

uncg research

Spring 2020

Research, Scholarship, and Creative Activity

RIPPLE EFFECT

Step into the
world of science.
And transform it.

pg. 22

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Cover photo: Undergraduate researcher Chris Roberts collects and tests fungal compounds, as part of the Oberlies lab's search for new drugs to treat cancer.



Innovation. Ask 15 experts about it – like the “Idea to Value” blog did in 2016 – and you’ll get 15 different definitions. But there are some common elements. Across multiple fields, innovation involves creativity, a new idea, addressing a real challenge, and creating value. It’s an application of better solutions that results in new ways of thinking or doing.

According to Stephen Johnson, author of “Where Good Ideas Come From,” innovation and evolution thrive in networks, within shared physical and intellectual spaces. These creative collisions and connections facilitate ideas.

That’s why innovation thrives at UNC Greensboro.

One area of fertile ground is that space where students and faculty learn from each other – where the magic occurs between mentor and mentee and discovery happens. Minerva Lithium, which you’ll learn about in our “It’s a Go” feature, took root there.

Another is in the efforts of our entrepreneurial LaunchUNCG team, who empower our researchers to develop discoveries with the potential to change our world, by offering them access to innovative networks, industry feedback and partners, seed funding, and much more.

As you would expect, many examples spring from our Bryan School of Business and Economics, celebrating its 50th anniversary this year. You’ll find two stories about the Bryan School’s stellar researchers within this issue.

Innovation is about broadening our way of thinking, on campus and off.

It’s when we take a devastating disease like Alzheimer’s and look for a new approach, like physical exercise, to keep memory loss at bay.

It’s when we harness the relationship between athlete and coach to fight concussions and enhance the long-term health of athletes.

It’s when a researcher who was a practicing social worker shines a light on the unique benefits of informal and kinship care – almost completely overlooked in the literature – to build better policies and approaches.

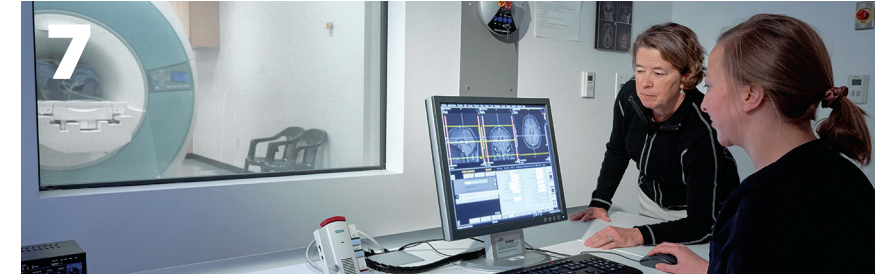
And finally, innovation happens when all students, instead of just those in a narrow subsection of our society, have access to world-class research opportunities, ensuring a robust and diverse workforce pipeline.

Find your innovation here.

TERRI L. SHELTON, PH.D.
Vice Chancellor for Research and Engagement

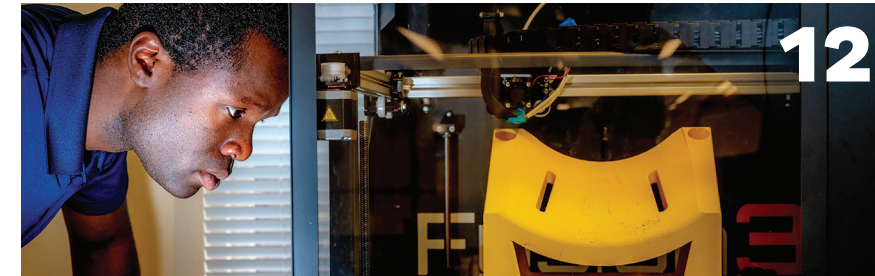
UNCG Research is online. Enjoy additional photography, shareable stories, and more at researchmagazine.uncg.edu.

FEATURES



Jogging Your Memory

Can you stave off Alzheimer’s? One researcher examines the neuroprotective qualities of exercise, using brain scans, blood biomarkers, and more.



It’s a Go

A lithium-trapping filter. A new way to assess knee health. LaunchUNCG is boosting faculty, staff, and student entrepreneurship, to speed innovation to the wider world.



So You Want to Be a Scientist

MARC U-STAR opens the lab door for students from underrepresented populations, to strengthen our biomedical fields and industries.

uncg research

DEPARTMENTS

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HEADGames

The NFL's centennial season began with shocking news: 29-year-old quarterback Andrew Luck was retiring after just seven years in the league.

Luck had been stuck in an injury-rehab-repeat cycle for years. A concussion and a lacerated kidney were just a few of a long list of medical ailments the star quarterback battled over his short career.

Athlete health and wellness have always been a public health concern. But now, says Dr. Jeff Milroy, the conversation is louder, and even more public, than ever before.

As an assistant professor of public health education and associate director of UNCG's Institute to Promote Athlete Health and Wellness, Milroy is one of the leaders pushing this conversation forward. His research centers on improving health outcomes for athletes.

While stories of professional players grab our attention, Milroy is focused on a much larger group with much more potential for public health impact: youth and college athletes.

According to data from the Sports and Fitness Industry Association, 56.5% of U.S. children, ages 6 to 12, played a team sport at least one time during 2017. Nearly 8 million students participate in high school athletics, and on the collegiate level, there are more than 500,000 student-athletes nationwide.

Recently, Milroy and his colleagues received a National Institutes of Health grant to investigate how parents

and coaches affect young athletes' concussion disclosure behavior. Studies show that over 50% of sport-related concussions go unreported, resulting in delayed care and long-term health impacts.

The new study builds off a 2016 study, funded by the NCAA and U.S. Department of Defense, in which Milroy and Dr. David Wyrick explored the impact of athlete-coach relationships on concussion disclosure in college athletics.

They found that communication from coaches matters. When athletes receive concussion-related messages from their coaches that specifically support disclosing symptoms, says Milroy, athletes are more likely to report problems.

But Milroy's mission is much broader than concussions. His work is about creating a sport culture in which athlete mental and physical health is prioritized by coaches, parents, school administrators, and athletes themselves.

The Institute to Promote Athlete Health and Wellness, led by Milroy and Wyrick, is recognized as a national leader in this space and currently serves as the educational partner of the NCAA Sport Science Institute. The two institutes work closely together on a variety of issues – including mental health, sexual violence, and alcohol and drug misuse – that impact college athletes.

"When it comes to the student-athlete population, we have more data than any other group out there, besides the NCAA," says Milroy.

Milroy, seen here at a Greensboro youth sports event, leads the research team, which includes Dr. Wyrick, Ph.D. student Pauline Privitera, Dr. Emily Kroshus at Washington State University, and Dr. Bill Hansen of Prevention Strategies, LLC, a UNCG spinoff company.

The UNCG institute, which has received over \$1.8 million in funding since it launched in 2013, also works with the NFL Foundation and other organizations that advocate for the health and wellness of student-athletes.

While the work often involves specific interventions for specific populations, the end goal is much bigger.

"When I have conversations with schools that are ahead of the curve, they're talking about creating cultures to spur the holistic success of their athletes," Milroy says.

While sport often gets a "bad rap," he says, positive sport cultures have the power to do a lot of good. "It's not just about wins and losses. It's about developing and fostering a culture that views human development as paramount and encourages athletes to become their best selves, on and off the field."

*By Alyssa Bedrosian
Learn more at athletewellness.uncg.edu
phe.uncg.edu/team/jeff-milroy*



DOES YOUR PREMIUM PAY OFF?

When you're paying an insurance premium, the question "Does my health insurance actually make me healthier?" might be more exasperation than genuine curiosity.

But for Assistant Professor of Economics Martin Andersen this question fuels a unique set of research questions at the nexus of health insurance and health.

WHAT THE DOCTOR ORDERED

The National Institutes of Health recently awarded Dr. Andersen \$275,000 to study prescription drug utilization and health outcomes, as they relate to diabetes, urinary tract infections, and pneumonia.

He's exploring the effects of utilization management – restrictions that insurance companies can place

on medications, treatments, and procedures – on beneficiaries' health outcomes.

"UTIs and pneumonia are quite common for Medicare subscribers – and major causes of morbidity and mortality. We track diagnoses, drugs dispensed, and patient outcomes. Different plans use different utilization management strategies, so we can compare how they're doing," he says.

"Since 2006, more than 30 million Americans have been enrolled annually in various Medicare Part D plans. Almost half of all drugs in these plans have some type of utilization management. Understanding these effects will provide insight into whether we should regulate utilization management."

The Bryan School researcher is

also exploring how the process is impacting prescribed opioid use, and by extension overdose rates. Preliminary results show that Medicare manages drugs with overdose risks more tightly – a positive impact. "Having a prior authorization or therapy requirement means you're less likely to have an overdose."

But, he adds, economists always look for the trade-offs. "This may mean some patients suffer more pain."

PROOF OF CONCEPT

One of Andersen's early successes in illustrating the connections between insurance and health came from an analysis of the 1973 expansions of Medicare coverage – specifically their effects on individuals with end-stage renal disease, in terms of insurance coverage, health care utilization, and mortality.

"Suddenly, people who could never have

afforded lifesaving dialysis were receiving this treatment," says Andersen. "Because Medicare was paying dialysis clinics, more could enter the market, giving many more people access to treatment – a classic example of the supply-side effect." From 1973 through the late 1970s, there was a huge reduction in kidney disease deaths.

His paper on the subject appeared in one of the top journals in health economics.

RECOVERING INVESTMENT BANKER

Andersen's passion for these topics began in his previous life as an investment banker. He covered pharmaceutical companies, sparking his interest in the economics of the drug and health care industries. To delve into the big questions he saw facing health care, he decided to pursue graduate studies in public health and health policy.

In 2017 the U.S. spent \$3.5 trillion on health care, or 18% of the national economy. "There's no prospect of this number going down in the near future. So my fundamental question is: Are we getting value – longer, better, healthier, happier lives – as a result of that spending?"

"My hope is my research will help decision makers understand that health insurance is not a luxury. It can genuinely affect people's lives for the better – making them healthier and more financially secure."

*By Susan Poulos
Learn more at go.uncg.edu/andersen*





CAREGIVER SUPPORT Washington and facilitator Lisa Taylor (l-r, standing below) meet with a group of kinship caregivers. Kinship care groups like this – offered by Family Solutions, Guilford Child Development, Senior Resources of Guilford County, and Aging, Disability, and Transit Services of Rockingham County – are one way the project is recruiting participants.



Washington and her co-investigators – Dr. Sonya Leathers from the University of Illinois at Chicago and Dr. Stephanie Irby Coard in UNCG Human Development and Family Studies – are also collaborating with the Guilford and Rockingham departments of health and human services, the Black Child Development Institute, and the Children’s Home Society of North Carolina.

NEXT of KIN



AFRICAN AMERICAN KINSHIP CARE

There is a long history of informal kinship care in African American communities, Washington says.

“Kinship care happens for all races and ethnicities, but it’s highest for African Americans. This is something African Americans have been doing since the time of slavery.”

During the Great Migration, for example, millions of African Americans left the rural South to escape racial and economic oppression. They sometimes left children in the care of relatives while seeking jobs and establishing themselves in new communities.

A common situation might involve a young parent who leaves a child in the care of grandparents to go to college. Other children end up in informal kinship care when parents die, are incarcerated, or suffer from substance use or mental health disorders.

When Dr. Tyreasa Washington was a practicing social worker, she dealt with many children who didn’t live with their parents.

Sometimes they had been placed by the state into traditional foster care. Sometimes they were living with a relative or perhaps a godparent who had a family connection, an arrangement called “kinship care” that is more common than traditional foster care.

Children in kinship care, Washington noticed, bounced between foster homes less often, had more stable lives and generally better prospects — though they still face challenges that other children don’t.

Now, as an associate professor of social work, Washington is studying kinship care among African American families.

There’s already plenty of research that details the challenges, obstacles, and poor outcomes kinship care kids face. However, children in kinship care arrangements still tend to do better than kids in traditional foster care. Washington wants to understand why.

