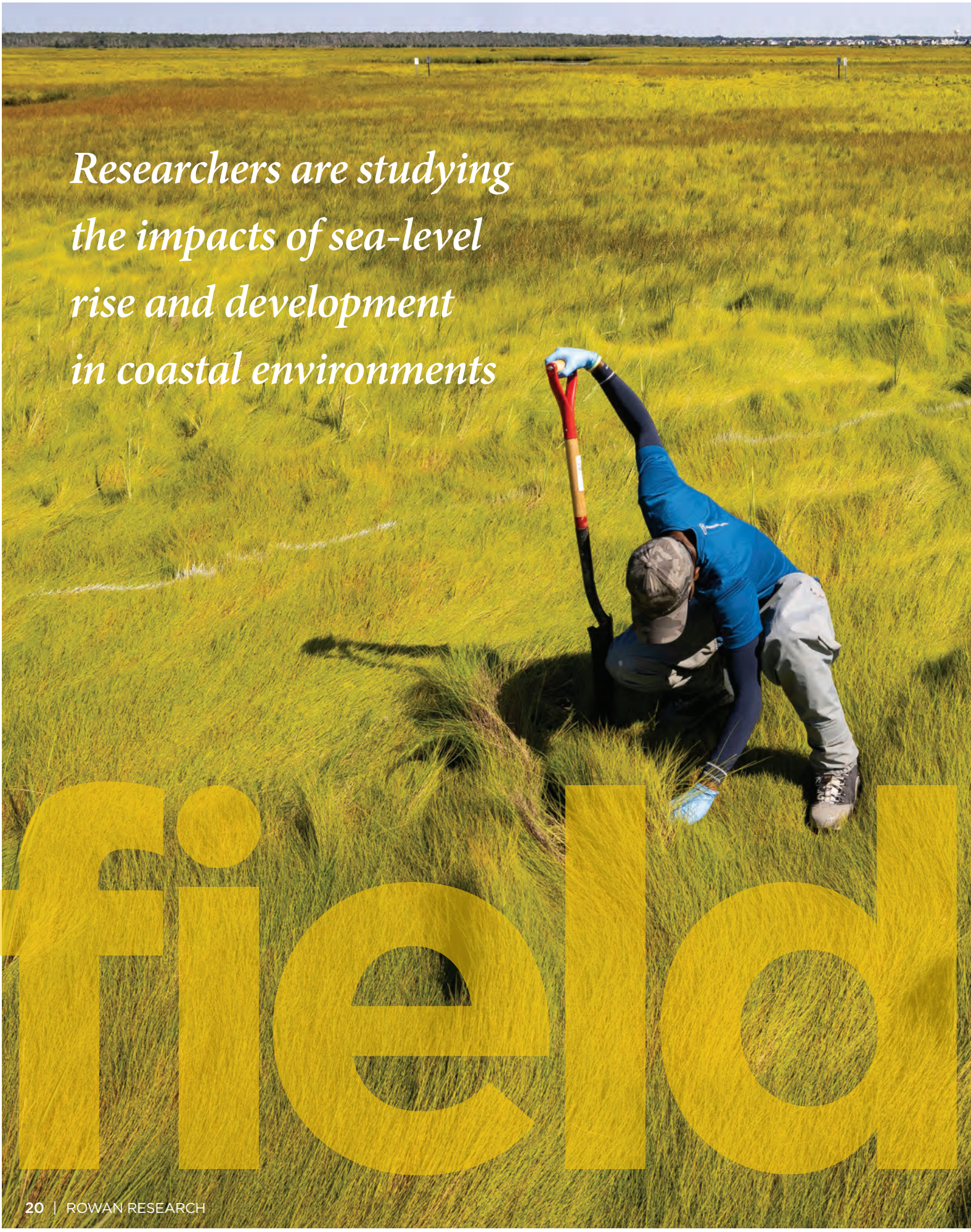
Such exploration in regenerative medicine will be a vital area of research in the new school.

