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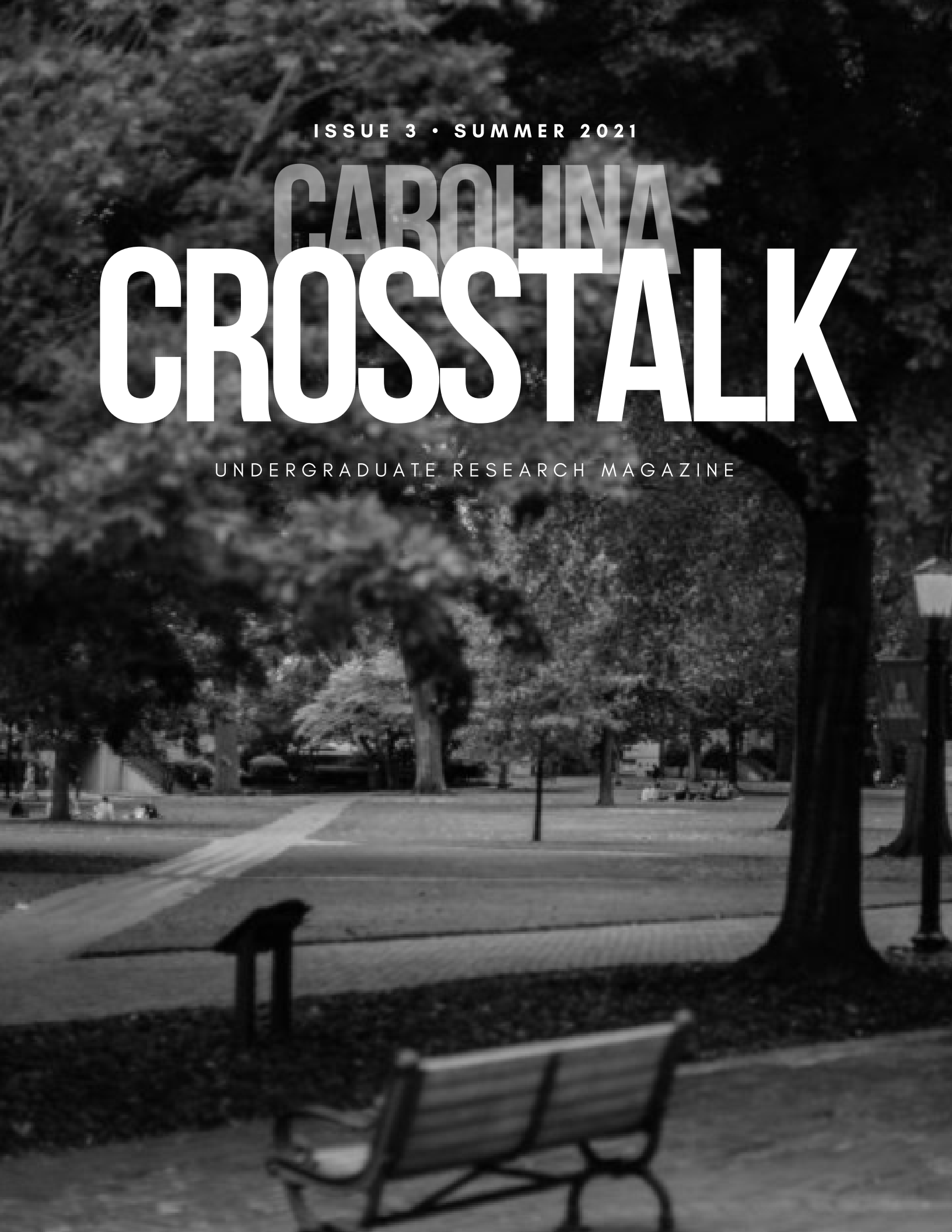
CAROLINA CROSSTALK

UNDERGRADUATE RESEARCH MAGAZINE



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LETTER FROM THE EDITOR

RESILIENCE IN RESEARCH

As our world encounters the unprecedented challenges and uncertainties of adapting to a life touched by the COVID-19 pandemic, we seem to move further and further away from our ideas of 'normalcy' and 'homeostasis.' After all, our lives have been so suddenly and so radically altered—in terms of both societal and personal impacts. Many of us have been thrown into situations that would have seemed incomprehensible in a non-pandemic context. Understandably, we often associate these changes with isolation, fear, worry, grief, and vulnerability. While the pandemic brought forth countless stories of unimaginable pain and loss, many of these stories are intertwined with resilience. The strength and courage of human resilience surfaces when I reflect on some pandemic narratives—narratives of people redirecting their pain and loss into a willingness to selflessly serve their communities, to reconnect with family and friends, to (re)discover hobbies, to brainstorm innovative solutions, to challenge the norms, to further investigate systemic issues, and to catalyze change.

The pandemic has moved us to give 'resilience' a different kind of meaning. Commonly, resilience suggests the idea of bouncing back to the initial or typical circumstances. However, this explanation fails to highlight the more accurate, the more powerful possibilities of resilience: to face hardships with flexibility and to allow for oneself/society to be remodeled and rebuilt with better, alternative ideals in mind.

Likewise, the student researchers and faculty researchers in our UofSC community continue to emulate this form of resilience, especially during our recent times. From limiting access to physical labs to modifying project protocols to reducing the number of individuals in the lab to uncertain funding to delayed timelines/results, the pandemic has impacted how researchers approach their research projects. On the flip-side, these circumstances seem to highlight the necessity and eagerness of researchers to collaborate with other research institutions, to encourage inclusive participation, to increase the public's trust in the relevant/possible applications of research, to consider the further implementation of technology, and to take research in adjusted or even new directions.

This Carolina CrossTalk magazine issue aims to magnify the stories of a few of the many UofSC undergraduate researchers that exhibit resilience, fueled by determination, creativity, and passion. The resilience stories in the following pages certainly inspire the CrossTalk team, so we hope they also inspire other students to actively pursue their research interests and move towards new concepts of 'normal' and 'homeostasis'—despite the adversities and because of the adversities.