“We’ve taken more of a positive approach,” Washington says. “What are the families doing well? What are the strengths and resources in these families that contribute to children’s social competence, academic competence, and better behavioral health?”

Washington has won a \$445,000 National Institutes of Health grant to study approximately 200 African American children in kinship care, to tease out what factors contribute to better outcomes for these children.

She and her research team will recruit families through social services agencies in Guilford and Rockingham counties, as well as at events and through online channels. She

will survey them to collect quantitative data and then follow up with in-depth interviews to dig into their experiences.

Earlier pilot studies Washington conducted indicated that the involvement of birth parents improves outcomes for kids. The new study should shed light on what that birth parent involvement actually looks like and how caregivers manage it.

The results could be helpful for social workers, teachers, and others who work with kids in kinship care, as well as to caregivers themselves.

“We want service providers to get the information,” Washington says. “We want families to have the information.”

“Especially since we’re focusing on informal as well as formal kinship care, she’s turning a lens on a population that has previously been invisible,” says Hannah Kaye, a graduate of the UNCG-NC A&T Joint Master of Social Work program, who will be project coordinator for the study. Kaye conducted research with Washington as a graduate student and is interested in eventually pursuing a Ph.D.

The research should also lead to more insights on how caregivers who provide kinship care could be better supported. “North Carolina is one of the states that does not pay kinship caregivers, unless they become a licensed foster parent, and that’s very challenging,” Washington says.

“We’re asking a family that’s already most likely marginalized and struggling to now take on other responsibilities, which causes challenges in the family. It has a lot of policy implications.”

By Mark Tosczak • Learn more at hhs.uncg.edu/swk

WHEN REPLICATION RUNS AWRY

Tuberculosis kills more than a million people each year. The World Health Organization says it's the leading cause of death from a single infectious agent — more deadly than HIV/AIDS.

One reason TB is so dangerous is that, out of the 10 million or so infections that arise each year, roughly 500,000 are from drug-resistant *Mycobacterium tuberculosis* — bacteria immune to physicians' first, and sometimes second, choice of antibiotics.

M. tuberculosis' ability to mutate and evolve drug resistance is poorly understood. It's a problem that naturally interests Dr. Eric Josephs, whose research centers on mutation.

Most organisms use an ancient molecular proofreading mechanism called DNA mismatch repair. As strands of DNA are replicated in the process of cell generation, mismatch repair reads each new string and, if it finds mistakes, fixes them.

"Almost every organism on the planet has the same proofreading mechanism, except for bacteria related to tuberculosis," says Josephs, an assistant professor at the Joint School of Nanoscience and Nanoengineering. "They appear to have a weird, independently-evolved proofreading mechanism suggestive of mismatch repair. But people don't know what proteins are involved or how it works."

Understanding that mechanism, and what turns it off and allows drug resistance to evolve, could one day unlock new treatments for TB and other diseases.

As a postdoc, Josephs used nanoscale techniques to study mismatch repair and mutation. A year after arriving at UNCG, he received a \$291,000 grant from the National Institute of Allergy and Infectious Diseases to apply those same techniques to TB bacteria.

The R21 grant supports early stage research with potential to create transformative breakthroughs. Josephs' mutation research has implications not only for drug-resistant TB, but also for other diseases.

"Proteins involved in mismatch repair can malfunction and cause cancers," Josephs says. "They can also influence the onset of Huntington's disease and a number of neuromuscular diseases."

This year, Josephs also won a \$1.7 million NIH R35 Maximizing Investigators' Research Award, a grant designed to support outstanding researchers early in their careers.

The funding will support a wide-ranging exploration of the mechanisms of mutation and mutation avoidance. Josephs hopes his work will shed further light on how diseases work and point the way to new potential treatments.

"New understanding about genetic mutation can be applied broadly to a number of different disease systems," he says.

The work could also have other applications in biotechnology and agriculture, where the ability to engineer changes in an organism's genetic makeup is critical.

By Mark Tosczak • Learn more at go.uncg.edu/josephs

Josephs' work on strategies to prevent accidental CRISPR mutations in the wrong genes was recently published in leading international journal "Nature Biotechnology." CRISPR is a molecular tool that enables scientists to introduce "targeted" mutations into specific genes in living organisms; many researchers think it holds the key to new disease treatments. "Preventing unwanted mutations," he explains, "is critical for future therapeutic applications."

JOGGING YOUR MEMORY

DR. JENNIFER ETNIER recently gave her 79-year-old mother a smartphone. Her mother's memory is almost impeccable, and Etnier knew she would quickly adapt to the technology. Her father, on the other hand, is in the early stages of late-onset dementia.

One difference between the two? Exercise. Throughout her life, Etnier's mom has maintained high levels of physical activity. By contrast, her dad was active as a younger man, but let his exercise decline in his later years.

"I started wondering if their differing exercise patterns contributed to this phenomenon," says Etnier, now the Julia Taylor Morton Distinguished Professor in the Department of Kinesiology at UNC Greensboro.

It's that curiosity that has guided Etnier's research since she arrived on campus in 2004, put her ahead of the curve in her field, and led to her latest \$3.4 million National Institutes of Health study.

The funding will support Etnier and her fellow researchers as they work to determine what effect exercise might have on middle-aged and older adults with a genetic risk of Alzheimer's disease — a leading cause of death in the U.S. They hypothesize that those with a family history of dementia or Alzheimer's disease can cognitively benefit from exercise.

"Dementia is a term used to describe cognitive declines serious enough to interfere with daily living," says Etnier, who is a fellow of the National Academy of Kinesiology and the American College of Sports Medicine. "Alzheimer's disease is the most common cause of dementia and is characterized by the death of neurons in the brain."



It's a fear woven deep in the fabric of humanity, and especially prevalent as we age: the fear of suddenly losing your ability to think and process – to remember. And the fear is valid, as the prevalence of Alzheimer's disease – a specific form of dementia – is on the rise, with no known cure or pharmacological interventions to prevent the disease.

Etnier gets that, and her work is proving that we can do something about it. She's already discovered that long-term physical activity is beneficial for older adults with a family history of Alzheimer's, regardless of their genetic risk for the disease.

In 2013, Etnier and team conducted their first Physical Activity and Alzheimer's Disease research study, or PAAD, with \$394,625 from the NIH.

In the original PAAD study, Etnier and her fellow researchers observed that exercise correlated with improvements in memory, with effect sizes ranging from small to large.

"If you think of a test where the average grade is 70 and the standard deviation is a 10, essentially we found that exercise increases your performance on that test by between 2.7 and 10.5 points," Etnier said. "If it increased it by the largest amount, that would be like increasing your 'grade' by a full letter grade."

The initial study was small – with 54 subjects – and lacked a control group for comparison, thus limiting the researchers' ability to definitively say that changes in memory were in response to the exercise.

This time around, in PAAD2, Etnier is including a control group and also wants to find out whether or not there are genetic variables that identify people who might benefit more from exercise than others. She is looking at the apolipoprotein E, or APOE, genotype as a potential variable to determine how much one can benefit from exercise. The APOE genotype is a predictor of Alzheimer's.

After the age of 30, cognitive decline begins even in healthy adults. But people with a genetic predisposition or family history of Alzheimer's may be experiencing these declines at a faster rate.

"We know the brain is malleable across the lifespan. Although the brain is more plastic – able to change in response to experiences – at young ages, it is still plastic even in older adults," Etnier says. "Physical activity is important at all ages – but the benefits may be even more critical as you get older."

IMPROVED COGNITIVE PERFORMANCE IN 8 MONTHS
Etnier's team has found that participating in a regular exercise program for as few as eight months is associated with improved memory performance in older adults. Among those at genetic risk for Alzheimer's, the researchers also observed alterations in brain function.

Graduate students and postdoctoral fellows, like Jarod Vance (far left) and Dr. Kyoungshin Park (third from left), run participants through various cognitive tests at the beginning, middle, and end of the year-long study. Below, Vance and Park administer one such test to a staff member (not a project participant).

ON THE MOVE

Etnier and her team are now working to recruit 240 people from Guilford and surrounding counties over the next three years. Unlike other studies looking at physical activity for prevention of Alzheimer's disease, PAAD2 focuses on a younger age group – 40- to 65-year-olds – and will utilize group exercise instead of solo exercise. These factors help distinguish the study from any other in the country.

"If an individual is cognitively normal when they are 60-80 and have both a family history of Alzheimer's and a genetic risk for Alzheimer's disease, then they may have some other genes in their make-up that are giving them protection against Alzheimer's," Etnier says. "By targeting a younger cognitively normal group, we hope to bypass that issue." The researchers also hope using a group exercise program will offer participants social support.

Participants undergo testing at the beginning, middle, and end of a year-long period, to measure thinking abilities, brain structure and function, and biomarkers related to Alzheimer's disease.

Half of study participants commit to an hour-long exercise program of walking and training with resistance bands three times a week for a full year, while the other half continue living their normal lives without regular exercise. Importantly, at the end of the study year, participants in the control group receive a short-term YMCA membership to encourage them to get active as well.

Executive Director David Heggie of Greensboro's Bryan Family YMCA helped Etnier secure partnerships with YMCAs in Alamance, Davidson, Forsyth, Guilford, Randolph, and Rockingham counties for the project's exercise programs.

Participating YMCAs provide exercise instruction and help collect participant data, such as heart rate and ratings of perceived exertions. UNCG Associate Professor and exercise physiologist William Karper provides regular oversight at the YMCA locations to ensure uniformity across the programs. Below, PAAD2 participants work out at the Kathleen Price Bryan Family YMCA, with guidance from graduate student Delaney Thibodeau.

THE BENEFITS OF A SINGLE WORKOUT
Etnier's team has found that a single 20-minute session of moderate-intensity exercise produced significant benefits for both short-term and long-term memory.





ALL IN THE BRAIN

In her undergraduate and graduate studies in clinical exercise physiology, Dr. Alexis Ganesh (right) developed a passion for understanding the aging brain. She chose UNCG for her doctoral studies specifically to work with Etnier, pictured above working at the UNCG Gateway MRI Center.

"From the first day of my doctoral program, I was excited to use the MRI scanner," says Ganesh. She was soon designing studies around the technology and learning to analyze brain images. Now, as a postdoctoral fellow, she's responsible for neuroimaging on the PAAD2 project.

She values the opportunities and training she has received here, she says – not just on the MRI but also on effectively communicating her results to scientific peers and the community.

BENEATH THE SURFACE

"What's intriguing about the measures we're taking is that the behavioral measures are not likely to be the most sensitive ones we have," says Etnier. "The ability to perform a task may or may not change over the course of a year, but brain structure and blood biomarkers are very sensitive."

Etnier works with Dr. Laurie Wideman, Safrit-Ennis Distinguished Professor in Kinesiology, to take blood samples at pre- and post-test appointments. They are looking at blood-based biological markers relevant to Alzheimer's and exercise.

Etnier is also using the University's Gateway MRI Center to assess brain structure and function.

"When you compare yourself to someone else, there are a lot of factors – like lifestyle, environment, and genetics – that might affect your brain structure and how it functions," says Dr. Alexis Ganesh, the postdoctoral researcher responsible for the project's neuroimaging. "We suggest that physical activity can provide benefits, but the degree of benefit may depend on where you're starting."

High-resolution MRIs of participants' brains show structural volume of brain regions, while functional imaging allows the team to see neural activation during tasks and investigate how functionally connected the brain is.



CHANGING LIVES

"Physical activity may give you the protection you need to stall the onset of clinical impairment or to prevent it altogether," Etnier says. "If we can delay the onset of Alzheimer's by five years, that's five more years with better quality of life – that's five more years with your children and grandchildren."

It was a radio ad asking for PAAD2 study participants that got Ginny Ebert's attention.

"I was excited right away," she says. "It touched home."

Ebert's grandmother and father have Alzheimer's, and at 50, she's pretty sure she's on the way. Her mind feels like a pinball machine, she says. Things that once came easily are now more difficult, and she has trouble processing and making connections. Then she forgets what she's trying to figure out in the first place.