"We're positioning Rowan as a leader in developing new treatment strategies and devices and then bringing them to patients," Byrne said. "Whether it's basic or applied science and engineering, we're bridging the gap between the lab and patients by searching for solutions and then bringing new innovations to the marketplace." ●

information to cells using messenger RNA (mRNA) to produce proteins called antigens. These antigens are recognized by immune cells to train the immune system to identify AML-specific antigens and kill the cancer cells.

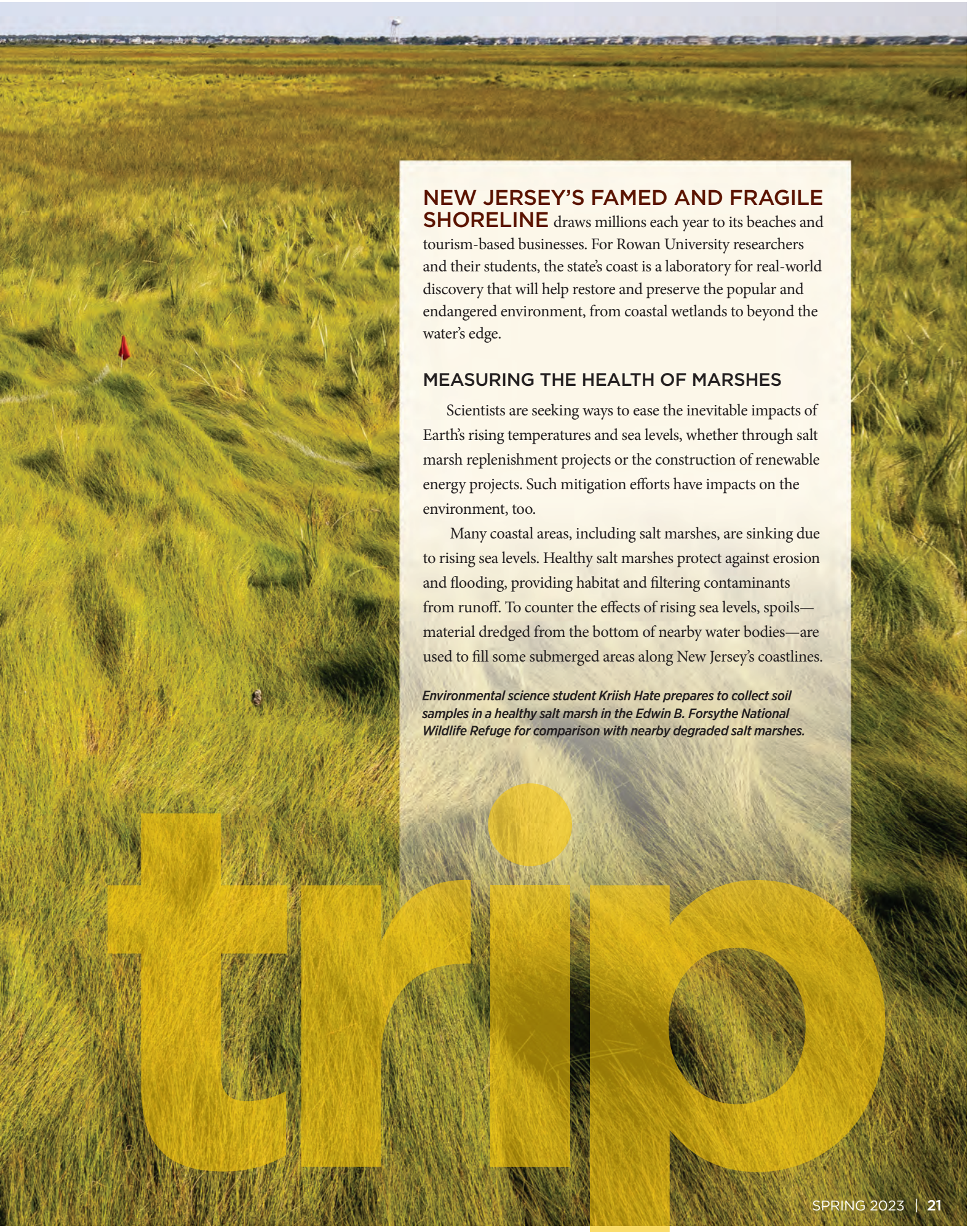
"You're basically training the body's own immune system to recognize the abnormal cells," Riley said.