Heny Patel

HENY PATEL EDITOR-IN-CHIEF

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HUGE THANKS TO THESE RESEARCHERS FOR CONTRIBUTING TO THIS EDITION OF CAROLINA CROSSTALK

CHRISTINA MUELLER, 2022
ETIENNE THIRIA, 2021
HALEY MELTZER, 2021
RACHEL BOHNENKAMP, 2022
SARAH MOTT, 2022

TABLE OF CONTENTS

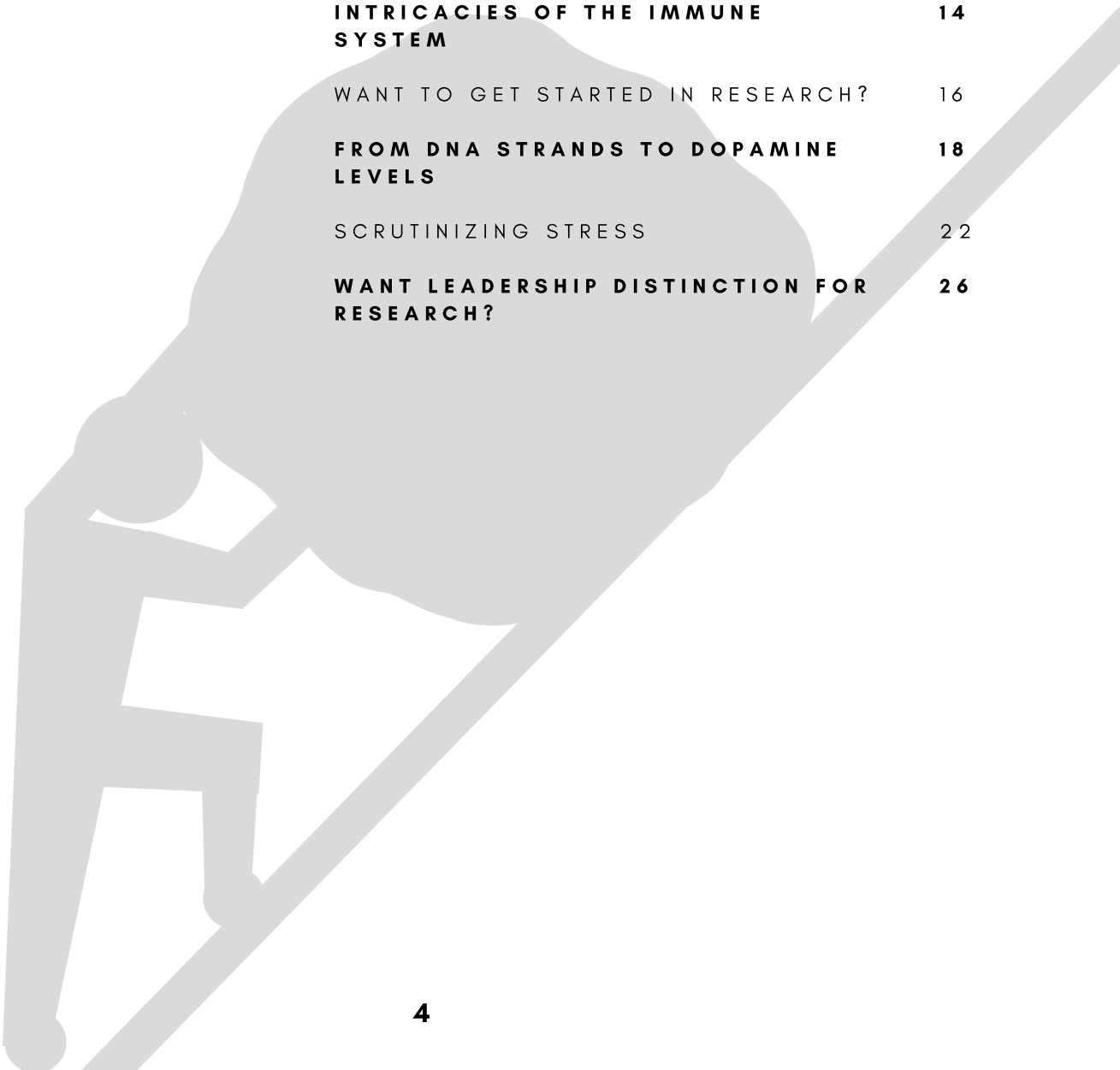


PHOTO BY PATRICK FEDERI, UNSPLASH

WATER INSECURITY IN COMMUNITIES CLOSE, YET FAR, FROM HOME

INVESTIGATING WATER INSECURITY IN RURAL ALASKAN COMMUNITIES

CHRISTINA MUELLER, MARINE SCIENCE, 2022

WRITTEN BY SAVANNAH KEATING

The COVID-19 Pandemic exacerbated many of the world's pressing issues, from healthcare system disparities to food insecurity to financial instability. The effects of the pandemic did not end at intensifying and exposing problems in much of the world's infrastructure. It also halted much of the onsite and in-lab research being done to investigate these problems. But, researchers in various disciplines persevered and learned how to conduct research in different forms - ones that were often not onsite or in the lab. Christina Mueller, a senior at the University of South Carolina majoring in marine science, is one of those researchers. She worked to adapt her research to her circumstances.

During her sophomore year, Mueller started her independent study at UofSC with Dr. David Fuente as her mentor. Dr. Fuente is an assistant professor in the School of Earth, Ocean, and Environment who is additionally trained as an environmental economist, urban planner, and environmental scientist. His research focuses on the provision of and accessibility to water and sanitation systems in low/middle-income countries. Mueller's research has since been expanded through the Magellan Grant and her Honors thesis. She attributes her initial interest in exploring the water insecurity in rural Alaska to growing up in Oregon, a state well accustomed to water access issues in the form of persistent droughts. Mueller is also an active member of SCAWWA, the Carolina Student Chapter of the American Water Works Association. Although water insecurity in rural Alaska is the primary research interest for Mueller's research project, the issue itself has many layers and has required her to learn more about the worldwide

issue of water insecurity from other perspectives in multiple parts of the world. While her major in marine science would seem to be a sufficient wealth of knowledge to draw from, that major was not enough for Mueller when it came to investigating water insecurity. She is pursuing not one, but two minors— in political science and geography. Each of her minors, along with her major, aids in her understanding of the complexities of water insecurity—from using her political science minor to comprehend how government agencies distribute funding to using her geography minor to understand the different uses for water in different geographical contexts.