Ebert graduated from UNCG in 1990 with a degree in nutrition, and throughout most of her life she was very active – swimming, running, and weightlifting. But then she took a long hiatus.

She began the PAAD2 exercise program in August, and so far, she has felt a lot better, both mentally and physically. But the thing she values most is the community she has built with the other participants.

"Getting to meet other people in a similar situation has created a supportive and positive environment," Ebert says.

Community is just a small piece of the enormous impact Etnier's work could have on both individuals and the future of Alzheimer's research.

"I hope that once we finish the PAAD2 study, we can give people at risk the tools they need to potentially delay or even prevent the onset of this disease,"

Etnier says. "If our expectations are realized, this could give hope to the millions of individuals who have seen a family member suffer the heart-wrenching effects of Alzheimer's disease and who may fear the same fate because of their family history."

*By Elizabeth L. Harrison
Learn more about PAAD2 and how you
and your loved ones can participate at
go.uncg.edu/PAAD2.*

The project is a great training ground, says Etnier. "Dr. Nate Berry, a UNCG doctoral graduate who worked on the project as a postdoctoral researcher, was recently hired by Under Armour as a lead research scientist."

Shonda Mobley (top photo, right), who received her master's in public health education at UNCG, serves as the PAAD2 project coordinator. Her responsibilities include screening and scheduling participants. Graduate students like Towfiqul Alam (bottom left) and Sam Kibildis (bottom right) evaluate participants' fitness by measuring respiration and perceived exertion during exercise.





The news from the U.S. Patent and Trademark Office came in the form of an old-fashioned letter. We have received, it said, your application for a patent on a device to measure knee laxity.

That letter, says Professor Sandra Shultz, represented a monumental step.

"All the pieces are coming together," she says. "That's two years of work right there. If you had ever told me I was going to be doing this, I would have thought you were crazy."

Knee laxity is a measure of motion in the human knee, critical in diagnosing joint and ligament health. Shultz, a co-director of UNCG's Applied Neuromechanics Research Laboratory, is a scientist, more familiar with the body's skeleton and musculature than the intricacies of product development and commercialization.

But luckily for Shultz and Professor Randy Schmitz, her collaborator and lab co-director, UNCG has people and mechanisms in place to help faculty, staff, and students navigate the labyrinth of research-based entrepreneurship.

It's called **LaunchUNCG**.

The goal, says LaunchUNCG Director Justin Streuli, is to provide "white-glove service to help achieve a commercially viable product."

In 2020, that's a broader, more nuanced concept than what once was simply called technology transfer. Today, white-glove service might mean facilitating preliminary research to confirm that a market exists for a new product. It might include aid in securing funds for product development, networking in the business world, or engineering advice.

Whatever assistance may be needed, LaunchUNCG has on-campus connections or an external network to provide it.

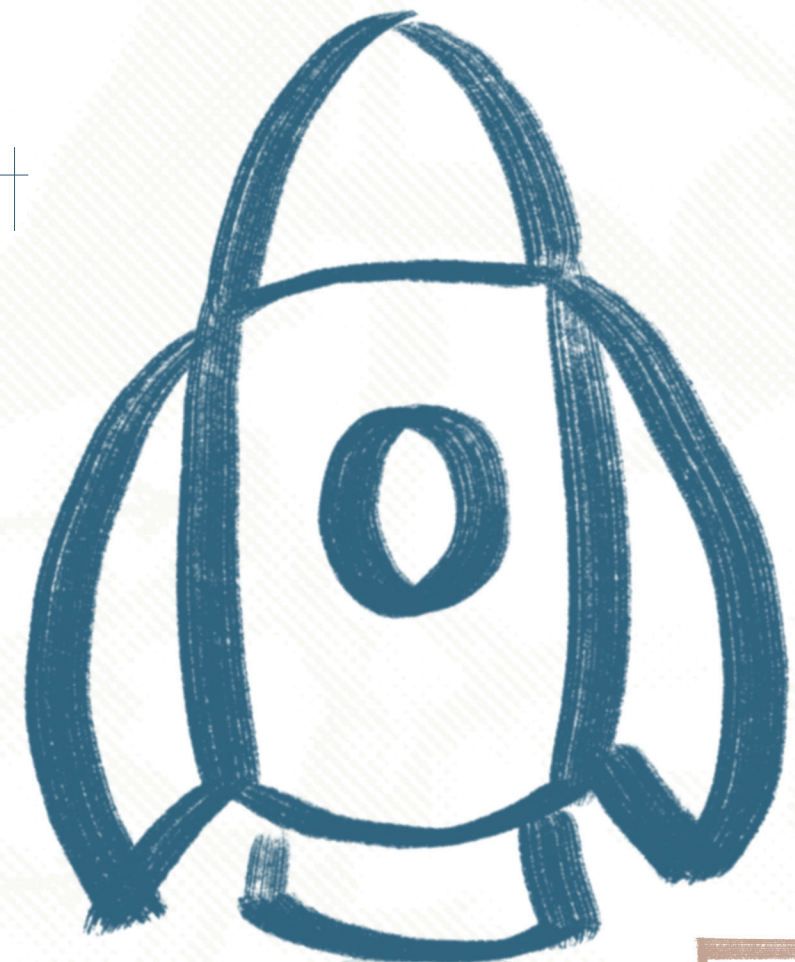
LaunchUNCG is a critical driver to further UNC Greensboro's strategic goal of student, regional, and knowledge transformation, says Dr. Terri L. Shelton, vice chancellor for research and engagement. "It's about fostering a culture of innovation and enhancing the impact of our research."

An important piece of that culture is a recent partnership between UNC Greensboro and NC A&T State University, and the National Science Foundation's Innovation Corps program, better known as I-Corps.

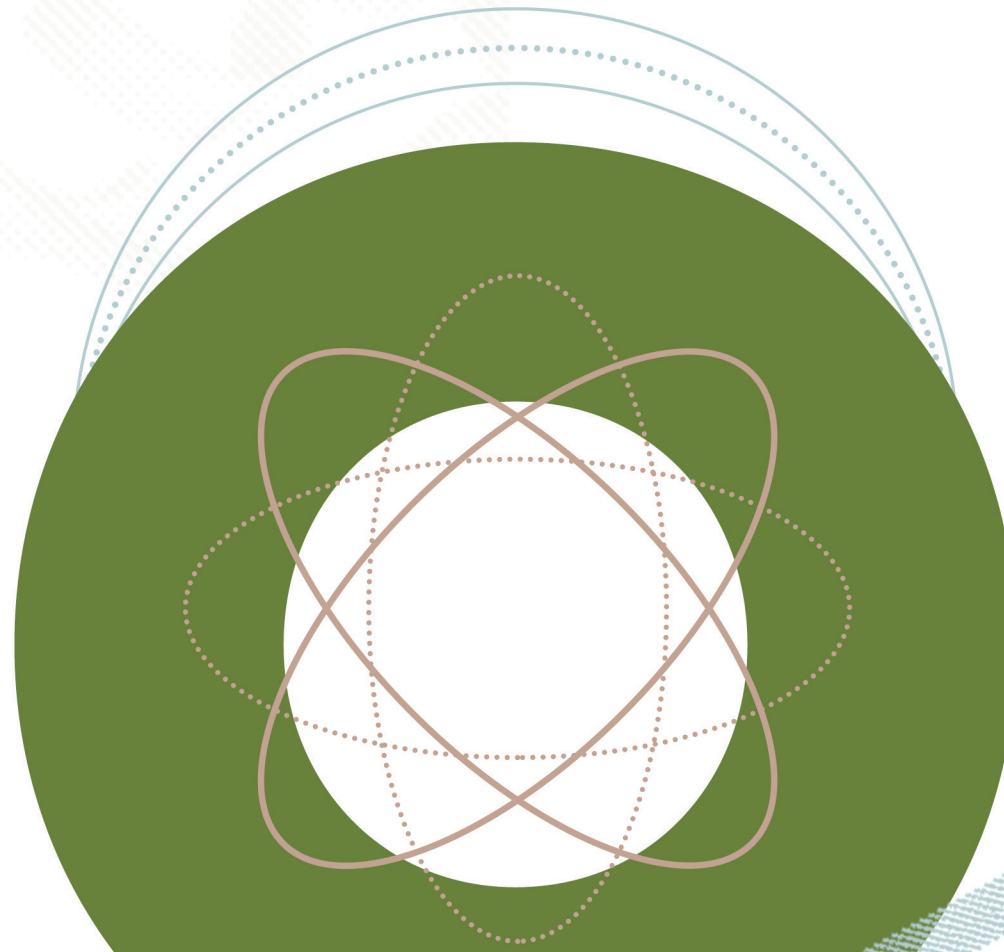
Facilitated by LaunchUNCG, the Greensboro I-Corps site guides select students, faculty, and alumni of UNCG and NC A&T through an entrepreneurial bootcamp, encouraging them to perform market research early when their innovations are still at a nascent stage.

Early market research allows intellectual property developers to determine whether they have properly identified their intended customer base. Research team members interview prospective customers for feedback on their innovation's design and functionality, including its physical features and benefits.

LaunchUNCG program manager Sam Seyedin describes I-Corps as a "go/no-go test."



IT'S A



LAUNCH

INNOVATIONS IN 2019

3 newly granted patents

4 innovations licensed for commercial development

83% increase in innovation disclosures

50% increase in patent and trademark applications



Lithium can cost from \$5,000 to \$10,000 per ton, depending on the source. Mining rock-like lithium carbonate is the most expensive way to attain the metal.

Above, Rathnayake and Dawood (left) hold a sample of their proprietary filter, woven at the JSNN using an electrospinning technique. With a lab-created saltwater sample, researchers demonstrate the power of their lithium-trapping method in the time-lapse photo series below.

AN ELECTRIFYING IDEA

Imagine cleansing wastewater of a harmful yet valuable element while, at the same time, helping to satisfy the world's growing demand for high-performance batteries.

Transformative research at the Joint School of Nanoscience and Nanoengineering, or JSNN, promises to do just that. The project is led by Associate Professor Hemali Rathnayake, assisted by graduate student Sheeba Dawood.

The element lithium is in great demand as a primary component in long-lasting batteries that power everything from smartphones to Tesla electric vehicles.

"There is a huge market for lithium for energy storage applications," Rathnayake says. Demand is so high that the light-colored substance has been called "white gold."

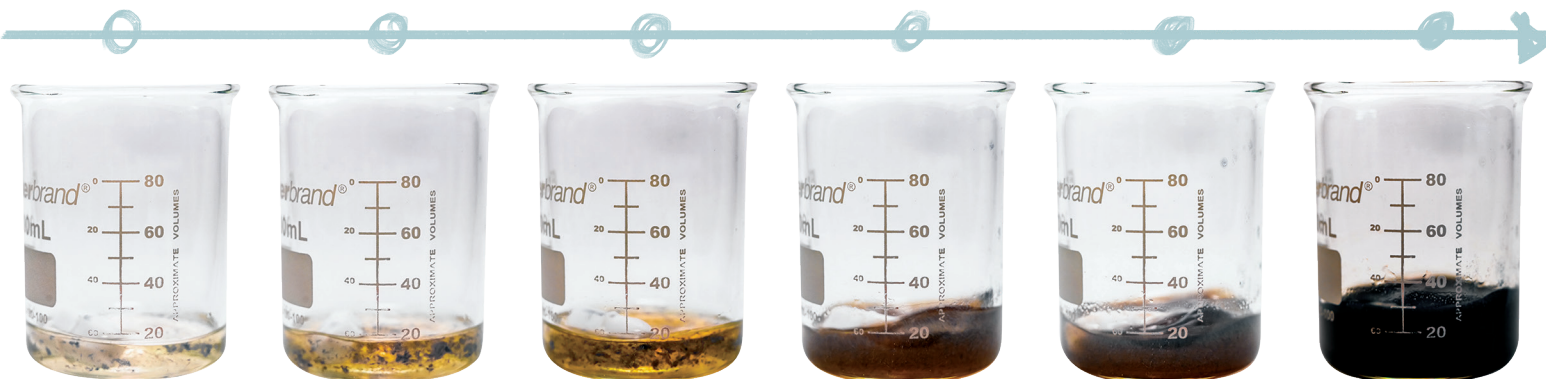
The world's largest lithium deposits are in Australia, with other large concentrations in South America. Yet trace amounts of lithium are quite common, especially in wastewater that is a byproduct of extracting petroleum from the earth.

