

**Eighteenth Annual
UNC Pembroke
Undergraduate Research and Creativity Symposium**

THE UNIVERSITY OF NORTH CAROLINA AT PEMBROKE



**PEMBROKE UNDERGRADUATE
RESEARCH AND CREATIVITY CENTER**

April 10, 2024

Program with Abstracts

Pembroke Undergraduate Research and Creativity (PURC)
Center
One University Drive
P.O. BOX 1510
Pembroke, NC 28387-1510
purc@uncp.edu

1 University Drive
P.O. Box 1510
Pembroke, NC 28372



Pembroke Undergraduate Research
and Creativity (PURC) Center
910.521.6841

Dear Students, Colleagues and Guests:

It is my distinct honor to welcome you to the 18th Annual Pembroke Undergraduate Research and Creativity Symposium! Hosted by the Mary Livermore Library, this event is a campus-wide celebration of undergraduate research and creativity. The faculty-mentored student research projects on display represent a wide variety of fields. We are pleased to include 130 presentations of scholarly ventures by approximately 190 students and 67 faculty mentors, representing 18 academic departments.

The mission of PURC is to promote, develop, and celebrate undergraduate student research, with the overall goal of enhancing undergraduate education and preparing students for careers and post-graduate study in all disciplines. Through faculty-mentored research experiences with faculty and other regional, national, and international scholars and professionals, students engage in scholarly discovery and become fully engaged members of the research community. In this way, the Center facilitates and coordinates preparation in research skills necessary for professional fields and graduate study.

Participation in undergraduate research continues to grow at UNCP. During this academic year, PURC-funded students received support to conduct research through 17 fellowships and presented research and creative works at approximately 3 international, 20 national and 13 regional conferences. Please join us in acknowledging and celebrating the accomplishments of these students.

Thank you to the faculty mentors, undergraduate researchers, campus leaders, donors, supporters, staff, and everyone else that makes undergraduate research happen at UNCP! Thank you again to Dr. Timothy Ritter and Dr. Charles Humphrey for their continued support of undergraduate research on our campus. I would also like to recognize the efforts of Alesia Cummings, Gordon Byrd and Tori Lewis, without whose efforts this event would not be possible. Next, I would like to thank the PURC Council whose many years of expertise are invaluable to the function of this council.

Employers and graduate programs increasingly look for skilled people who not only excel in their research and scholarship, but also are able to collaborate and communicate meaningfully with all peoples across many disciplines. This event is a celebration of our student's demonstrated ability to do so. I wish everyone a great conference and thank you for bringing out the best in our campus!

Brandon Sanderson
Director, Pembroke Undergraduate Research and Creativity Center



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Photo by Dr. Lisa Kelly, Biology