Rachel Riley and her team are working to develop personalized treatments for pediatric cancer.



Researchers are studying the impacts of sea-level rise and development in coastal environments

field



NEW JERSEY'S FAMED AND FRAGILE SHORELINE draws millions each year to its beaches and tourism-based businesses. For Rowan University researchers and their students, the state's coast is a laboratory for real-world discovery that will help restore and preserve the popular and endangered environment, from coastal wetlands to beyond the water's edge.

MEASURING THE HEALTH OF MARSHES

Scientists are seeking ways to ease the inevitable impacts of Earth's rising temperatures and sea levels, whether through salt marsh replenishment projects or the construction of renewable energy projects. Such mitigation efforts have impacts on the environment, too.

Many coastal areas, including salt marshes, are sinking due to rising sea levels. Healthy salt marshes protect against erosion and flooding, providing habitat and filtering contaminants from runoff. To counter the effects of rising sea levels, spoils—material dredged from the bottom of nearby water bodies—are used to fill some submerged areas along New Jersey's coastlines.

Environmental science student Kriish Hate prepares to collect soil samples in a healthy salt marsh in the Edwin B. Forsythe National Wildlife Refuge for comparison with nearby degraded salt marshes.

trip

Kriish Hate and Charles Schutte lug equipment across a salt marsh to one of several sampling locations. Using a grid system, the team collects samples across the marsh to correlate field data with aerial photos captured by the New Jersey Department of Environmental Protection.

Charles Schutte, Ph.D., and undergraduate students in the School of Earth & Environment are working with the New Jersey Department of Environmental Protection (NJDEP) to identify salt marshes that are in need of help.

To more efficiently monitor the health of vegetation across geographic areas, scientists aim to develop a new method of mapping salt marshes using aerial imagery collected by drones.

By using visual patterns of healthy and unhealthy vegetation, scientists hope to identify declining areas more quickly. The sooner they can assess the data, the sooner scientists can intervene before conditions deteriorate beyond rehabilitation.

In Rowan's part of the study, Schutte is focused on the soil chemistry of the wetlands to understand whether current conditions will support healthy plants. At each sampling location in the field, the Rowan team carefully removes the salt marsh grasses to expose the soil below. The team tests soil and belowground water for chemistry parameters, including pH, salinity and temperature. Nitrogen levels are key indicators, too. As plants decompose, they add nitrogen to the soil where bacteria convert it into nutrients that plants use to grow.

As with much field research, it is time-consuming and sometimes difficult work in often picturesque but uncomfortable conditions. Collecting accurate samples is critical to the study and an invaluable learning experience for the students.

"Students are an integral part of our team and we are fortunate to have motivated students to support these projects," said Schutte.

FINDING THE BASELINE AT THE BEACH

Expanding the offshore wind energy industry in New Jersey is a key component of Gov. Phil Murphy's plan to reduce the state's carbon emissions. Murphy established the goal of setting New Jersey on the path to 100% clean energy by 2050. With intermediate targets for wind energy set for the next decade and beyond, the governor's executive orders also call for feasibility studies to accelerate progress.

New Jersey's coastal development is a flashpoint for debate about the urgency of climate change and human impacts on the fragile land mass, the health of the waters and life in and around it. The state's study of offshore wind projects began nearly 20 years ago with a blue ribbon panel. Today, sustainability science is key to the success of the alternative energy plan.