The traditional method of removing this lightweight metal from petroleum wastewater utilizes evaporating settling ponds, a process that can take up to two years. And that's just stage one of the reclamation process. Then, dried, settled material must be separated and refined to be of use.

Rathnayake and Dawood have devised a new way to remove lithium from petroleum wastewater – a lithium-trapping filter derived from a renewable resource. This proprietary nanomaterial is able to trap molecules of lithium measuring only one to three nanometers, or about a billionth of a meter.

The Greensboro I-Corps program, and then a \$50,000 national I-Corps Award, supported Dawood as she conducted field research in the U.S. petroleum industry, including attending a trade show where she was able to access representatives of many companies.

The researchers determined that their filter can be commercially viable when the lithium content in water is 400 milligrams per liter or greater. Dawood learned that amounts of suspended lithium in wastewater range from 400 to 1500 milligrams per liter. The filtering process is faster and more efficient than the evaporative method, able to process up to 55 gallons per minute.



EVERY MINUTE MATTERS

A UNCG I-Corps team recently received a \$225,000 NSF SBIR grant and a \$75,000 NC Biotechnology Center Technology Enhancement Grant in support of their device to detect heart attacks more quickly and accurately. After completing training with the first Greensboro cohort in 2017, Dr. Jianjun Wei and Dr. Taylor Mabe also won a \$50,000 grant to participate in the national I-Corps program, where they received a "Spirit of I-Corps Award" for their efforts.

Another advantage of the nano-filter process, Rathnayake says, is that the polymer used to create the filter is naturally abundant, renewable, and therefore relatively inexpensive.

The petroleum industry, always looking for ways to trim costs and boost profits, has shown much interest in the filter, Dawood says, especially in Pennsylvania, North Dakota, and Arkansas. Those states mandate that petroleum production wastewater must be cleansed to remove environmentally harmful material.

Nationally, Dawood said, the petroleum industry annually produces 700 billion barrels of wastewater.

Like the gold dust that attracted prospectors to California in 1849, harvesting minute amounts of lithium can turn into real profits. It doesn't take long to understand why these researchers are excited about their innovation's potential.

Dawood, a scientist with an entrepreneur's passion, hopes to create a company that will license the process and take it to market. She's also identified firms that she might partner with to achieve the same end.

There's another fascinating aspect to this nanotech innovation: The polymer that makes up the filter is a conductor. Once packed with lithium particles, the filters essentially become batteries, ready to store electricity.

Rathnayake and Dawood have trademarked a brand name for their nascent product, a name that pays homage to UNCG. It will be called Minerva Lithium™.

ADVANCING INNOVATION

LaunchUNCG helped qualify UNCG and NC A&T to become an I-Corps Site in 2017, a status achieved by only three other campuses in the UNC System. As an I-Corps Site, the universities received a five-year, \$500,000 grant from the NSF.

With that funding, LaunchUNCG facilitates the training of multiple cohorts of innovators each year. As part of the training, cohort members receive funds to cover field research travel expenses. Depending on the product and intended market, research might be accomplished within a limited area, such as the Carolinas or Southeast. Other projects might send researchers farther afield.

The I-Corps funds required may be only a few thousand dollars. But those funds can make a critical, money-saving difference in the long run, especially for graduate students, professors, and recent alumni.

"A thousand bucks can go a long way for somebody who doesn't have anything," Streuli says.

I-Corps grant funds can also support building product prototypes, but only after extensive market and design research. Streuli requires at least 30 field interviews with potential customers before considering a prototype grant request.

Researchers with promising innovations that require further development may also apply to the national-level I-Corps program for more training and funds.

Closer to home, LaunchUNCG offers additional avenues of support. Streuli has allied the Greensboro I-Corps site with two state organizations dedicated to fostering entrepreneurs – NC IDEA, a private foundation supporting entrepreneurial endeavors with high-growth potential, and First Flight Venture Center, a non-profit business incubator focused on high-tech companies.

One of First Flight's programs, called LiftOff, provides assistance and consulting to neophyte companies to help them navigate the early stages of developing their business.

Participation in the LiftOff program costs \$5,000, which can be a stretch – or impossible – for an early-stage company. Thanks to a grant from NC IDEA, each year LaunchUNCG may send one team of entrepreneurs to take part in LiftOff. So can each of the other I-Corps Site campuses in North Carolina.

Successfully completing LiftOff gives teams a leg up in applying for top-level National Science Foundation grants from the Small Business Innovation Research, or SBIR, program. Seed funding awards of up to \$1.75 million are available, with no equity stake required.

"My goal," Streuli says, "is for LaunchUNCG startups to get SBIR grants."



GREENSBORO I-CORPS

\$1.2M development and startup funding

16 companies launched

56 teams

76 graduate and undergraduate students trained

75% minority-led

68% female-led

ENTREPRENEURIAL EDUCATION

Creating a culture of innovation requires more than supporting researchers on campus who already have big ideas, says Streuli. Through NC Entrepreneurship Center events, LaunchUNCG reaches out to get the entire campus and community thinking like entrepreneurs.

UNCG ENTREPRENEUR DAY The annual event, now in its tenth year, matches over 90 classes across campus with guest lecturers from the business and nonprofit sectors, impacting over 2,000 students in a single day.

2 MINUTES TO WIN IT The annual idea pitch competition gives 20 finalists from colleges across the Triad the opportunity to win over \$2,000 in cash prizes, plus coworking memberships, business consultations, and more.

JERRY MCGUIRE STUDENT ENTREPRENEUR OF THE YEAR AWARD A \$1,000 annual scholarship supports UNCG's most entrepreneurial student or team.

UNCG + FORGE MAKERSHIP An annual scholarship winner receives a membership to Greensboro's makerspace The Forge, to work on prototypes for their product idea.

FOCUSED ON THE KNEE

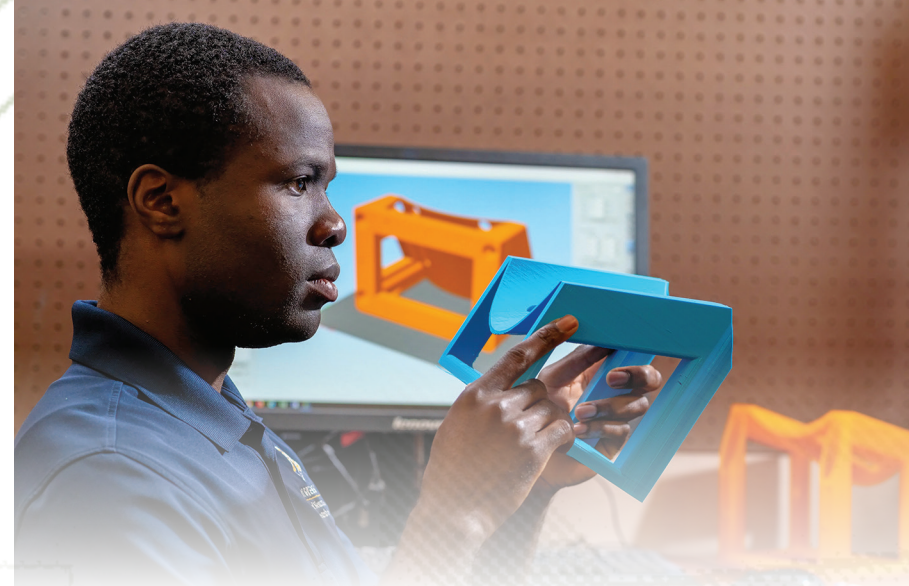
Much of Professor Shultz's career research has focused on what may be humanity's most problematic joint, the knee. Of specific interest to Shultz – and to many trainers, therapists, and physicians – is the condition of the knee's ligaments.

The amount of ligament looseness, known as knee laxity, is an indicator of joint health. "When force is applied to the tibia – the lower leg bone," Shultz explains, "knee laxity dictates how much it moves relative to the femur, or thigh bone."

Knee laxity in young women has been of particular interest to Shultz (photo below, right) and other researchers. Too much knee laxity, the kinesiologist says, "is a pretty strong predictor of future knee injury in young athletic females." In older adults, greater knee laxity increases the risk of – and can also be caused by – osteoarthritis.

Most investigation of knee laxity is accomplished by manipulating the knee by hand. Mastering the process requires significant training and practice, and each diagnosis of knee laxity is highly subjective. The amount of laxity detected determines the treatment regimen prescribed, which may involve exercise, a brace, or perhaps surgery to tighten ligaments.

Devices to measure knee laxity exist, but current instruments measure only one range of motion. The knee, however, has three axes of motion.



Graduate student Elvis Foli makes final adjustments to device components created with the university's 3D printer. This type of printing was a first for UNCG Libraries, according to Digital Media Commons head Dr. Armondo Collins.

Shultz and Schmitz (photo left) saw need for a device that could accurately measure all aspects of knee laxity. They envisioned a device that would not require intensive training to use. It would be sized to fit on a training table and be light enough for a trainer or medical technician to set up and use. The device would mechanically manipulate the lower leg and measure all three axes of motion.

Profit, Shultz says, was not a motivating factor. The real drivers were a passion for research and knee joint health.

"This was something we needed," she says. "We needed to continue to advance the research. And then we realized that this has big commercial potential."

Guided in their quest by LaunchUNCG, the researchers located talent and resources on campus to assist in developing a prototype.

Through the I-Corps program, kinesiology graduate student Elvis Foli conducted field research across the Southeast. He interviewed trainers and physicians for their perspectives on improving knee laxity diagnoses. The information Foli gathered confirmed demand for the device.

Shultz and her team knew what the device needed to accomplish, but the team lacked the engineering expertise necessary to pull off a prototype. This time LaunchUNCG had the expertise in-house. Program manager Seyedin (photo left, center) has a background in aeronautics. His engineering expertise cost the team of kinesiologists nothing.

Other campus resources helped the team further minimize costs. Then-kinesiology graduate student James Coppock collaborated with UNCG Libraries, employing their Fusion400 3D printer to create a complex component for the device. Printing the part took more than 36 hours. Not to mention all of the design work leading up to that final step.

Internal UNCG Giant Steps seed funding and a \$100,000 NC Biotechnology Center grant are currently supporting the team as they continue to develop the prototype.



3 NEW PATENTS IN 2019

"NON-AROMATIC DIFLUORO ANALOGUES OF RESORCYLIC ACID LACTONES"

Inventors: Mitchell Croatt, Nicholas Oberlies, Lara Fakhouri, and Cedric Pearce / New class of chemical compounds, derived from a natural fungal compound, with potential applications in the treatment of carcinomas, leukemia, and other cancers.

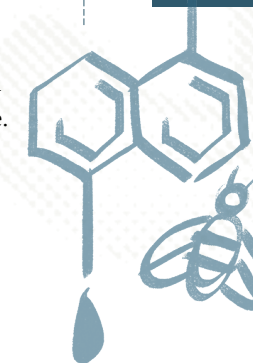
"VIRTUAL REALITY TRAINING TO ENHANCE LOCOMOTOR REHABILITATION"

Inventor: Chris Rhea / A VR method to rehabilitate patients who have difficulty walking as a result of illness or injury. Can serve a wide variety of populations, with potential for use by patients in their own homes.

"METHODS AND COMPOSITIONS FOR INDUCING HYGIENIC BEHAVIOR IN HONEY BEES"

Inventors: Olav Rueppell and Kaira Wagoner / Nontoxic methods to improve removal of dead or diseased brood among honey bees, to curb the devastating impacts of parasitic mite *Varroa destructor* on colonies and, ultimately, the agriculture industry and food security.