When asked to speak about her research, Mueller first wants to clarify what exactly water insecurity is, because many people are not clear on what constitutes true insecurity. Water insecurity is broadly defined as unacceptable levels of water-related risks, inadequate access to clean water for household, community, health, and ecosystem services. For instance, under the conditions of water insecurity, a person might have enough clean water to drink, but not to bathe or wash clothes. For remote communities in Alaska, water insecurity is a pertinent and urgent issue. According to Mueller, the average person in the United States uses between seventy to a hundred gallons of water a day. However, in some of these rural Alaskan communities, individuals only have access to between three to seven gallons of water a day. As a result of this reality shaping their everyday lives, these communities have unfortunately become accustomed to a constant state of water insecurity. This pushes them to utilize nontraditional methods to retrieve water. Most of the rural communities that Mueller's research looks at do not possess pipe systems for water transport. Instead, they utilize different types of water delivery systems. The most common type of water delivery system used in Native Alaskan communities in rural Alaska is called "self-haul," which requires community members to travel several miles to a water source multiple times a day to obtain clean water. Water insecurity has vastly shaped these communities' daily rituals and the communities' cultural aspects.

Like many other researchers during the pandemic, Mueller could not be onsite in Alaska to observe and learn more about her research through firsthand experiences. But this circumstantial complication did not keep her from learning as much as she could about water insecurity in rural Alaska. With more than 120 hours, she spent much of her time in the past year conducting a systematic review of the literature on water and sanitation in rural Alaska to gain a comprehensive understanding of water insecurity and organizing the literature to build connections between different articles. This intense reading load was initially daunting to her, but she soon became grateful for the hours spent reading, jotting down notes, and collecting and analyzing literature. Additionally, Mueller will continue her research by conducting virtual interviews with stakeholders in Alaska.

According to a recent study by Laura Eichelberger (a senior epidemiology and health research consultant at the National Tribal Water Center of the Alaska Native Tribal Health Consortium), the COVID-19 pandemic has a significant link to water insecurity in rural Alaska. Many of the communities utilize wash basins filled with water in their homes to wash their hands. As a result of the general lack of easy access to an abundant amount of clean water, the water in the wash basins is not changed regularly. One of the main steps in curbing the spread of the virus, as suggested by the CDC, is frequent hand washing. However, when multiple people wash their hands with the same water, the bacteria are not sufficiently removed from their hands. The pandemic, an unexpected development from these unprecedented times, further emphasizes the relevancy of Mueller's research.

While Mueller conducted her research at home and within the Carolina community, her work is still valuable on a global scale. One of the *United Nations Sustainable Development Goals* aims to ensure that by 2030, every person in the world

should have access to a necessary daily amount of clean water. Her work serves as an important reminder that research can help advance the progress made to tackle our world's issues relevant to our time. No matter where the research is conducted.

Mueller pursued her research throughout these uncertain times. Consequently, she has gained more knowledge and received even further proof of how important research on water insecurity and water resource management truly is, especially in vulnerable communities. She hopes that her research will help people in the Carolina community become more aware and grateful for the resources that many have. And that it will bring more awareness to the issue of water insecurity in communities around them.

←CHRISTINA MUELLER

PHOTO BY NATHAN DUMLAO, UNSPLASH

COVID FEEDING CREATIVITY

INVESTIGATING HOW THE PANDEMIC HAS CHANGED DIETARY HABITS

ETIENNE THIRIA, BIOMEDICAL ENGINEERING, 2021

WRITTEN BY AUDREY GALIMBA

In March 2020, COVID-19 stepped onto the world stage as a full-blown pandemic. Fear and uncertainty put many operations on hold. However, instead of finding pause, Etienne Thiria found inspiration, taking his first steps in the realm of research.

Thiria is a rising senior biomedical engineering major with a minor in neuroscience. Yet, he found himself fascinated with a different area altogether: student diet. Etienne recalls a meal in his first year of college. "There was one time I had white rice, and it had so much salt that I was taking spoonfuls of salt, I kid you not." Moments such as these have sparked Etienne's interest in investigating the diet of college students. This is notable because college students are generally a demographic with a restricted budget, making them almost discouraged from cooking through the promotion of student meal swipes and freshman dorm design.

In December 2019, Thiria started looking for a faculty member who would be able to advise him on his research interest. He began by investigating research faculty in health-related areas, from biomedical engineering to pharmacy, on the Faculty Research Database, maintained by the Office of Undergraduate Research. Thiria read about each faculty members' research projects and emailed the professors he was interested in working with. Sixty emails later, he received two rejections and two responses of interest. This is how he met his current research advisor, Dr. Susan Steck, a professor of epidemiology and biostatistics at the Arnold School of Public Health. Thiria was drawn to Dr. Steck's lab because she studies how diet affects clinical outcomes, including cancers. In addition, Dr. Steck is a registered dietitian, which Thiria thought would help improve his research.

Thiria began with the broad idea of interviewing students who ate at residence dining halls to gather their thoughts on the food. The concept was vague, and the aim of the study was not completely clear. Then, COVID-19 hit, indirectly helping Thiria narrow down his idea. He wondered how diet had been affected by the pandemic. Thus, his research question was born, one that helped him secure funding via the University of South Carolina's Magellan Scholar Award: *How has the COVID-19 pandemic changed dietary habits in the UofSC population?*

In January 2021, Thiria crafted an online survey that targets the questions he is interested in. The survey was expanded to include questions on physical activity, mental health, and sleep, in addition to diet, covering the core pillars of lifestyle and well-being.

Thiria wanted to analyze the responses to see how lifestyles might have changed after being in a high-stress environment (like one perpetuated by the pandemic) for a prolonged period. After testing and proofreading, the survey was ready to implement in February. Thiria served as technical support for the participants until May when data

collection ended. Thiria is currently analyzing the collected data from approximately 500 participants made up of faculty, staff, and students. After analysis, Thiria will work on writing the paper for eventual publication.

Thiria encourages aspiring researchers to look within and consider; what truly interests you? He notes that initiative is important if you want to lead a project. You can approach a faculty member with a research question already in mind. "To do a Magellan, it helps to have your own idea," Thiria says. The Magellan Scholarship allows Thiria to fund his research as well as receive a personal stipend, letting him focus more closely on his work.