On the beach and out at sea, Lauren Kipp, Ph.D., is leading work to study the chemistry of coastal waters along the continental shelf. With help from students in Rowan's Department of Environmental Science, Kipp's project will be used to determine baseline coastal conditions before the installation of wind turbines. The field program involves collecting a series of water samples on the beach and near the shore at several locations along the coast of southern New Jersey.

Kipp uses the properties of naturally occurring radioactive isotopes, specifically radium, to establish baseline conditions. As water travels through the ground to the ocean, radium isotopes are naturally transferred from sands and soils into the water. By comparing the amount of radium isotopes from samples collected on the beach to samples collected from the ocean, Kipp can measure how much groundwater is discharging to the ocean.

Kipp's team uses a simple drive-point boring device and pump to draw water from the sand for testing. Offshore, correlating ocean samples are collected using similar techniques.

The students' contribution to the research is yielding vital information to the effort to understand environmental impacts and better respond to the challenge of delivering clean, renewable energy for New Jersey. At the same time, the field experience is training and preparing undergraduates for professional careers and advanced degrees in geoscience disciplines.

Rowan's commitment to real-world science and the future of collaborative research come together in New Jersey's coastal living laboratory, according to Schutte.

"As a student, I benefited tremendously from faculty mentors," Schutte said, "so training the next generation of scientists is my way of paying it forward. I know they will make their own scientific discoveries and continue to pass on their knowledge." ●

Kipp (left) takes field notes while undergraduate Alyssa Robbins and project co-investigator Schutte assist with groundwater sample collection at Brigantine Beach, New Jersey.

MAKING MEANING

RESHAPING THE FUTURE OF COMBAT USING AI

AIMING TO MAKE game-changing impacts on its future combat capabilities, the Department of Defense has awarded Rowan University an additional $3 million to create virtual and mixed-reality combat simulations augmented by artificial intelligence (AI). The project is a continuation of a $5.5 million partnership between Rowan University and the U.S. Army Combat Capabilities Development Command – Armaments Center at Picatinny Arsenal, New Jersey.

Improvements to weapons and tactics for combat are shaped by changes in technology. Drones, sensors on tactical vehicles, and AI can work together to protect exposed crew members and gunners operating in combat vehicle turrets.

"We are developing secure, immersive and autonomous mixed-reality environments that can enhance the operational evaluation of next-generation gunner turret systems and accelerate their development," said the project's principal investigator, Nidhal Bouaynaya, Ph.D., associate dean for research and graduate studies and professor in the Department of Electrical and Computer Engineering in the Henry M. Rowan College of Engineering.

To safely simulate, test and refine its new technologies, the team is creating virtual, augmented and mixed-reality environments featuring armored and tactical vehicles, gunner protection kits (GPKs), threats and engagement scenarios. Artists and programmers will work with veterans who were previously deployed to create realistic combat scenarios.

The team is also building situational awareness systems to alert military personnel to threats using secure, high-speed wireless communication between the vehicle and the crew members. A sensor suite will capture data collected from sensors mounted inside and outside the tactical vehicles, as well as physiological data from the gunner and information about the weapon, such as its position and misfeeds.

Engineers will feed the data to the AI system, so it can identify threats and make predictions. Ultimately, each element of the project will be woven seamlessly together, giving the gunner access to processed information using a combination of head-up displays and VR headsets.

To date, the Rowan team has created a virtual environment with photo-realistic visuals, including a tactical vehicle and multiple terrain options. The team's AI system recently demonstrated it could detect aerial drone threats in real time within the simulated environment.

Next, the human factors team will collect physiological data from test subjects (Rowan University student volunteers) by immersing them in a number of virtual scenarios. The information will help the team determine the best methods for presenting information to a gunner.

The Rowan team has created a virtual environment with photo-realistic visuals, including a tactical vehicle and multiple terrain options.

Bouaynaya and her team are pushing the boundaries of convergence research in virtual and mixed reality, AI, sensors, human factors, and advanced materials. Because the research is conducted within a mixed-reality simulation environment, Bouaynaya expects to answer many questions about how well these tools can work in a real combat environment.