See all UNCG innovations currently available for licensing at innovate.uncg.edu



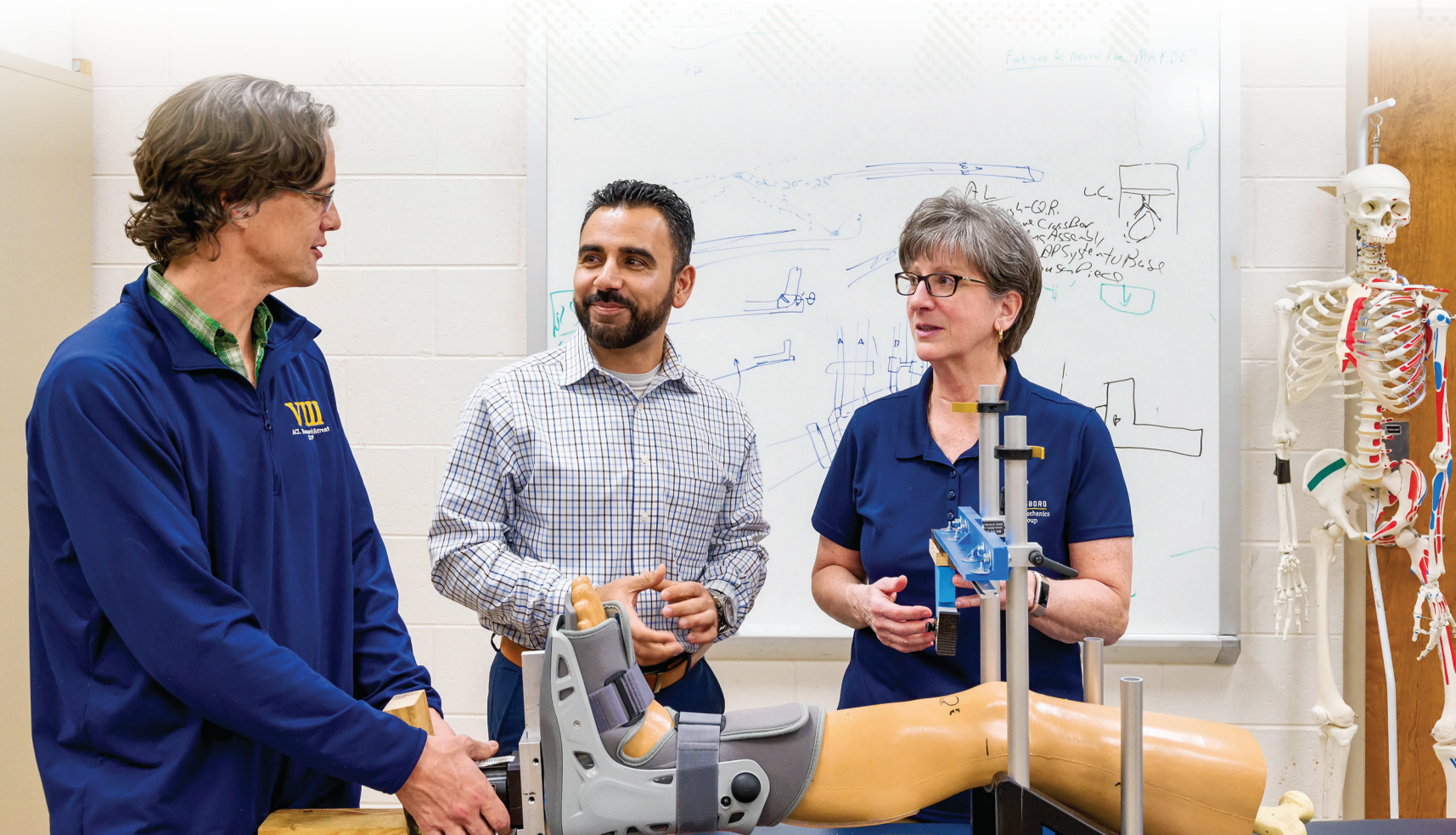
It was a decade ago when Shultz and Schmitz first kicked around the idea for a knee laxity diagnostic tool. But they were scientists first, not businesspeople. Without a fertile environment to nurture it, their idea lay dormant.

The development of LaunchUNCG, which created a "one-stop shop" to access all the resources available to academicians turned entrepreneurs, breathed new life into their idea.

With UNCG's expanding resources in place to help move transformative ideas toward commercialization, the researchers are energized.

"We want to keep people healthy," Shultz said. "We want to keep people physically active. That's the goal of what we do in the lab."

By Tom Lassiter • Learn more at launch.uncg.edu
go.uncg.edu/shultz • go.uncg.edu/rathnayake



FIGHT FOR THE FUTURE

Dr. Risa Applegarth received the Junior Research Excellence Award for her work in rhetoric. As an associate professor of English and women's, gender, and sexuality studies, Applegarth focuses on scientific and professional discourse and social movements. She is widely recognized for her scholarship and teaching, with accolades including the Outstanding Book Award from the Conference on College Composition and Communication and UNCG's Mary Settle Sharp Award for Teaching Excellence.

TRUTH TO POWER

"My upcoming book will be about youth protest and will include the upsurge of climate activism among youth. Quite a few people have taken umbrage with the challenging nature of young climate activist Greta Thunberg's rhetoric. 'You should be ashamed,' she tells leaders. 'Our house is on fire and you've done nothing.' She uses a lot of condemnatory language that can be hard for audiences to hear.

"Conversely, I've already written about a group of youth who, starting in 1990, connected tens of thousands of young people to support a statue, in Los Alamos, against nuclear war. These teens worked, in a conciliatory manner, with adults who shouted them down at council meetings. Those adults behaved pretty abominably – and were ultimately successful. Civility doesn't always get the job done, and civility doesn't only go one way."

PARKLAND PROTESTS

"I find youth activism around the school shootings issue really inspiring, and my recent research analyzes youth involvement in March for Our Lives protests. I'm frustrated with media coverage framing their activism as success or failure – the idea that elections will show whether they succeeded. As though that will settle whether anything of note has come out of this massive show of support. By listening to what these teens have to say, I hope to demonstrate additional ways their activism matters – from networks they've formed, to speaking, writing, and organizational capacities developed, to engagement with local and state officials and organizations."

WHO TELLS THE STORY?

"My first book was 'Rhetoric in American Anthropology: Gender, Genre, and Science.' Anthropology developed in a colonialist vein, connected to a nineteenth-century desire to control and contain. But by looking at work developed by white women, women of color, Jewish women, and older women who joined the field of anthropology, we see that was not the entirety.

"Women anthropologists like Margaret Mead and Ruth Benedict wrote out of different relations with the communities they studied.

Some wrote as insiders, like Zora Neale Hurston or Lakota writer Ella Cara Deloria. They often wrote in experimental forms, resulting in less problematic, more reciprocal approaches.

"There's a lot of discussion in creative nonfiction and many academic disciplines about the line between fact and truth and knowledge and reality. These women researchers were wrestling really early with questions of how representation affects reality and whether the way you write can shape both the perception and reality of the thing you're writing about."

BEING DIFFERENT

"My research considers how people use their bodies to disrupt public space and try to bring attention to different matters – from their clothing and appearance to demonstrations, sit-ins, and protests.

"Our understanding of an issue can be changed by bodies making us think differently. I am inspired by how many of my students came to UNCG because they want to be in diverse classrooms. When we talk about challenging issues – that they do not all have the same prior experiences with, that they do not all agree about – they bring so much openness, energy, and honest, earnest desire to engage and understand one another."

ACT LIKE A PROFESSIONAL

"A feminist perspective on gender, language, and communication is central to everything I do. I've written about the 'The Independent Woman,' a feminist periodical in the 1920s that promoted economic opportunity for women. It focused attention on grooming, appearance, dress – ways to look unassailably professional in order to not have your competence questioned, to not disrupt the tastes and sensibilities of people around you in the workplace.

"Women bore the burden of being seen as having a gender, while men represented themselves as gender-free, merely objective in their tastes and preferences. A lot of advice readers received was about ways to minimize disturbance: 'don't wear heavy scents,' 'don't draw attention to your body in any way.' They had to scrupulously survey their own bodies to ensure no one was ever disturbed by the fact they were female.

"My interest came in part from the lack of change in this area. I help graduate students who are on the job market, and a lot of the advice that circulates is still extremely gendered, heteronormative, racialized, and about having a body no one can object to. That puts all the burden on women, on people of color, and on sexual minorities to make sure everyone else is comfortable in the workplace."

Interview by Mike Harris • Applegarth pictured (center) with leaders from March for Our Lives Greensboro and March for Our Lives North Carolina. Learn more at english.uncg.edu/directory/applegarth



COMING UP NEXT

Viola Munos, undergraduate researcher



In high school, Viola Munos excelled in biology, chemistry, and math. But she never took a physics class – her school didn’t offer it.

“Even though I’d never had a class, I knew I wanted to do something with physics in college,” she says. “It was the only thing I knew would be challenging enough to hold my interest.”

Munos enrolled at UNCG last year, after earning an associate degree. Though she’s an academic junior, she plans to remain for at least another two years, gaining as much experience as possible.

A big part of that, she says, is undergraduate research.

UNCG’s STAMPS program, which supports underrepresented students showing significant science and math capabilities, presented her first research opportunity. Through the NSF-funded initiative, she visited the Joint School of Nanoscience and Nanoengineering, where she secured an internship with Professor Tetyana Ignatova.

In Ignatova’s lab, Munos is working on methods to transfer single-atom thick biosensor materials – specifically graphene – onto chips.

The biosensors can help scientists determine how much force a cell applies during growth. “Neuroscientists want to put these sensors on neural stem cells to see how they send information from one to another – how they move, how they push each other,” Ignatova says. “Potentially, it will provide information on normal and abnormal neural cell behavior.” The ultimate hope is to use these 2D nanoscale biosensors to repair neural injuries.

Currently, collaborators from Penn State University are growing graphene

sheets on copper foil, and Munos is developing ways to transfer the graphene to different chip types, including glass, silicon, and other biocompatible polymers.

Graphene, a honeycomb-patterned nanocarbon material, is extremely sensitive to any type of strain. Consequently, it has high potential as a biosensor – if it has no rips. But the current process to separate graphene from the substrate on which it is created – called electrochemical hydrogen bubbling – uses a sodium hydroxide solution to pull them apart, sometimes damaging the graphene. Munos is working on a liquid-less process to side-step this problem.

“There are a lot of publications on the problem of transferring graphene,” says Dr. Ignatova. “It’s an extremely important area of work in nanotechnology.”

So far Munos’s work, which she will present during an upcoming South Carolina conference, has contributed to the lab’s creation of a 5mm x 5mm graphene nanosheet, which is large enough to house around 100 biosensors.

It’s a first step in a long process, Munos explains. She’s also putting clean, continuous graphene on glass, in collaboration with nanobiologists at the JSNN, to study graphene-bacteria interactions. The results could benefit medicine and beyond.

“I’m contributing to improving graphene’s efficiency, so it can be used in everyday life,” she says. “Maybe technologies will be less expensive so we can cure different diseases.”

*By Whitney Palmer
Learn more at ursco.uncg.edu
jsmn.ncat.uncg.edu*

WHO’S PAYING FOR THIS?

Huicheng Wu, graduate researcher

The apparel industry is one of the most wasteful on the planet. Not only do consumers throw out wearable clothing that ends up in landfills, says Huicheng “Jeff” Wu, but production of textiles consumes large amounts of water, energy, chemicals, and fibers, creating a large carbon footprint. The push for low-cost apparel also often leads to unethical treatment of workers.

Wu worked in marketing and other front-end positions at Chinese apparel companies for a dozen years, before coming to the Bryan School of Business and Economics and the Department of Consumer, Apparel, and Retail Studies, to conduct research on apparel supply chain management. He chose the program, he says, because it is one of the largest and best respected in the country.

When Wu explored the literature on sustainability in apparel supply chain practices, the doctoral student says, “There was a void.” Publications focused on engineering questions rather than on human interactions, which can determine whether sustainable solutions are actually used.