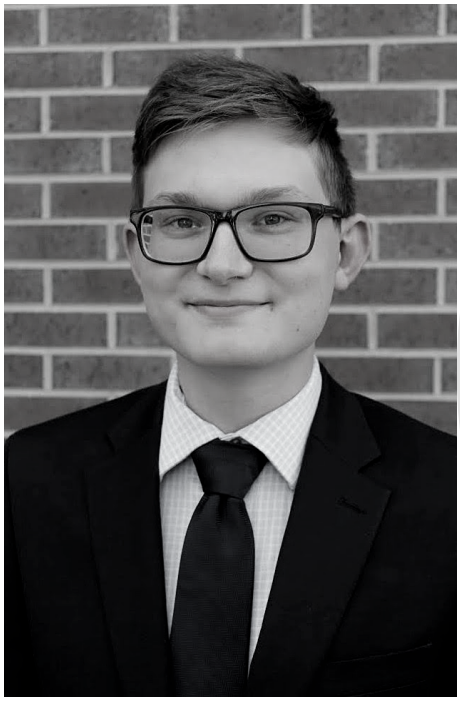
The best part of Thiria's project is yet to come; he is excited to see what the data analysis might reveal. While Thiria's next career steps may not directly involve research as he plans on working in industrial quality control, he is excited to see where his investigation will lead. He hopes to have his work published and available through an accessible database such as PubMed.

Even though COVID-19 has changed so many lives in challenging ways, Thiria says it has been a "blessing" in a way, as it helped inform his research question and allowed for more robust online resources. Despite the many adverse impacts of living through a pandemic, there is hope that some good can come out of it. We can try to understand how it impacts us while developing strategies to improve ourselves and the world around us.

FUNDING SPOTLIGHT: THE MAGELLAN SCHOLAR AWARD

The Magellan Scholar Award is a competitive award of up to $3,000 that can be used for materials, travel, or student compensation for a research, creative, or scholarly project. However, notably, there are additional funding opportunities available for undergraduate researchers.

The award requires that your project is in collaboration with a faculty mentor, and you may work in any discipline from any of UofSC's eight campuses across the state. For more information on award requirements and the application process, you can check out the Office of Undergraduate Research via www.sc.edu.



← **ETIENNE THIRIA**

WANT TO GET INVOLVED WITH CAROLINA CROSSTALK?

We are a student-run research magazine at UofSC that features the stories of undergraduate researchers in all the diverse disciplines. We aim to communicate student research in an engaging manner to encourage conversation and inspire others to pursue their own research interests.

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IF YOU HAVE QUESTIONS OR WANT UPDATES ON THE MAGAZINE!

WE ARE LOOKING FOR:
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PHOTOGRAPHERS
& RESEARCHERS

INTERESTED IN SHARING YOUR RESEARCH OR IN NOMINATING A RESEARCHER?

INTERESTED IN JOINING THE TEAM?

PHOTO PROVIDED BY HALEY MELTZER

INTRICACIES OF THE IMMUNE SYSTEM

CHARACTERIZATION OF THE ANTI-APOPTOTIC EFFECTS OF IFIT3 DURING THE ANTIVIRAL IMMUNE RESPONSE VIA STUDY OF AN IFIT3 KNOCK-OUT CELL LINE

HALEY MELTZER, PSYCHOLOGY & NEUROSCIENCE, 2021

WRITTEN BY ISABELA VALENTA AND HALEY MELTZER

One of the many paradoxes of the COVID-19 pandemic is that the world needed research to be brought out of it; however, how was one supposed to conduct research with restricted access to materials, new restrictions in place, and limited collaboration with other scientists? Despite all of these seemingly overwhelming difficulties, Haley Meltzer was able to, and still does, persevere through it all.

As a newly-graduated alumna with a bachelor of science in experimental psychology and a minor in neuroscience, Haley Meltzer conducts research regarding the body's immune system response to viruses. Despite just graduating, she is still passionately working on her research over the summer. As an undergraduate, she received the Magellan Mini Grant as well as the Magellan Scholar Award for her amazing work and dedication to her research.

Meltzer's road to starting her research was kickstarted by a simple email blast from the undergraduate research office asking for student researchers. After reading an intriguing blurb about a project and sending her resume over, Meltzer was accepted into the lab of Dr. Jennifer Grier. Dr. Grier's lab studies center around immunology and host pathogen interactions.

Meltzer studies the body's innate immune response to viruses. The immune system has two main divisions: the innate and the adaptive. The adaptive is much more long-term so it remembers pathogens you have encountered in the past, while the innate immune system, the focus of her project, serves as the first line of defense against pathogens such as viruses and bacteria. She is specifically focusing on interferon-stimulated genes which are a group of proteins that are upregulated, meaning that there are more of them, when the body is infected with the virus. So far, what is known is that they play some role in fighting pathogens and so she is trying to figure out what mechanism they have in fighting viral infections.

Not only was Meltzer's research impeded by the pandemic since she was forced to go online, but her research was also applicable to the pandemic itself. With studying the body's response to viral infections, she is specifically studying viruses with RNA genomes such as SARS-CoV-2. It can be applicable to vaccines or treatments for severe viral infections like COVID-19, which brings more relevance to the real world. She now has the ability to look at viruses and the way that the body responds to them, and be able to determine how

they potentially can be treated or prevented.

Meltzer enjoys that every day is a little bit different in the lab and that no day is the same. There are some days where she works on cell culture or literature analysis, and other days where she is running experiments and analyzing data. Because of the COVID-19 pandemic last summer, she spent the majority of her time working from home and doing literature reviews. This summer, she works fully in the lab about three to five days a week doing cell culture, preparing for experiments, and looking into relevant literature to stay up to date on research related to her project. Meltzer enjoys the fact that she can come in with a game plan for numerous experiments, or sometimes can just see what needs to be done around the lab and prepare for the rest of the week.

One of the benefits that the pandemic brought to her research was that it gave her the ability to work from home and do literature analysis before jumping into the experiments in the lab. She feels that this provided her with the ability to have a thorough understanding of her project and all that it entails before conducting hands-on research.

So far, her favorite moment in the research process has been being able to see how everything has come together like a puzzle. Learning about different protocols and procedures while working remotely, and being able to now apply that information and see how it affects her data, makes up her favorite part about research. “I like seeing how every aspect of the immune system overlaps on a cellular level,” says Meltzer, as well as seeing her coworkers work on other projects that overlap with her own. Learning the techniques for running all of these experiments and watching every step along the way is very gratifying to her and she loves being one step closer to seeing something new.

Since graduating from the University of South Carolina, Meltzer has been working on her research as well as obtaining an EMT certification, and she plans to attend medical school afterward. She hopes to take her research even further by studying antiviral immune responses with numerous other interferon stimulated genes, and to examine interactions among other aspects of innate immunity.

PHOTO PROVIDED BY HALEY MELTZER

WANT TO GET STARTED IN RESEARCH?