"The combat landscape is changing rapidly," Bouaynaya said, "and will be changing to include more robots and more AI. The framework we are developing is one way to keep pace and maybe get one step ahead of those changes." ●

"We are developing secure, immersive and autonomous mixed-reality environments that can enhance the operational evaluation of next-generation gunner turret systems and accelerate their development."

— Nidhal Bouaynaya

A FIRST FOR NEW JERSEY

ROWAN UNIVERSITY TO ESTABLISH SCHOOL OF VETERINARY MEDICINE

IN RESPONSE TO GROWING DEMAND, both regionally and nationally, for veterinarians, veterinary specialists and skilled technicians, Rowan University is establishing the first school of veterinary medicine in New Jersey.

"We are creating a destination of choice for students who share a passion for animal health and want to pursue careers in veterinary-related studies at all higher education levels," President Ali A. Houshmand said. "Our curriculum will emphasize developing career-ready professionals to address shortages of animal health care providers in New Jersey and throughout the United States."

With only 33 veterinary schools in the United States and only five on the East Coast, a new veterinary school in New Jersey will keep talented and high-achieving students in our state, reduce the cost of veterinary education for New Jersey residents, and attract out-of-state veterinary students to New Jersey.

The veterinary school will offer New Jersey's first Doctor of Veterinary Medicine (DVM) degree, as well as additional degrees and training programs designed to shape the future of veterinary medicine and animal health care in the state.

Rowan will establish undergraduate, graduate, doctoral and internship/residency programs, including an accelerated DVM/MBA in collaboration with the Rohrer College of Business and an M.S./Ph.D. in veterinary biomedical science in collaboration with the Rowan-Virtua School of Osteopathic Medicine and the Graduate School of Biomedical Sciences, Cooper Medical School of Rowan University and Rowan's College of Science & Mathematics.

The veterinary school will be located on the University's West Campus.

Matthew Edson has been appointed as the founding dean.

Additionally, through a unique partnership with Rowan College of South Jersey-Gloucester, the school will offer an associate's degree in veterinary technology to community college students.

Pending approval from the American Veterinary Medical Association Council on Education, the school plans to welcome its inaugural class of 60 students in fall 2025.

To be located on Rowan's West Campus in Harrison Township, the 117,000-square-foot building will include academic classrooms, educational and diagnostic laboratories, a teaching hospital and administrative and faculty offices. The teaching hospital will provide core experiential learning to students, animal health care services to the public, as well as specialty referral and diagnostic services to regional veterinary practices.

The New Jersey Legislature appropriated $75 million in funding to help support construction of the veterinary school's academic and clinical facility.

The building will be combined with the new 50,000-square-foot Virtua Health College of Medicine & Life Sciences Research Center on the West Campus.

With the addition of the new school, Rowan will become one of two universities in the nation to offer the DVM, Doctor of Medicine (MD) and Doctor of Osteopathic Medicine (DO) degrees. The University provides its MD program through Cooper Medical School of Rowan University and its DO program through Rowan-Virtua School of Osteopathic Medicine.

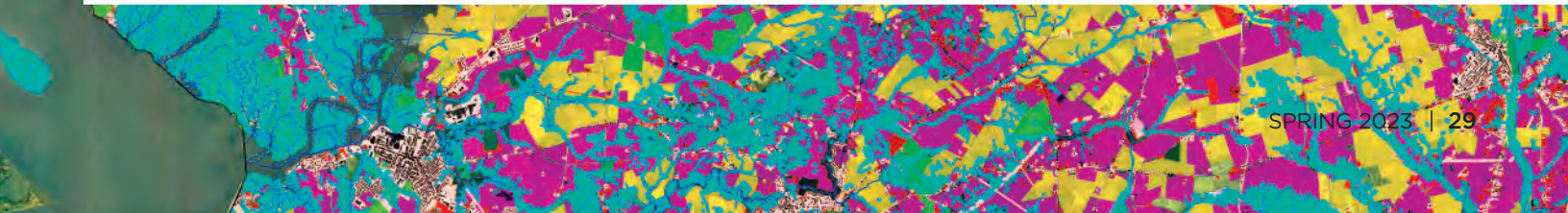
Matthew Edson, DVM, a licensed veterinarian in practice for more than a decade, is the school's founding dean. Named a top veterinarian by South Jersey Magazine in 2017, Edson was voted "Best Veterinarian" in Burlington County by Burlington County Times readers for four consecutive years, from 2018-2021.