18th Annual
Pembroke Undergraduate Research and Creativity Symposium

Wednesday April 10th, 2024 -- *Mary Livermore Library Commons and Reading Room*

Schedule of Events

- 9:45-10:00 Registration** (Library Commons)
- 10:00-10:05 Greetings:** Brandon Sanderson, Director, PURC
- 10:05-10:20 Keynote Speaker** – Jennifer Gerz-Escandón, Ph.D., Associate Vice President for Academic Programs & Research, University of North Carolina System
- 10:20-11:45 Poster/Exhibit Session** (Library Commons)
- 11:45-12:15 Deli Lunch Service** (Adjacent Special Collections)
- 12:15-12:50 Poetic and Musical Performances** (Reading Room)
- 12:15-12:25 *“Henrietta’s Hymnbook” and “Chaotic Evil 2.0”*
Silas Seigler, Composer
Mentor: **Dr. Aaron Vandermeer**, Music
- 12:30-12:40 *“No More Tadpole Nights”, “Valentine’s Day 2024” and “The Next Monday”*
Ray Eddy, Poet, reciting from the volume *“Dirty Laundry”*
Mentors: **Michael Berntsen**, ETWL
- 12:45-12:50 *“Sarabande” by Arcangelo Corelli (1653-1713), arr. By Himie Voxman,*
Daniel Henry and Julian Locklear, Alto Saxophone
Mentor: **Dr. Lindsey Jacob**, Music
- 12:55-2:05 Awards Presentation, Reception and Closing Remarks** (Reading Room)
- 12:55-1:05 **Dr. Timothy M. Ritter & Marie A. Amero Endowed Research Scholarship** – MyKayla Greene
- 1:05-1:15 **Dr. Charles Humphrey Undergraduate Conference Travel Award** – Daniel Henry, Julian Locklear, Kai Anderson, Brett Sasser, Rachal Davis, Tiffani Roberts
- 1:15-1:25 **Dr. Humphrey:** Remarks on Undergraduate Research
- 1:25-1:35 **Undergraduate Research and Creativity Mentoring Award** – Dr. Amber Rock
- 1:35-1:45 **Undergraduate Research and Creativity Mentoring Award** – Dr. Haitao Zhao
- 1:45-1:55 **Utilizing Archival Materials for Research** – Mrs. Jennifer Randall, Special Collections and Archives Librarian, MLIS
- 1:55-2:05 **Closing Remarks by Campus Leadership** – Dr. Diane Prusank, Provost and Vice Chancellor for Academic Affairs



Keynote Speaker 2024

Dr. Jennifer Gerz-Escandón serves as Associate Vice President for Academic Programs and Research at the University of North Carolina (UNC) System Office. Within the Academic Affairs Division, Dr. Gerz-Escandón leads the implementation of UNC Board of Governors policies on graduate academic program planning and approval and manages two system-wide research initiatives: the Research Opportunities Initiative and the Undergraduate Research Program Award. Her core responsibilities also involve managing annual sponsored programs and research reporting for the \$2B UNC System research enterprise and supporting key UNC System affinity groups including the Chief Research Officers, the Graduate Council, and the Undergraduate Research Council.

Prior to joining the UNC System Office, Gerz-Escandón was associate dean for Interdisciplinary Education and Fellowship Programs in The Graduate School at the University of North Carolina at Chapel Hill. Prior to that she was director of National Scholarships and Fellowships for the Honors College at Georgia State University, where she focused on expanding access to undergraduate research experiences by supporting the Undergraduate STEM Research Society. During her nearly 20-years in higher education, Gerz-Escandón has held administrative and faculty roles at two public and two private universities plus visiting positions in Japan and the United Kingdom. She is honored to be the recipient of a Fulbright International Education Administrator grant to Germany and a German Academic Exchange Service grant. Gerz-Escandón holds a bachelor's degree in government from Georgetown University, a diploma in international relations from the University of the West Indies, and a master's degree and doctorate in international relations from the University of Miami.

Posters

1 - Wireless Technology, denial of services and machine learning

Muhammed Adeniran, *Mathematics & Computer Science*

Mentor: **Joong-Lyul Lee**

Abstract:

This project examines the intersection of Wireless Technology, Denial of Service (DoS) attacks, and the application of Machine Learning (ML) as a countermeasure. It aims to address the vulnerabilities inherent in wireless networks that are increasingly targeted by DoS attacks, disrupting services and compromising data integrity. Through the deployment of Machine learning algorithms, the project proposes a novel approach to detect, classify, and mitigate DoS attacks in real-time. By integrating Machine Learning into wireless security protocols, the project seeks to enhance resilience against DoS attacks, ensuring reliable and secure wireless connectivity. This exploration demonstrates the potential of Machine Learning in adapting to and defending against evolving cyber threats.

2 - Experience & Connections: The Influence of Presenting and Attending North Carolina Sociological Association's Annual Conference

Kai Anderson, *Sociology & Criminal Justice*

Mentor: **Melanie Escue**

Abstract:

I attended the North Carolina Sociological Associations annual conference on March 22, 2024, in Greensboro, North Carolina. Here, I co-presented a project titled "Capturing Heteronormativity and Cisgenderism in Everyday life." Not only did I develop presenting experience, but I was also given a window into developing professional experience and creating connections in the field of sociology. This allowed me to see research from a range of scholars and opened my eyes to what other research is out there, nurturing my path into the field of sociology and my future through continued higher education.