Make an appointment with the **Office of Undergraduate Research** or attend one of their workshops! They are dedicated to making sure that every student in every discipline has the chance to ask questions in research and pursue the answers!

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FROM DNA STRANDS TO DOPAMINE LEVELS

EFFECTS OF GENETICS ON RESPONSE TO SOCIAL COMPARATIVE FEEDBACK WHEN LEARNING A MOTOR TASK

RACHEL BOHNENKAMP, BIOLOGICAL SCIENCES, 2022

WRITTEN BY CATHERINE DEMINO

Rachel Bohnenkamp, a biological sciences major and Spanish minor in the South Carolina Honors College, is helping conduct research in a largely underexplored area. Though not directly related to her plans (she hopes to work as a physician assistant after completing her education), her work with the Arnold School of Public Health is part of an important investigation within the field of healthcare. Her results have the potential to apply to clinical populations like stroke patients in the future.

A rising senior, Bohnenkamp began her search for potential opportunities in the spring semester of her freshman year in March 2019. Her first step was to check the university's faculty research database for ongoing research projects in areas of her interests, particularly healthcare. As a biology major, she assumed her options would be limited—to her, "research was just something you did on a bench." What she ended up doing was unlike anything she had imagined.

After reaching out to professors whose research content intrigued her, Bohnenkamp heard back from Dr. Jill Stewart, an experienced physical therapist and the principal investigator (PI) of the Department of Exercise Science's Motor Behavior and Neuroimaging Laboratory. They met up and Bohnenkamp learned what her job description would be: to conduct research as part of a study by Dr. Stewart's doctoral student, Dr. Allison Lewis, on how baseline levels of the neurotransmitter dopamine, which is related to motivation and motor control, affect the brain's reward pathway and ability to perform motor tasks. To Bohnenkamp's surprise, this meant that she would be working directly with people! Volunteers would come into the lab, give a sample of their saliva (from which their genotypes for dopamine-related genes could be determined), and then try to complete a motor task that involved using a hand-held joystick to accurately hit a target on a computer screen. Throughout the process, the researchers would give the volunteers positive social comparative feedback, a term that boils down to telling someone "You're doing better than most people on average." This technique targets the reward center of the brain and tries to increase the volunteers' motivation to continue their motor tasks. Though it hasn't been officially proven yet (the research is still in the process of collecting data), the ideal result is that positive social comparative feedback does increase dopamine

levels, increasing both the performance and motivation to perform joystick-based motor tasks. The team is currently using healthy people as their current volunteers, but they hope to be able to apply their results to clinical populations, especially individuals who have had a stroke.

Within the broader research setting, Bohnenkamp has also decided to narrow her focus to the question, "How do particular single-nucleotide polymorphisms (SNPs, for short) affect dopamine neurotransmission?" In other words, is there any genetic influence on baseline levels of dopamine in the brain? This is what her senior thesis hopes to determine. Her thesis will be overseen by Dr. Allison Lewis, PT, a Ph.D. student and fellow researcher in Dr. Stewart's lab. To answer her question, Bohenkamp sent the DNA samples from each volunteer off for formal genetic testing. The research is still ongoing and it can take many weeks to hear back from the genetic processing lab, so she's still waiting for the results. But when she gets them, she'll have a complete genome for every person who participated in Dr. Stewart's research. From this, she'll have to go through each genome and compare the makeup of five to six key genes to the volunteers' dopamine levels. Her research requires a lot of collecting, inputting, and analyzing data, but Bohnenkamp is excited about it.

Since Bohnenkamp is conducting her research on SNPs as a subset of Dr. Stewart's own work, she has been provided access to many laboratory materials and resources, as well as a network of knowledgeable team members. According to Bohnenkamp, her research opportunities gave her the chance to be part of something she'd "never be able to come up with on [her] own." She is also grateful to have received a SURF Grant from the South Carolina Honors College, which allows her to get paid for her research, and a Magellan Scholar grant, which she has used to pay for the many genetic processing fees.

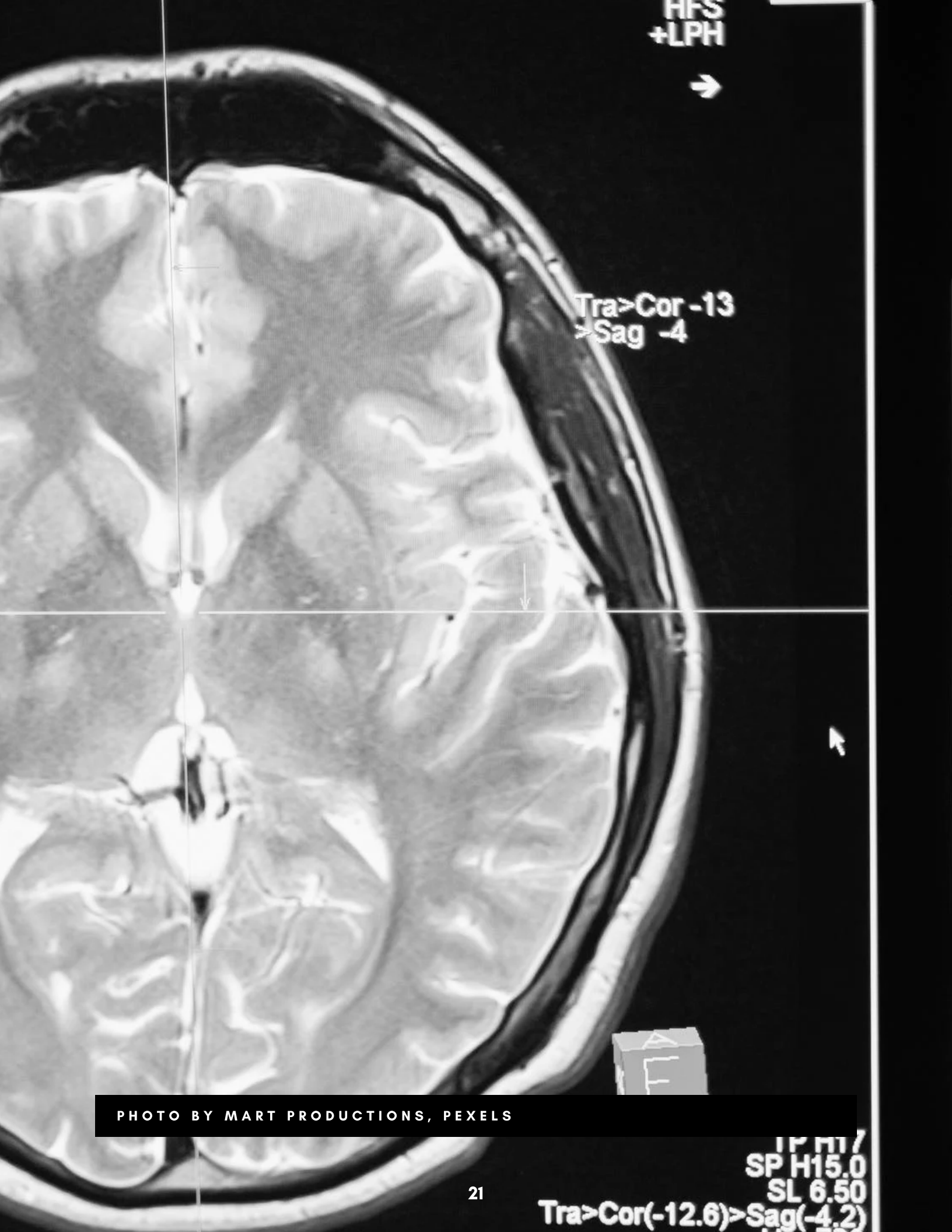
Bohnenkamp encourages everyone to get involved in research for themselves, stating that research is educational and helps you use your background in a variety of areas to think through