"We're excited to create a veterinary school where hands-on experience, virtual reality, simulations and outcomes-based, student-centered education and assessment are integral to the teaching and learning experience," said Edson.

THIRD FASTEST-GROWING

A LITTLE MORE THAN 10 YEARS AGO, Rowan University could describe itself as a well-regarded state university with a nationally ranked engineering program.

Today, Rowan is a dramatically different institution: a top 100 public research university and a model for



strategic change. Thanks to its rapid trajectory, Rowan has been recognized by The Chronicle of Higher Education as the nation's third fastest-growing public research university.

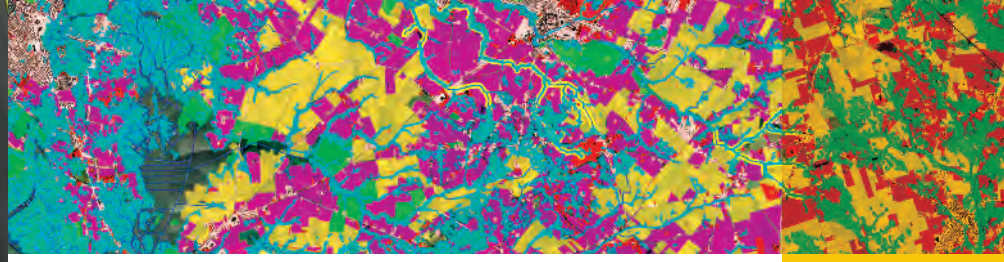
Enrollment nearly doubled between 2010 and 2021, the result of a careful investment in research, while remaining focused on building high-quality undergraduate programs designed to meet the needs of a fast-changing world.

To get here, Rowan broke norms, operating like a business and maintaining a laser focus on controlling costs—for both the University and its students.

"Affordability is critical," said President Ali A. Houshmand, Ph.D. "As a state institution, we have the obligation to provide access, affordability and a quality education to everybody."

UNIQUE PARTNERSHIPS, CREATIVE THINKING

Through unique partnerships with two community colleges, Rowan University forged new pathways toward a bachelor's degree at a significant cost savings for students, without sacrificing quality.



Creative thinking also fueled a public-private partnership between investors, Rowan University, and Glassboro, home to the University's main campus.