3 - Postsecondary and College Preparation Among Homeschooling Families

AJ Anderson, *Psychology*

Mentor: **Lois-Lynn Deuel**

Abstract:

In our analysis of the increase in homeschooling families post COVID, we investigated the definition of "homeschooling" and the rational underlying the choice of legal home-based education among parents. We were interested in learning more about postsecondary preparedness for academic achievements, life skills, and employability skills. We also

research homeschooling parent attitudes about public school environments. Popular wisdom were sought about the controversial claims regarding limited social skills, unusual behavioral characteristics, and lack of exposure to diverse experiences, ideas, and racial/ethnic/linguistic groups among students educated in the home. This investigation was conducted using local focus groups (n=15) with homeschooling parents in Robeson County, NC, and the analysis of the national dataset (n=16,446) from the Parent and Family Involvement in Education Survey conducted by the National Center for Educational Statistics (NCES). Finally, contrasts were made between homeschooling and non-homeschooling on academic aspirations for their children, civic and community involvement (at national and regional levels).

4 - The Effects of Vitamin A on Testicular Growth and Development in Prepubertal Beef Bulls

Maricela Andrade, *Biology*

Marijo Wilkes, *Biology*

Mentor: **Nicolas Pereira**

Abstract:

The bull is the individual that bears the greatest responsibility within a herd for the overall fertility as it is common for a single bull to sire between 25 to 50 cows in one breeding season. More than 90% of the calves born in the US come from natural breeding. Sertoli cells (SC) are the only somatic cells within the seminiferous tubules responsible for the development of germ cells among other important testicular functions. Higher SC count has also been proven to increase testicular weight, scrotal circumference, and daily sperm production. Several factors have been described as influencing SC replication as FSH, IGF1, and Vitamin A through its biological compound Retinoic Acid. We hypothesize that Vitamin A will increase the number of SC cells established in the bull before puberty. Our objectives are to determine the effects of vitamin A on testicular growth and development, testicular cytology, parenchyma Pixel Intensity (PI), and Testicular Blood Flow (TBF) determined by color Doppler ultrasonography. Eight prepubertal Angus cross bull calves will be randomly assigned to two treatments: Vitamin A or Control. After the administration of vitamin A, and for four consecutive weeks the bull calves will be weighed, scrotal circumference measured, and PI and TBF determined. At week 4, testicular and epididymal weight and volume determined. In addition, testicular parenchyma samples will be collected for SC and germ cell counts.

5 - "I'm Proud to be a Lumbee": Lumbee History by Lumbee People

Unmai Arokiasamy, *American Indian Studies*

Mentor: **Michele Fazio**

Abstract:

The first documented record of Lumbee People refers to us as a “mixt crew” in 1754. The same language was retained when the Farm Security Administration came to Pembroke, photographed us, and documented us as “mixed breed Indian” in the 1930s. This is just one iteration of the many ideologies that outsiders have purported about Lumbee People. These narratives continue to undermine our own understandings as a community and a Nation. Understandings such as the Lost Colony Theory continue to attack tribal sovereignty by taking away our authority over our own identities; they ignore the plethora of oral history we have retained and still share as evidence of our identity. By overlaying community voice with scholarly history, this project will begin to create an archive of Lumbee history distinct from any other record of us because it will provide a place for Natives and nonnative people to get their knowledge from the source. My only goal for this project is to allow autonomy over the history my People have experienced. One that we have always been proud to be the living proof of, no matter which way our tale has been spun.