something completely new. For her, it was genetics, physiology, psychology, and physics. Through her research, Bohnenkamp has also been able to create unforgettable memories, like the time she got to witness an MRI being taken as part of Dr. Lewis' collection of motor data. She looks forward to continuing research in the future since medicine is "an evolving field" with questions that always need answers. Physician assistants are allowed to participate in research while working, so her experiences in the future as an aspiring PA might even take her research in a new direction.

She is glad her research process went mostly uninterrupted by the COVID-19 pandemic of 2020 and 2021. Though her lab had to halt research in Summer 2020, Dr. Stewart and Dr. Lewis had the means to safely pick back up where they left off in the Fall semester, albeit with a few extra precautions. Added safety protocols had to be observed, which included wearing masks, regular handwashing, and wiping down all surfaces before and after they have been used. The pandemic has also made Bohnenkamp realize how unpredictable life can be. She says, "As much as we want to control outcomes, in research but also life in general, most times our success actually depends on our ability to be flexible and adapt." She concludes that things rarely work out how you design them—and that's okay.

For anyone interested in learning more about her current research topics, Bohnenkamp recommends the National Center for Biotechnology Information's website as a solid resource.

← RACHEL BOHNENKAMP



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SCRUTINIZING STRESS

CHARACTERIZING THE ROLE OF ESTRADIOL IN NEURAL SYSTEMS UNDERLYING SOCIAL STRESS SUSCEPTIBILITY IN FEMALE RATS

SARAH MOTT, PSYCHOLOGY MAJOR AND NEUROSCIENCE MINOR, 2022

WRITTEN BY HENY PATEL

From an early age, Sarah Mott remembers being fascinated by the brain and its neural architecture. Her father (who is, in fact, a professor at the University of South Carolina studying neuroscience) introduced her to neuroscience research through engaging conversations and the multitude of questions that came with them. A few of Mott's most cherished memories involve conducting simple science experiments with her father, which further cultivated in her an appreciation for the brain. She recollects experimenting with the Stroop Effect as a child—she and her brother would comically compete to see who could say the most words in 30 seconds. She wondered, "what's going on in my brain that makes the inconsistency between the text color and color name difficult to recognize?" She never grew out of this interest regarding the inner workings of the brain. Instead, her curiosity only intensified. In high school, she took the opportunity to conduct a science experiment and subsequently competed at the regional science fair at UofSC. Initially, Mott was a little unclear on how to fashion her interest in the brain into an actual science project. Mott reached out to a plethora of faculty mentors at UofSC that were working on neuroscience-focused projects and she came across Dr. Susan Wood—Mott's soon-to-be faculty research mentor. Dr. Wood is an associate professor in the Department of Pharmacology, Physiology, and Neuroscience in the School of Medicine Columbia. Mott is extremely fortunate and grateful to Dr. Wood for the opportunities she made for high schooler Mott. She worked in Dr. Wood's lab during the summer of her sophomore and junior year of high school. Although her ability to conduct research was limited due to her age, she found that her experiences in the Wood Lab transformed her instinctive interest in the brain into a perplexing passion for neuroscience. Mott expresses, "I have always been a lover of puzzles and the brain is the biggest of all" and "research gives me the means to collaboratively attempt to contribute pieces to this puzzle."

When Mott ended up choosing to attend UofSC, her involvement in the Wood Lab continued. She has worked in the Wood Lab ever since, enjoying every single second of it. Shaping her passion into a research question, Mott along with the Wood Lab currently investigates the role of estrogen in the brain following social stress which often results in an increased risk of stress-related disorders in females.

Social stress is the most prevalent form of stress experienced by humans. Some examples include bullying, domestic violence, and co-worker conflict. We can pinpoint single instances of social stressors in life; however, Mott's research focuses more on acute exposure to social stress which seems to be a common risk factor for the development of

social-stress-related disorders in women. While anxiety affects approximately 18% of the U.S. population, women are twice as likely to be diagnosed and afflicted with an anxiety disorder than men. This unfortunate reality serves as a research interest for Dr. Wood's Lab because there seems to be an increased susceptibility to anxiety disorders in females between the onset of puberty and the end of menopause, suggesting a potential relationship between ovarian hormones and the disproportionate development of social-stress-related disorders in women. Mott and the Wood Lab use an animal model of social stress to "understand the role that estrogen plays in anxiety-like behavioral response and neuronal activity following a social stressor." Estrogen, one of the two main sex hormones, is a characteristic hormone present in women.