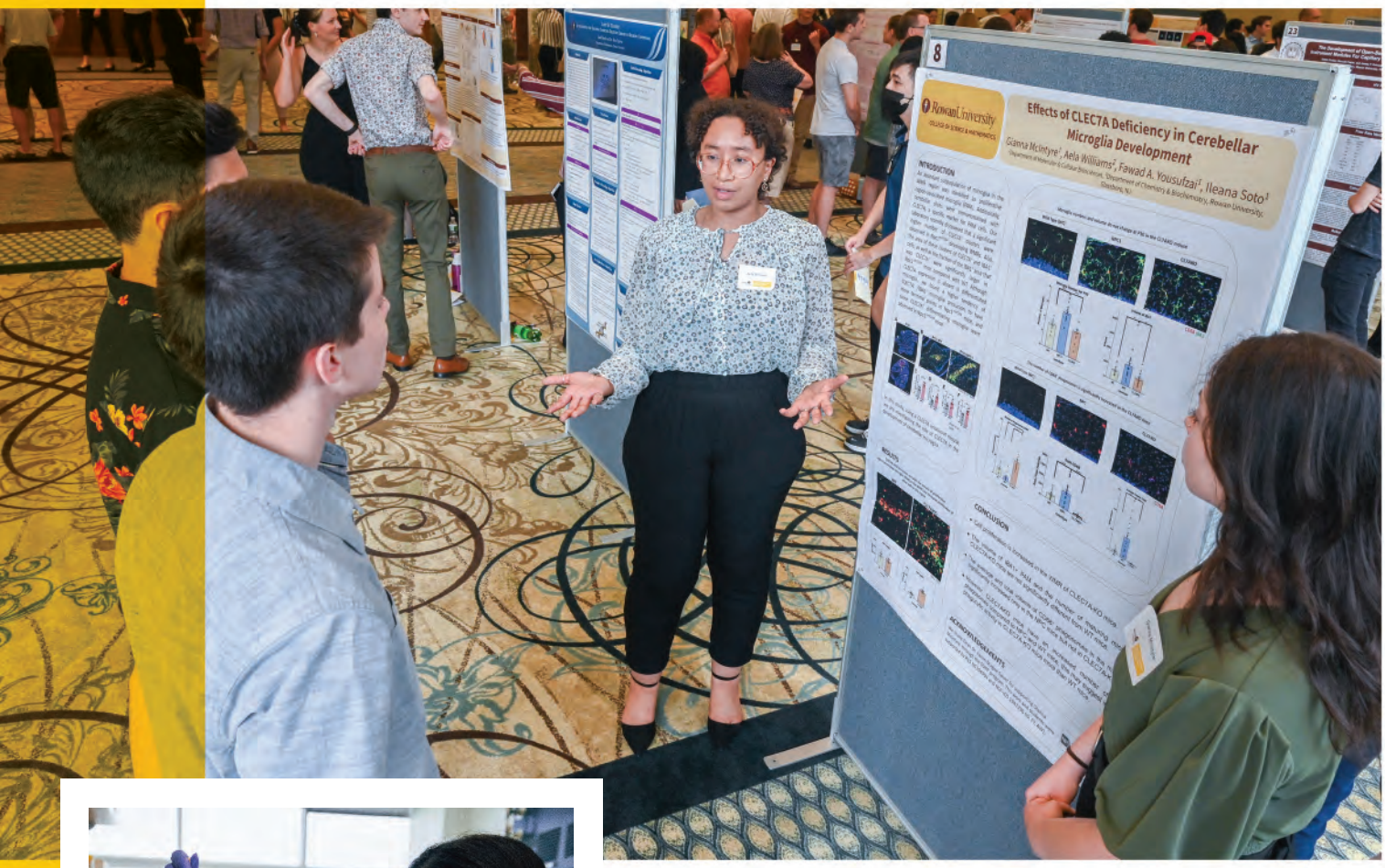
Out of 26 acres of mostly privately owned student rental properties came Rowan Boulevard, a $426 million redevelopment project that caught the attention of institutions across the nation.

Leading Rowan University for more than a decade, President Ali Houshmand continues to encourage partnerships throughout the region to increase opportunities for students, promote research to solve problems and advance opportunities for economic development.

In turn, Rowan shared its name and reputation with the independently operated colleges, now Rowan College of South Jersey and Rowan College at Burlington County.

The mixed-use cityscape rapidly met the University's need for modern student housing and academic space, while attracting new businesses and visitors to a revitalized downtown.

In 2009, Rowan University partnered with Cooper University Health Care to open the state's first new medical school in 35 years, Cooper Medical School of Rowan University in Camden. In 2012, New Jersey passed legislation to restructure its medical and health sciences educational system, designating Rowan as its third public research university.



With the legislation, the state's only osteopathic medical school also became part of the institution.

Now, Rowan is advancing plans to develop New Jersey's only veterinary school. Once complete, Rowan University will be one of just two in the nation to offer the MD, DO and DVM degrees, helping to address critical needs for more physicians and veterinarians.