6 - Blue Crab Population Decline in Chesapeake Bay

Julia Autry, *Biology*

Mentor: **Dennis Edgell**

Abstract:

This study explores the alarming decline in the blue crab population within the Chesapeake Bay, a trend highlighted by surveys indicating a recent low. The blue crab, vital to Maryland's ecosystem and economy, generates millions in yearly revenue, underpinning family traditions, local cuisine, and the state's fishing culture. Central to this investigation is the impact of pollution on seagrass beds, crucial habitats for blue crabs, reflecting a broader environmental crisis affecting marine life globally. This project aims to identify key factors driving the decline, evaluate its ecological and economic repercussions, and explore potential solutions. Through comprehensive analysis, this research seeks to offer insights into reversing this downward trend, introducing new solutions, and ensuring the sustainability of blue crab populations and the overall health of the Chesapeake Bay ecosystem. Consumer choices can influence conservation efforts and the health of the bay. The goal of this presentation is to enhance understanding of the complex interplay between environmental degradation, marine biodiversity, and a sustainable seafood industry.

7 - Groundwater and Surface Water Interaction

Ashley Barez, *Geology & Geography*

Mentor: **Madan Maharjan**

Abstract:

The purpose of this study is to understand the interactions between groundwater (The Black Creek Aquifer) and surface water (The Cape Fear River). The magnitude and frequency of these interactions provide insight into their biogeochemical interactions. Two

wells were drilled off the riverbank of the Cape Fear River. Well 1 is approximately 50 meters off the river, and Well 2 is approximately 150 meters off the bank. A pressure sensor transducer was installed in each well and in the river to measure the water level. A fourth sensor was installed outside one of the wells to collect barometric pressure at 30-minute intervals, which was later used to retrieve corrected water levels in the wells and the river. The results show that the water levels in the two wells and the river have different signals, suggesting interactions of groundwater and surface water at different times of the year. Water samples were also collected from the wells, the river, and nearby tributaries, providing preliminary data that further insights into water chemistry. The study results are expected to enhance our understanding of the nature of groundwater and surface water interactions along the River.

8 - Effectiveness of External DNA Decontamination to Evaluate Plant Diets of Aphids

Brooke Blackmon, *Biology*

Mentor: **Lisa Kelly, Kaitlin Campbell**

Abstract:

An effective method of studying the diets of hemipterans is to analyze their consumed DNA. We hypothesized that surface decontamination involving 4% bleach effectively removes external DNA from aphids while the consumed DNA is left. We experimentally tested the effectiveness of two different bleach decontamination protocols. We contaminated some aphids with strawberry DNA to mimic external contamination. These aphids were either bleached or left as controls. Uncontaminated aphids were either bleached or left as controls. We predicted milkweed DNA would be detected in all aphids except unbleached ones contaminated with strawberry DNA. We predicted strawberry DNA would be detected in strawberry-contaminated, unbleached aphids. We extracted DNA from all aphids, performed PCRs, and sent amplicons for Sanger sequencing. Nucleotide sequences were matched to taxa. We did not detect milkweed DNA in any aphids except control aphids that were neither contaminated nor bleached. We detected strawberry DNA in the strawberry-contaminated, unbleached aphids. Results suggest that both bleach protocols effectively remove external contamination and that 4% bleach destroys the aphid's consumed DNA.

9 - Impact of Attending and Presenting at the Association of Southeastern Biologists Annual Conference in March 2024

Brooke Blackmon, *Biology*

Mentor: **Lisa Kelly, Kaitlin Campbell**

Abstract:

In March of 2024, I traveled to the Association of Southeastern Biologists Annual Conference in Chattanooga, TN. At this conference, I presented my research entitled "Effectiveness of External DNA Decontamination to Evaluate Plant Diets of Aphids." Presenting at this conference allowed me to connect with many undergraduate and

graduate peers who were researching topics similar to mine and also topics vastly different. I also got to network with faculty from graduate programs across the Southeast. Overall, I gained valuable experience that will further my educational and career journey.