He was particularly interested in open costing, an industry technique that has been growing in popularity over the last five years.

“International buyers from developed countries often refuse to pay higher unit prices that would compensate manufacturers for environmental costs,” he says, putting pressure on manufacturers to ignore sustainability. Economists have a word for these ignored costs, which must still be paid by societies in the form of health care and environmental clean-ups – externalities.

But manufacturers are beginning to respond to this issue by openly including sustainability costs in their negotiations with buyers. “The open costing method,”

Wu explains, “uses a list of itemized cost elements when a garment is presented to buyers, instead of a lump-sum unit price.”

To learn more about the human dynamics of open costing, Wu drew on research methods and theories from the social sciences. He conducted 30 in-depth interviews and administered 200 surveys, employing a snowball sampling strategy where his contacts in the Chinese industry reached out to other likely respondents in China and Bangladesh. The two countries account for 42% of world apparel exports.

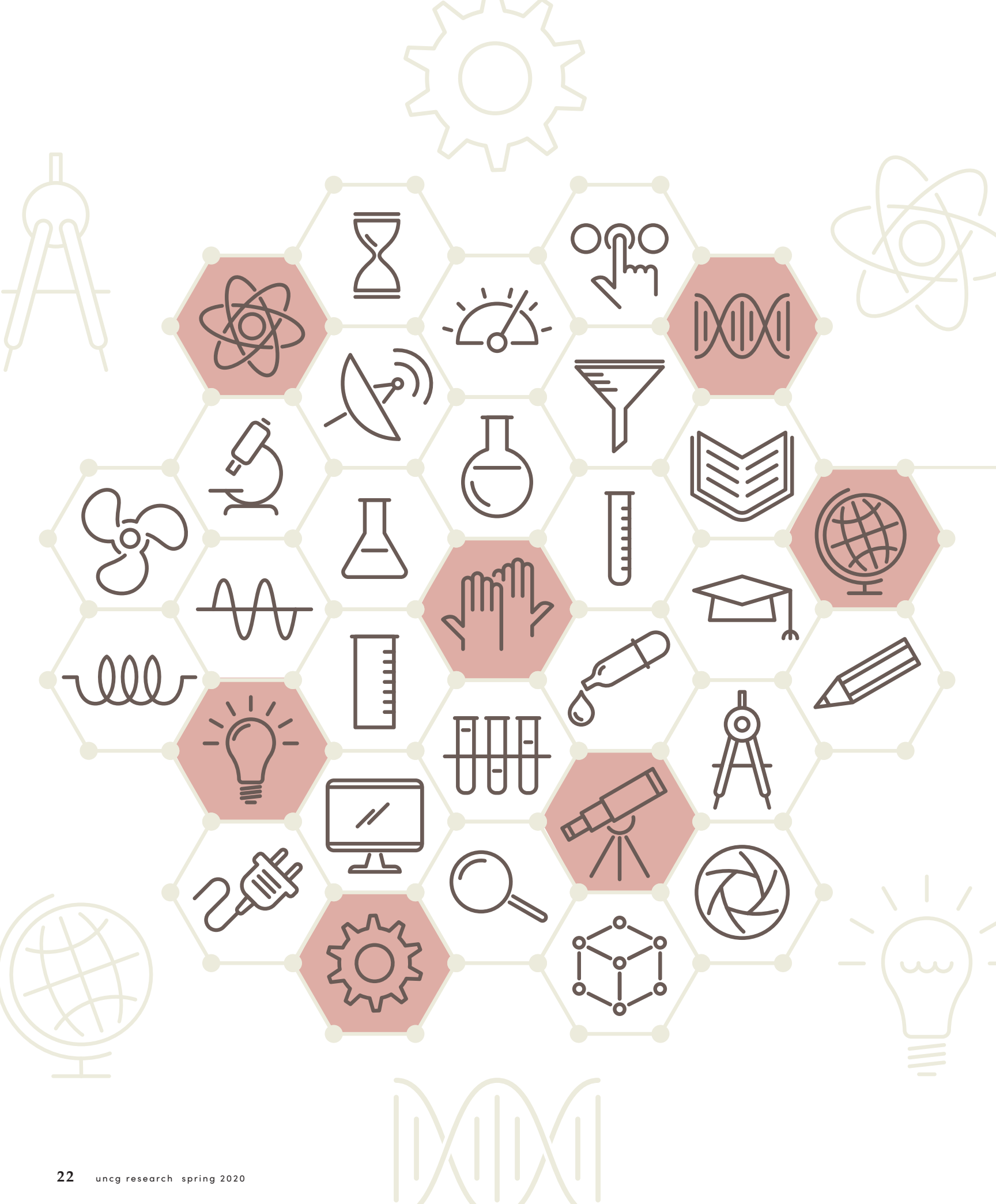
Wu found that open costing is helping suppliers adopt more sustainable practices. He also discovered unexpected impacts on supply chain partnerships.

Itemizing costs might seem like an obvious thing to do, given our consumer experiences with cash-register receipts. But between businesses, revealing information creates vulnerabilities, thought to be exploitable by competitors willing to cut corners. Despite this traditional model of fear and secrets, Wu found open costing increased trust between long-term supply chain partners.

The work garnered Wu a Most Promising New Research Award at the 2019 meeting of the International Textile and Apparel Association in London. He hopes his efforts will contribute to a greener future for a global industry.

*By Randall Hayes
Learn more at grs.uncg.edu • go.uncg.edu/cars*





So you want to be a scientist

FOR CENTURIES IN THE WESTERN WORLD, the study of science has been dominated by a specific demographic – those with economic and cultural advantages necessary to advance in academics and research careers. Likely white, likely male.

In 2018, a National Institutes of Health study found that, over the previous seven years, only 1% of NIH grants for experienced investigators went to underrepresented minorities. The percentages for early stage and new investigator funding were only slightly higher.

Diversifying research is crucial, not only for the benefit of the young scholars entering various fields, but for the disciplines themselves, says Dr. Lee Phillips, director of UNC Greensboro's Undergraduate Research, Scholarship, and Creativity Office.

"A diverse set of researchers can more effectively identify and address problems, particularly in a country like America where our professional workforce doesn't reflect our diverse demographics."

But to shake up the scientific workforce, Phillips and his colleagues say, you have to start at the beginning.

Most students enter college unprepared for research careers. They don't know how to ask questions, conduct projects, or

present their results.

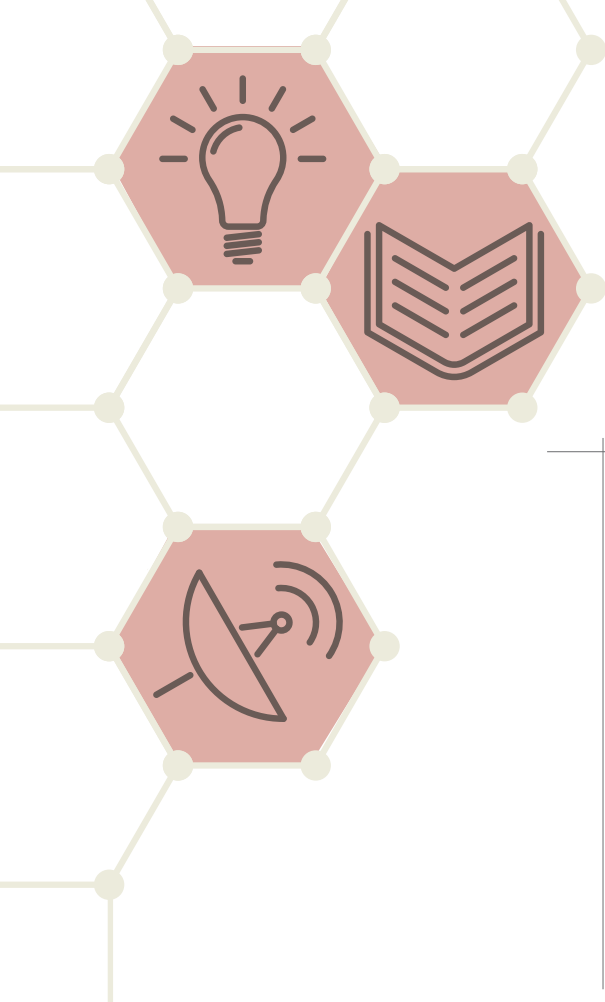
What takes undergraduates to the next level? What gets them to the point where they may consider graduate school and a scientific career?

Phillips says mentorship from a faculty member is proven to help students succeed in college and then advance to graduate school. Students also thrive with exposure to the professional research world.

But a student needs economic freedom to spend time doing that. They need peers, mentors, or educational experiences to introduce the idea of conducting research – both the reasons and the processes. Much of this depends on socioeconomic circumstances. And that undeniably keeps students and universities, as well as fields of study and industry, locked within systematic racism.

Maximizing Access to Research Careers Undergraduate Student Training in Academic Research

Two years ago, nanoscience professor Dan Herr, Phillips, and their colleagues won NIH funding to launch a MARC U-STAR program. Through the two-year program, promising underrepresented students receive financial support, targeted mentoring, hands-on experience, and exposure to the professional world of research.



The program has opened up new possibilities for the recruitment of students of color and women, giving new structure to the pipeline.

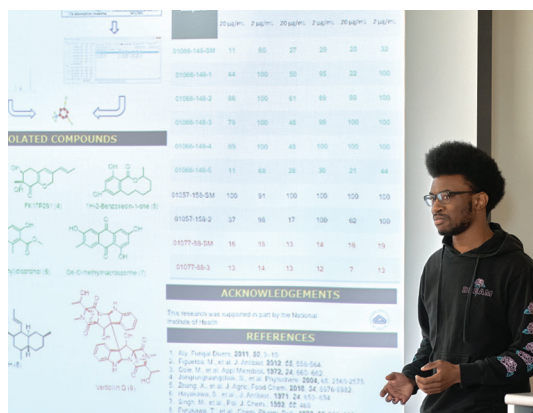
A COMMITMENT TO CHANGE

Dr. Joseph Graves, an NC A&T State University professor at the UNCG-NC A&T Joint School of Nanoscience and Nanoengineering, is another principal investigator, or PI, on the project. He also teaches courses, such as “Genes, Race, and Society,” at UNCG.

Graves has worked with MARC U-STAR programs and similar initiatives since 1985. As the first African American to have earned a Ph.D. in evolutionary biology, he believes the most effective mentorship for minority students comes from minority scientists. Throughout his career he has made a point of seeking out these students to mentor them. Graduate and postdoctoral researchers in his lab are encouraged to provide similar mentorship to the next generation of researchers.



DEVELOPING SCHOLARS One of the biggest conferences the students attend is the Annual Biomedical Research Conference for Minority Students, which Phillips calls “a rock show for biology and chemistry students.” UNCG MARC fellows attend the conference for both years of the program, with an impetus to present research their second year. Above, students practice their 2019 ABRCMS presentations, one week out from their departure to Anaheim, California.



“It creates an atmosphere where students feel at home,” he explains. “Universities have traditionally not been accommodating to underrepresented minorities, so within these institutions we create an environment where students feel supported by people who look like them.” Associate Professor of Chemistry Kim Petersen mentored MARC fellows when the project launched, and recently joined the PI team. Another critical student relationship, she says, is with academic enhancement coordinator Traci Miller, who tracks their progress, advises them, and plans professional development opportunities.

“We’re giving students these big experiences. Then we build in mentoring activities,” says Petersen. “This is taking undergraduate research to the next level, especially with the amazing conferences.”

The team plans to follow the careers of successive cohorts of MARC students for a minimum of 15 years, to study program impacts. Herr says the program is a long-term commitment, not just in terms of charting student progress, but in maintaining a connection and continuing to provide mentorship.

“It feels more like an extended family,” he says. “I tell the MARC students: ‘wherever we are, call me anytime.’”

NATURAL STEP

Chris Roberts is a junior at UNCG and a first-year MARC fellow.

He began working in Sullivan Distinguished Professor Nicholas Oberlies’ natural products lab as a sophomore, but his admission to MARC has allowed him to increase his lab time considerably.