As far as what day-to-day activities look like for her as a student researcher, Mott utilizes advanced programs to quantitatively and qualitatively observe anxiety-like behavior and neuronal regulation that arise during and immediately after the animal model of social stress. Specifically, she employs a Nikon microscope with a stereology system to find and examine biomarkers of stress and neuronal activation in stress-sensitive regions of the brain. So far, Mott recalls her favorite moments to be ones that involved her performing immunohistochemistry (IHC) assays—a process that allows her to selectively identify proteins within the brain by employing antibodies that bind to specific antigens on a particular protein. IHC entails

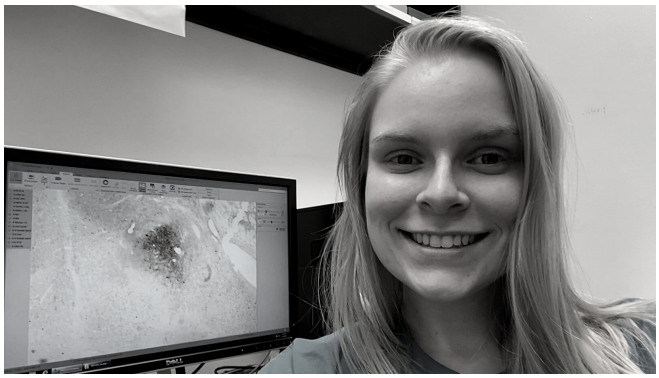
PHOTO PROVIDED BY SARAH MOTT

staining certain proteins with colors, which enables researchers to visualize the target protein. Mott stains for both c-Fos (a marker for neuronal activation) and corticotropin-releasing factor, or CRF (an important neuropeptide involved in initiating stress-related behavioral responses). Her favorite moment is when she finishes the IHC process and the finalized stained brain tissue is revealed. Apart from seeing the colors being expressed, the tissue also shows which stress-sensitive brain regions (i.e. where in the brain) show expression of both c-Fos and CRF, enabling Mott and the Wood Lab to further understand the link between estrogen and stress-related processes in females. Mott thanks Dr. Wood for surpassing all of her expectations of research by giving her "the opportunity to be involved in all aspects of the research process, whether it be experimental design, data collection, data analysis, or presentation."

While Mott's research question focuses on behavioral response and neuronal activation following social stress in females, Mott is amazed by the applications of her study to research

projects that tackle different questions. Anxiety disorders are the most common mental illness in the United States. While the understanding of anxiety and comorbid incidence of depression has seen progress in the past decade, current treatments for anxiety disorders and depression do not sufficiently take the demographics of those affected into account. When it comes to addressing the heightened susceptibility of women affected by anxiety and other stress-related disorders, current treatments are lacking and indicate that more research is necessary for the development of therapeutic interventions for stress-related disorders in women. Mott's research in the Wood lab furthers our understanding of the role of estrogen in anxiety disorders and provides avenues for therapeutic interventions by looking at stress-sensitive systems that could be targeted to augment resilience to stress. This will additionally allow researchers to create a more comprehensive map of neural regulation in terms of estrogen pathways and responsibilities.

Thus far, Mott has been awarded a Science Undergraduate Research Fellowship (SURF), a Magellan Scholar Award, and a Magellan Mini-Grant—which all have allowed her to devote even more time and resources towards her research inclinations. Additionally, she earned a travel award from the American Society for Pharmacology and Experimental Therapeutics (ASPET) to attend the 2020 ASPET Annual Meeting at Experimental Biology, allowing her to share aspects of her research with other individuals that return the same kind of enthusiasm when sharing their own research findings. Mott believes communication in research to be key because "it gets us ever closer to being able to answer larger, more all-encompassing questions about the brain." In fact, Mott has won several presentation awards at local and national meetings: her poster for Discover UofSC 2021 was recognized for excellence and outstanding achievement by the UofSC OUR and she received a 1st place poster award in the undergraduate division for behavioral pharmacology from ASPET.