NURTURING RESEARCH

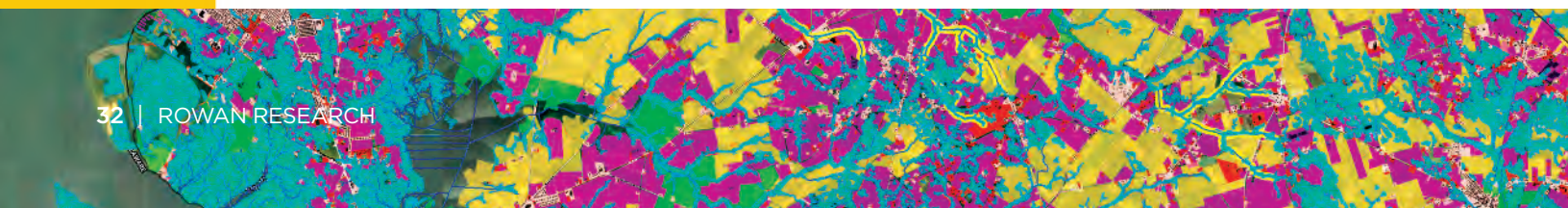
Spurred to innovate further, Rowan expanded its research division, attracting fast-rising faculty interested in solving real-world problems through applied research.

By 2018, Rowan received classification as a Carnegie R2 doctoral university with high research activity, a distinction shared with 135 universities among 4,300 institutions of higher education.

Today, Rowan is driving forward to achieve R1 classification, reserved for institutions with the highest research activity. In 2021, Rowan partnered with Virtua Health to open the Virtua Health College of Medicine & Sciences with a commitment to hiring 50 new research faculty within a decade.

A Middle States Commission on Higher Education visitation team gave Rowan glowing remarks in all areas, stating that Rowan is a "model for institutional transformation."

Unsatisfied with incremental growth and change, the institution continues to press forward, leapfrogging traditional thinking and innovating higher education. ●



UPCYCLING

USING THE PROPERTIES OF NATURAL MATERIALS TO CREATE SUSTAINABLE SOLUTIONS

ELECTRICALLY CONDUCTIVE nanofibers and foams, biomedical sensors with heat-transferring properties and biocompatible solutions with magnetic properties are just a few of the innovations made possible through research in natural fibers.

Xiao Hu, Ph.D., a professor in the Department of Physics & Astronomy, studies many types of natural biopolymers, including proteins from silk, celluloses from wood, zeins from corn, chitins from shrimp and keratins found in hair. The biocomposites that Hu creates out of natural fibers are new materials with tunable functions and properties. Manipulating the structure and properties of natural materials has direct applications in areas like biomedical science and the development of biodegradable building materials. ●

"The reason we study natural biopolymers is because we're focusing on green, sustainable materials that can biodegrade after use with no harmful effects on the environment."

– Xiao Hu

Xiao Hu holds a collection of silkworm cocoons from around the world. His materials science lab studies the properties and structures of silk and other natural materials to develop new technologies.

ROWANRESEARCH
Rowan University
201 Mullica Hill Road
Glassboro, NJ 08028

Joseph Stanzione engineers sustainable composites from plant materials.

WE ARE ENGINEERING BETTER, GREENER MATERIALS

THE U.S. MILITARY needs lighter, stronger, and more sustainable materials it can quickly produce anywhere. As director of Rowan University's Advanced Materials & Manufacturing Institute (AMMI), Joseph Stanzione, Ph.D., is in a position to help.

Most plastic composites are petroleum-based. That poses a few problems including dependency on oil, harmful impacts on the environment and overreliance on limited resources.

"Fossil fuels are not being produced as quickly as we're consuming them," Stanzione said. "But if we could use a fraction of all of the Earth's plant matter that's produced annually as sustainable plastic composites, we could replace part, if not all, of the petroleum-derived materials made—and potentially give back to the environment." ●