During his on-campus research experience this past summer, he learned to work through many different phases of research, with the ultimate goal of identifying anticancer drug leads from different fungi.

He began by mastering the extraction of fungal cultures and quickly advanced to techniques, such as high-performance liquid chromatography, for purifying drug leads. Once compounds are isolated, he analyzes their structures via nuclear magnetic spectroscopy and mass spectrometry, gaining valuable skills on UNCG’s highly precise research instruments.

Roberts knew he could succeed in the classroom, but he says he couldn’t have learned how things work in the lab without hands-on research experience – and his mentor agrees.

“There’s something about chemistry that’s very tactile. You just have to do it,” says Oberlies.

In the natural products chemistry lab, Roberts has also found new motivation.

“What drives me is finding ways to cure different diseases. It interests me how different medicines are produced. There are



around 5 million species of fungi and only around 130,000 have been investigated.”

Roberts knows that more than half the drugs that treat cancer are derived from a natural source, and, like everyone in Oberlies’ lab, Roberts is eager to test as many new fungal compounds as possible against human cancers. With funding from the National Cancer Institute, they test up to 500 species a year.

“1,500 people will die from cancer today. Our goal is to find a compound to minimize that number in the future,” says Oberlies. “Could that discovery come from an undergraduate? Absolutely.”

Doctoral student Sonja Knowles has served as another mentor for Roberts. “In the beginning, I would be with Chris through every step, to train him on techniques as well as the rationale behind them,” recalls Knowles. “But he has grown tremendously and now works independently, including troubleshooting when a problem arises.”

Now, Roberts is training other student assistants. “Chris has been an asset to not only me but the whole lab,” says Knowles. “He has become a great example for new students.”

As a MARC scholar, Roberts will next complete a summer experience at an external doctoral institution. While positions

Roberts, pictured left collecting samples with Oberlies, is also the recipient of an NSF STAMPS – Science, Technology and Math Preparation – scholarship. The STAMPS program and MARC U-STAR are just two of a host of initiatives at UNCG targeting underrepresented students.

in every university lab are highly coveted, Oberlies says Roberts is much more likely to be able to find one as a MARC fellow. As a funded student who already has experience in the lab, he is an asset.

STAND-OUT GROWTH

Senior biology major Mo’nay Rodgers applied to become a MARC fellow in 2018.

In her cell biology course during her junior year, she realized, for the first time, that she had potential to excel as a scholar.

“Cancer cell cycling was interesting to me,” she recalls. “It wasn’t a class where I had to study, but I wanted to.”

She was accepted into MARC, and though she could have graduated in 2019, she decided to stay an extra year to fully make use of the research opportunities and mentorship she would receive.

Now in her second year of the program, she has assisted in Dr. Graves’ genomics laboratory for two different projects and also worked at the Purdue University Center for Cancer Research.

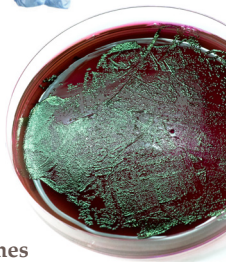
Rodgers is especially pleased about the opportunity to attend and present her work at academic conferences – not only ABRCMS and UNCG’s Thomas Undergraduate Research Expo but also the Biocomputational Evolution in Action Conference, an NSF-funded event in Lansing, Michigan.

At the most recent ABRCMS, Rodgers presented her work on iron magnetite resistance in *E. coli*, and the resulting genetic adaptations that can produce more dangerous strains of the bacteria.

“The work Mo’nay is participating in helps us better understand how bacteria may evolve resistance to novel nanomaterials,” explains Graves. “We want to slow down the spread of multidrug-resistant bacteria.”



SEEING YOURSELF AS A SCIENTIST Rodgers says her most meaningful inspiration comes from peer and mentor networking. “In science, I don’t always get to see people who look like me,” she says. “To be in a room full of people like that is really exciting, and to have them so happily and openly ready to work with me is thrilling.”



DEFINE THE DIRECTION

Senior kinesiology major Lauren Dorn began her first foray into research as a technician for a High Point University neuroscience professor, studying neuroglial cells and binge drinking.

In 2017 she was selected to join UNCG's first MARC cohort and began conducting research with Safrit-Ennis Distinguished Professor of Kinesiology Laurie Wideman. They are studying psychosocial factors in children's lives that impact health and psychological wellness over time.

"The outcome of my first project at UNCG suggested that neighborhood characteristics – park or green space access, crime levels, and public transportation – as well as parenting behaviors impact insulin levels, BMI, and ultimately cardiometabolic risk," says Dorn. "We looked at c-reactive protein, which is indicative of inflammation and stress in the body. We found a relationship there, so that was really interesting."

Dorn presented the work at ABRCMS.

"I wanted to research and study medicine, and the MARC program has made it more of a possible reality for me," she says. "It has allowed me to put myself out there in ways I wouldn't have been able to."

For her external summer research experience, Dorn worked at the Mayo



"MARC has given me the opportunity to define what I want to do and propelled me in the direction I wanted to go," says Dorn, pictured right, in the lab with Wideman.

Their work is part of RIGHT Track, a longitudinal study with more than \$10 million in NIH funding that has tracked emotion regulation and health in 450 families over two decades.

Clinic, looking at the effect of Vitamin D on myocarditis, an inflammatory condition that can progress to heart disease.

"I actually have a personal connection with that," she explains. "Some of my family members have had Vitamin D deficiencies that negatively impacted their health."

Although Dorn has already completed her second year as a MARC fellow, she is continuing her research with Dr. Wideman, now analyzing Vitamin D as a hormone working in tandem with estrogen in the body.

Their latest work examines a larger cohort of adolescents and more variables – such as seasonal vitamin D level variations and subject demographics. Dorn will also study neighborhood environments, especially factors influencing physical activity and birth control intake. She will present her results at UNCG's 2020 Thomas Undergraduate Research Expo.

"The goal is to get a manuscript out by the time she leaves campus," says Wideman.

Dorn, who next plans to pursue a graduate program, knows she will be an asset to the research community, particularly after completing MARC.

"There's so much information out there that is untouched or understudied. Diversity ensures we have a variety of perspectives and motivations to continue. I like that I'm able to use my own personal experiences in the research and affect my community," she says. "And we may have the next discovery that helps somebody drastically improve their health."

MOVING FORWARD

Former student-athlete Alexis Rice is in the first year of her master's program in applied sports psychology at UNCG. As an undergraduate, she was in the first cohort of UNCG's MARC program.

Her mentor is Assistant Professor of Kinesiology Erin Reifsteck, whose research focuses on promoting physical activity and health through sport and life transitions. The Moving On! program, which aids college athletes in planning for a healthy lifestyle after college, was developed by



Reifsteck with funding from the NCAA.

"I like being able to actually apply what you find," says Rice. "A lot of my family have been athletes or played a sport. So, when I talk to them, I can explain it through the lens of their experience, and they understand."

Rice's first research project found a significant difference in exercise identity between ethnic minority college students and white, non-Hispanic students, particularly among women. Reifsteck says Rice's findings could inform tailored physical activity interventions for college students.

"Her understanding of how research works improved a lot during that first year," says Reifsteck, recalling how they worked on Rice's writing and her process – including a literature review and developing and analyzing questions.

Rice pursued her external research project at the Physical Activity Research and Community Implementation Laboratory at Virginia Tech, examining physical activity among community-based health educators and the degree to which they met recommendations.

"It was different, but enlightening," she says, recalling the adjustment period. "I took what Dr. Reifsteck taught me and applied it in a different way. She required me to be at a certain level, and she pushed me a little bit, so when I got to a different institution, I could push myself."

Upon her return to UNCG, Rice participated in a number of trainings and

workshops for professional development, graduate school preparation, and even how to battle feelings of impostor syndrome.

"It was a good balance," she says.

"We had courses with Dr. Graves and other mentors where we really had an opportunity to learn how to analyze at a higher level."

At the beginning of her graduate career, Rice is already an accomplished young researcher and taking part in the greater conversations in her field. This spring, UNCG will host the Diversity in Sport Conference, supported by the Association for Applied Sport Psychology, and Rice is part of the planning committee.

Her mentor notes that kinesiology is one of UNCG's biggest majors and increasingly diverse, but at the student level. Diversifying faculty is the next step, and Reifsteck sees MARC as an important tool in the process.

"One way we can improve diversity and representation in our field and in our communities is through the graduate student pipeline. These programs give us opportunities to work with students and prepare them to be professionals and academics. I think that's really critical for our field and other disciplines this program targets."

*By Susan Kirby-Smith
Learn more at marc.uncg.edu*

Rice (above) first worked with Reifsteck on applied sports psychology as a MARC student researcher. Now, she works with her as a graduate student at UNCG.

WICKED PATH TO THE WEST END

Amendum and UNCG Assistant Professor Erin Farrell Speer recently launched a new BFA concentration in musical theatre. The first cohort of seven musical theatre majors began in fall 2019.

A mouse click starts the YouTube video. An orchestra score slowly swells beneath the lofty voices of two cast members, as they perform “When You Believe” from DreamWorks’ epic new London stage production of “The Prince of Egypt.” Music supervisor and arranger Dominick Amendum gently nods his head, conducting the scene in his mind.

“This ... here,” he says, gesturing to the screen, as the orchestra and voices suddenly rise in unison. Those background vocals and the shape of the song’s arrangement are the result of his work. Amendum’s eyes well up slightly, evidence of the heart and soul he has put into bringing the moment to fruition.

This much-anticipated show on the West End is not Amendum’s first big production. UNCG’s Smart-Tillman Artist in Residence served nearly a decade as associate music supervisor of the hit musical “Wicked.” He also conducted and music-directed the show on Broadway, in Los Angeles, and on its first national tour.

As coordinator of UNCG’s Musical Theatre program, Amendum (bottom right, with students) has found his sweet spot – his love of teaching, he says, feeds and informs his work in the professional world and vice-versa. And he expects as much from his students as he does from Broadway performers.

“If I’m doing my job, they should leave here and be able to walk into that rehearsal room for a Broadway show and know exactly what that’s going to feel like and what the expectation is.”

Amendum has a strong working relationship with award-winning composer Steven Schwartz of “Wicked” and “Pippin” fame, and the dynamic duo collaborate through every stage of music score creation. “A big part of what I do is kind of like alchemy,” says Amendum. “Filtering and knowing the composer – knowing what they’re thinking – then bringing that into the world. That’s why a lot of my career has been working with the same people, because I get to know their style really well.”

What’s it like working as an arranger? “Putting up a musical is like building a house,” Amendum explains. “The composer is the architect and draws all the plans and has the vision, and the arranger is the contractor who actually puts all those ideas into play.”

By Matthew Bryant • Learn more at musicaltheatre.uncg.edu and theprinceofegyptmusical.com



LIFETIME CONNECTIONS Amendum’s commercial theater work means he brings current industry knowledge and connections to the classroom, but that’s not all his students value. “I carry his teachings with me,” says UNCG alumnus Deon’te Goodman (above), of “Hamilton” Broadway fame. “Despite his insane schedule and incredible amount of responsibility, it never felt as though he didn’t have time for me. Not only did he verbally express his belief in me and my potential, he showed it by providing me with opportunities that allowed me to learn, grow, and prove myself. He stressed the importance of being a kind person just as much as a skilled professional.”



THE RIGHT MOVES

Authorities misunderstood and suppressed capoeira as it arose on the streets of Brazil, frequently arresting practitioners of the martial art. Assistant Professor of Dance Ana Paula Höfling thinks scholars have misunderstood capoeira's subsequent movement from the streets to the stage, an error she works to correct in her latest book, "Staging Brazil: Choreographies of Capoeira."

An acrobatic form with African roots, capoeira incorporates elements of dance, with dramatic leaps, flips, sweeps, and flying kicks. "Players alternate between strikes and defenses in an improvised and fluid call and response," says Dr. Höfling. "It is a combat game that requires intense focus and cooperation. There is nothing else quite like it."