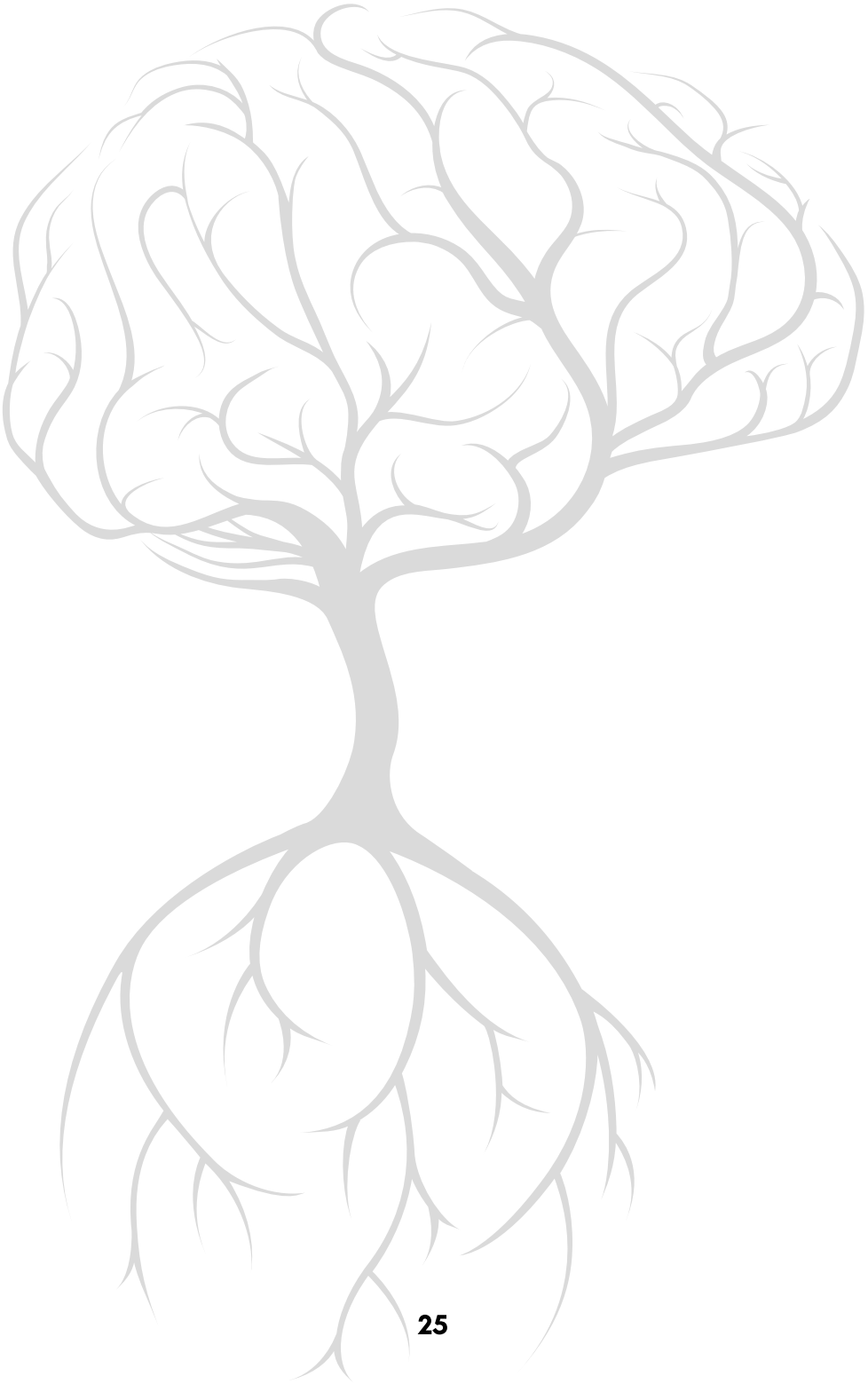


All in all, her awards have facilitated experiences that humble her as she becomes more aware of the incompleteness of neuroscientific knowledge and of the countless questions waiting to be answered by dedicated, inspiring researchers. Her research experience continues to give her the confidence and motivation to pursue answers to curious questions.

Considering our global situation, a conversation about stress is incomplete without mentioning the implications of the pandemic—on Mott's research experiences and on the nature of her research project. When UofSC switched to a virtual model, the School of Medicine (where the Wood Lab is located) also shut down in response to COVID-19 guidelines. Adapting to her circumstances, Mott's eagerness for her research did not dwindle. Most of her in-person work came to an immediate pause.She and Dr. Wood decided that, for a few months, Mott would switch gears and focus on the behavioral component of her research project. This meant that Mott would conduct literature reviews and quantify anxiety-like behavior from videos taken of their animal model of social stress. With her research surroundings being moved to her home for a while, Mott had to learn how to set up and work the online software necessary to score animal behavior. This was quite the task as Mott's Macbook was incompatible with the software—she often resorted to borrowing anyone and everyone's Windows computer. Yet, this experience of adapting to technology taught her resilience and flexibility. She is more grateful for her hands-on research experiences now that undergraduates can research once more in the School of Medicine. As

we are aware, the COVID-19 pandemic changed our lives in sudden and unimaginable ways. Many of those changes can be stressful for individuals in all stages of life. Mott's research does not directly involve COVID-related data, but her research indirectly ties into the pandemic because of the collective social nature of COVID-related stress and possible long-term effects on our physical and mental health.

Inspired by her captivation with neuroscience, Mott's firsthand research experiences play an instrumental part in her decision to attend graduate school and study neuroscience. Mott appreciates her experiences, "my time as an undergraduate researcher has been an outstanding opportunity to learn skills and techniques that will be beneficial to me through graduate school and in my career."



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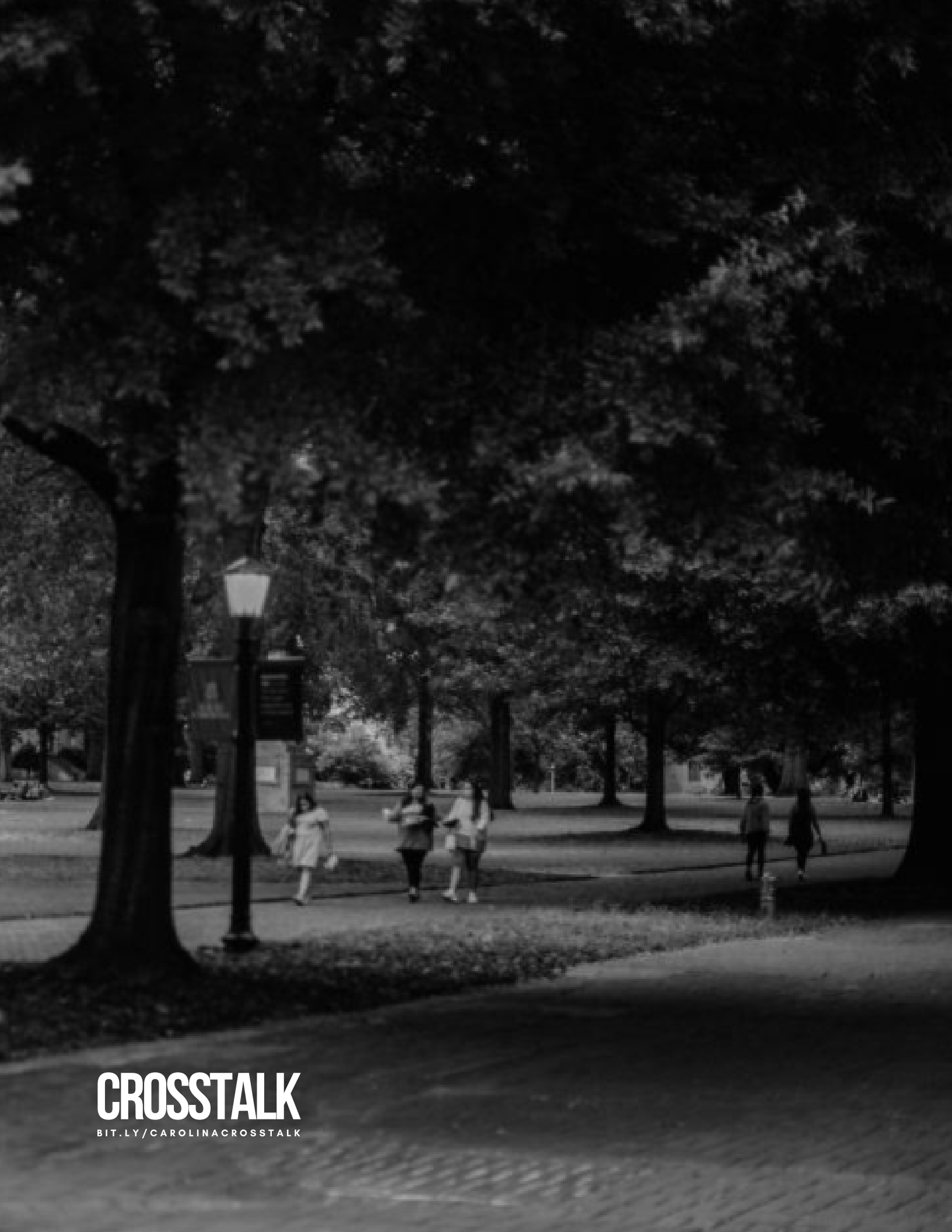
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