Capoeira traveled from the Brazilian underclass to world stages in the 1960s, becoming "a moving postcard of Brazil," Höfling says. She became captivated as an undergraduate in California when she enrolled in capoeira classes at a school near her home. Her first instructor, Mestre Acordeon, studied with Mestre Bimba, "an amazing historical figure," she says, who created a well-known teaching manual and record.

Höfling has immersed herself in the practice and history of capoeira in the years since, making it the focus of her dissertation and her most recent book, published in 2019 by one of the top academic presses for dance studies. She interviewed practitioners across Brazil and in New York City. She spent time in libraries, newspaper archives, and people's homes, studying articles, photographs, and instructional record albums and manuals. "I tried not to reproduce claims that were made before without rethinking them," she says. The process corroborated some earlier beliefs about capoeira, but debunked others.

For example, some claim the transition from Brazilian streets to international stages robbed capoeira of its power and authenticity. Höfling challenges those arguments: "These spectacles were choreographed by capoeiristas; they were danced and performed by capoeiristas. Why is that not part of the practice?"

She tried moves based on illustrations and descriptions in the old manuals and records. Doing so helped with her analysis of larger themes involving cultural authenticity and how the form evolved. "Rethinking claims of what is and what is not African is part of my analysis. Art historian Robert Farris Thompson made claims about African dances in the 1970s that have become widely used in dance studies. But I think it's time to move on."

In her book, Höfling includes rarely seen historical photographs and shines a spotlight on previously unheralded capoeiristas. They include Emília Biancardi, the first woman to direct a folkloric ensemble featuring capoeira, and Mestre Canjiquinha, who taught a generation of capoeira instructors. Practitioners have thanked Höfling for those inclusions. "It's great when you see and hear the impact of your research," she says. "If people in the capoeira community are reading the book, that makes it worth it."

By Eddie Huffman • Learn more at go.uncg.edu/hofling • hfsbooks.com/staging-brazil



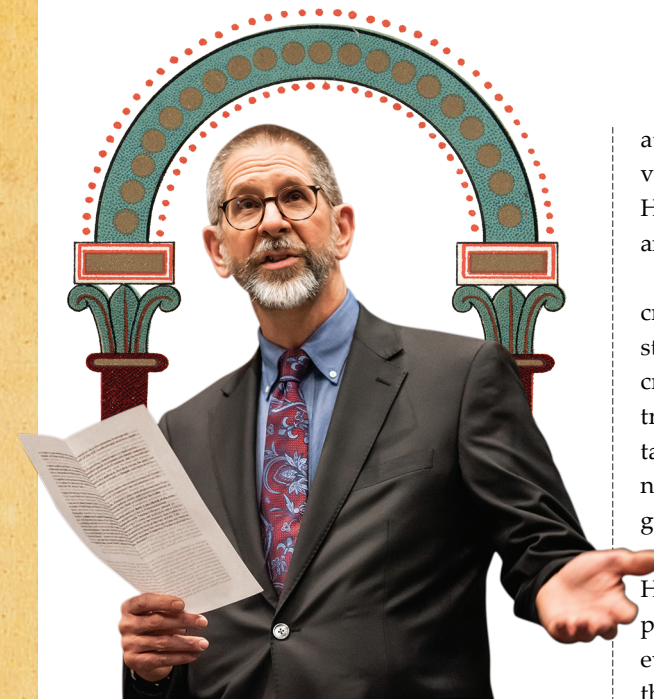
Höfling reenacts moves from a manuscript created by Mestre Vicente Pastinha.



Pastinha founded the first capoeira angola – or traditional-style – school in 1941.



He illustrated his manuscript by tracing the work of photographer Pierre Verger.



PROPHECY AS POETRY

Jews and Christians typically study the Bible – the world's most widely read book – to learn about their God and how they should live.

But how often do people open the Bible to enjoy it as art?

Dr. Christopher Hodgkins' newly published "Literary Study of the Bible: An Introduction," 25 years in the making, brings that possibility to the forefront for both scholars and ordinary readers.

"My book explores imagination throughout the Bible," the professor of English says. "And how – through lyric poetry, narrative, and drama – we are given kaleidoscopic ways of understanding God and his people."

The Wiley-Blackwell publication takes its name from a course Hodgkins has taught since 1994 and follows some of the structure of that class as well as the structure of his Renaissance literature courses.

He begins with short lyric poems, in this case the Psalms. Starting with those brief poetic works, he says, best prepares the reader to approach longer narrative sections, such as Genesis, in a more meaningful way.

The goal is to give readers a familiarity with the artistic and poetic conventions

at play. These include repetition, multiple viewpoints, and ironic dissonance, says Hodgkins, citing the creation story as an example.

"The Babylonians portrayed the creation of the universe as a deadly struggle for power, but the Bible retells creation as the work of a serene and transcendent poet, yet also of an intimate, tactile sculptor. At the heart of reality is not a death match, but an art of universal grandeur."

In "Literary Study of the Bible," Hodgkins often relates biblical texts to popular and literary culture – and to the even more ancient works that influenced them. "Looking back, we hear echoes of 'Gilgamesh' in Genesis, of Hammurabi's Laws in Exodus, and of Egyptian love lyrics in Solomon's Song."

Looking forward, he adds, "we can draw lines connecting Genesis and Jefferson, Moses and Martin Luther King, Job and George Bailey, Delilah and Dark Ladies, Ecclesiastes and existentialism."

When seen as "cosmic theater," Hodgkins says, "the Bible contains the great plot lines that still animate our favorite entertainments: from the alienated outsider hero to the king incognito; from the 'Jezebel' to the social prophet; and from the One Who Lived to the One Who Died. Luke Skywalker, Peter Parker, Harry Potter, Steve Rogers, Carol Danvers – they're all there."

The book also showcases recent scholarly findings on how many Biblical elements that appear chaotic, random, or overly repetitive to a modern Western reader have been carefully crafted over centuries of collaborative work.

"The Bible brings together the Hebrew commitment to multiple viewpoints, the Greek rational philosophical tradition, and the Anglo-Saxon statement of one true thing," Hodgkins says. "When you recognize these cultural traditions interweaving through time, you experience the scripture as a remarkable work of art."

By Susan Kirby-Smith
Learn more at go.uncg.edu/litstudybible/english.uncg.edu/hodgkins

A CRIME TO BE SICK

An epidemic spreads regardless of blameworthiness or culpability. “We can’t stop epidemics with handcuffs and prison sentences – that’s not how they work,” says Assistant Professor of Sociology Trevor Hoppe. “Blame is not an effective solution to disease.”

In his new book, “Punishing Disease: HIV and the Criminalization of Sickness,” Dr. Hoppe analyzes how and why more than two dozen states adopted laws targeting people with HIV. These laws made a wide range of behaviors crimes, regardless of whether there was any real risk of disease transmission.

No other disease in modern U.S. history, he says, has been criminalized so systematically.

SEXUALITY, MEDICINE & THE LAW

Awards in the areas of sociology, sexuality studies, criminology, and public health – including the Centers for Disease Control and Prevention’s Young Innovator Award – attest to Hoppe’s expertise in multiple fields and cross-disciplinary impact.

“I’m sort of an odd duck,” he says. Hoppe’s research sits at the intersection of sexuality, criminology, and medical sociology, with a focus on how the state controls and manages aspects of our lives. “I’m interested in how punishment has become an institution of social control, and how sexuality has been the subject and target of this control.”



His previous book, “The War on Sex,” co-edited with Dr. David M. Halperin, explores methods used by governments and society to prevent stigmatized sex, and makes a case for why sexual liberation is indispensable to social justice and human rights.

For “Punishing Disease,” Hoppe reviewed 500 criminal cases, looking at outcomes based on demographics and how relevant laws were constructed. He says lawmakers often passed HIV-specific criminal laws based on societal fear of gay people. However, heterosexual men and white heterosexual women are disproportionately convicted under those laws. “If you are in a community where HIV is highly prevalent and you find out you had sex with someone with HIV, you’re not as likely to call the police,” he notes. The idea of being exposed to HIV is less shocking. “But if you are a white woman living in rural Ohio in the same situation, phoning the police might be a more ready-made response.”

FIXING PROBLEMS WITH PRISON

In his work, Hoppe invites fellow sociologists – and advocates working to reform legal and public health institutions – to consider the dangers of using punishment to stop the spread of disease.

“America’s failed war on drugs is a telling case study. The billions of dollars we spent on incarceration haven’t put a dent in average drug usage rates. Why keep trying? Because addiction and HIV disproportionately impact highly stigmatized minorities: African Americans, gay men, the poor. Where stigma lurks, blame is easy to assign.”

He warns, “It’s important for today’s and tomorrow’s epidemics that we resist the impulse to imprison people to contain disease. There will be another epidemic.”

By Susan Poulos • Learn more at soc.uncg.edu/people/trevor-hoppe/trevorhoppe.com

“Punishment is not an effective or appropriate solution to a medical problem like HIV,” says Hoppe. His latest book, “Punishing Disease,” has received awards from the American Sociological Association, the Law and Society Division of the Society for the Study of Social Problems, and POZ, a magazine for people affected by HIV.

MIND OF MINERVA, SPIRIT OF SPARTA

The new Minerva Graduate Scholars Program is one of the highest recognitions a doctoral or MFA student at UNCG can receive. “The idea,” says Vice Provost and Dean Kelly Burke, “is to bring our top student scholars out of the silos of their disciplines, to exchange ideas, inspire each other, and grow.”

Chosen based on academic potential, achievement, and work and life experiences, the inaugural cohort of 44 students will participate in cultural and professional development opportunities throughout their time on campus.

Meet three of our new Minerva Graduate Scholars below.



Originally from Salt Lake City, **NATHAN SOUTHWICK** is a doctoral student in musical arts who carries his 250-year-old violin around campus in a colorful, sticker-strewn case. It’s a souvenir of his time studying in Austria, which he describes as difficult but transformative.

“The real takeaway is what the violin teaches you about life,” he says. “No one makes sound on my violin but me. If something’s not right, I have to change it.”

It’s a lesson he shares. “It’s an honor to teach students this type of self-efficacy.”

One of Southwick’s research interests is little-known American virtuoso violinist Maud Powell, who formed the first all-woman string trio and toured the country in the early 1900s. “She was an incredible human being who was all about bringing her art to people and serving underrepresented people through her work. That resonates with me.”

JOSEPH GAZING-WOLF was born in Egypt in a town that was, he says, mostly a landfill. At age 5, he was recruited to farm the fertile grounds along the Nile.

“The transition from Garbage City, which is about as far away from nature as you can get, to living on the banks of the Nile River, was like being on a different planet,” says the rangeland ecology student. “Discovering this ecologically rich world gave me new life in some sense. I study savannas because it’s where I feel I was truly born.”

Wolf was brought to the U.S. at age 10 by adoptive, Lakota parents, who raised him on their ranch. “My goal,” he says, “is to advocate for those who can’t advocate for themselves, to give voice to the forgotten. On the range, these are the plants and animals upon whose lives our lives depend.”

After completing her undergraduate degree with honors at UNCG, Raleigh native **INDYA WALKER** worked for three years with a Greensboro-area mentorship program for African American boys.

“I saw students grow and thrive despite their circumstances, but I also saw a lot of gaps in the research around mentorship. There wasn’t much focus on African American youth. It’s mainly a Eurocentric view,” says Walker. “That led me back to grad school. I want to shed a spotlight on these individuals and give them a voice.”

The Human Development and Family Studies student plans to focus on resilience in black families. “Looking back at my own life as a first-generation college student, I’m wondering what factors contribute to growth and success.”

By Todd Lohrenz
Learn more at grs.uncg.edu/minerva-scholars



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HOW DO YOU KNOW IF SOMETHING'S REALLY #TRENDING?

Dr. Aaron Beveridge studies how public opinion and digital communication are shaped by data-driven technologies – like social networks. In his digital rhetoric course, “How to Be an Influencer,” UNC Greensboro students develop a video series or podcast, and learn to use network analytics to better engage audiences. In bringing together research and teaching, Dr. Beveridge challenges his students with the question: What does it really mean to be “trending?”



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