10 - Environmental Effects on Richness and Diversity of Endothermic Vertebrates in the Lumber River State Park

Lacy Bracken, *Biology*

Mentor: **John Roe**

Abstract:

The Lumber River State Park has a variety of habitats and animals. The environments include different forestry, variation in proximity to water, and different amounts and frequencies of prescribed fire the area has undergone. Testing to see if there is a correlation between habitat and animal biodiversity is important to better understand animal populations and behaviors in response to environmental variation. We sampled animals across the Lumber River State Park at 48 randomly placed stations using wildlife cameras set for periods of 3-10 weeks. We reviewed images, identified species, and counted individuals to calculate species richness and Shannon-Wiener diversity indices. We used regression analysis to check for correlations between the environmental variables and species richness and diversity. We also examined how many weeks were required to detect all species at each station. Each station would typically take between 200-1000 pictures in a three-week period. Species richness ranged from 1-10 and diversity ranged from 0-1.8, but we found no relationships between habitat variables and richness or diversity. Species accumulation curves indicate that 9 weeks were enough to document all species present at a station. This study is part of a long-term project in which these baseline data can be compared to future environmental changes as the Lumber River State Park implements a prescribed burning program to restore fire-maintained longleaf pine ecosystems.

11 - Development and Implementation of Technologies for Plastic Recycling

Dominick Burgess, *Chemistry & Physics*

Mentor: **Cornelia Tirla**

Abstract:

Plastic pollution is one of the most pressing issues posed to the environment today. Plastics are omnipresent in modern products be they clothing, packaging, or electronics to name a few. Coupled with their difficulties in recycling most plastics are not recycled, and those that are rarely maintain their previous quality. Methanolysis is a method of chemical recycling that breaks the ester bonds within polymers returning them to their monomers, their independent molecular forms. Methanolysis has previously required high temperatures and pressures making mass deployment for recycling difficult and expensive. This method using a potassium carbonate catalyst not only occurs at room temperature

and atmospheric pressure, it also avoids any expensive or particularly dangerous reagents while effectively breaking polyethylene-terephthalate (PET, the most common polyester in use, down into its monomer.

12 - Forensic Analysis: Impact of Chemical Hair Treatments on Opioid Detection

Kae Burns, *Chemistry & Physics*

Mentor: **Steven Singletary**

Abstract:

Hair has been used in forensics to determine the timeline of drug usage. Previous studies have shown a bias to some cultural groups, which may be linked to hair treatment use. The goal of this research is to determine the impact of hair treatments on detection of codeine and codeine derivatives in reference to the chemical interference, wash procedures, and external contamination. The treatments being focused on are bleaching, dyeing, and a combination of both, with untreated hair as a control. Permanent hair dye enters through the cuticle and deposits in the cortex, the entrance of the dye into the cuticle can cause damage to the hair shaft. Semi- and demi-permanent hair dyes deposit color on top of the cuticle and can deposit nutrients that also attach to the cuticle helping to “repair” some of the damage. Bleach enters through the cuticle and strips the color from the cortex, which is damaging and drying for the hair shaft. These processes may or may not affect drug detection and quantification. Here we present our results from this study.

13 - Leveraging Image Processing for Enhanced Health Outcome Prediction

Andrew Cart, *Mathematics & Computer Science*

Mentor: **Shaohu Zhang, Melanie Escue**

Abstract:

The neighborhood environments can significantly impact health. A well-planned built environment with green spaces, parks, and sidewalks can promote exercise and recreational activities. This can potentially reduce the risk of disease such as obesity and diabetes. Therefore, studying the connection between the built environment and health outcomes can help policymakers and public health professionals make informed decisions on improving health and well-being. We use the image-sharing platform, Flickr, to collect images falling under specific environments including single/multi-lane roadway, road light, sidewalk, and building types, etc. We use these images to train our environmental indicators. We apply the trained models to Google Street View (GSV images, which provide a valuable alternative to traditional, resource-intensive, and time-consuming in-person assessments of the built environment. We aim to examine the environmental factors that contribute to community health and well-being of residents living in Durham County, a largely urban setting, compared to those living in Robeson County, a predominantly rural area in North Carolina.

14 - Retracing Chicana Feminism in El Movimiento and the Deep South

Brenda Chavez Soriano, *History*

Mentor: **Christopher Woolley**

Abstract:

In the 1960s, "El Movimiento" was a path for Chicana/o's to push forward the need for basic human rights and civil rights. The constant discrimination of being Chicana/o impacted Mexican Americans throughout their life including the workforce, education, and housing to name a few. However, the struggle was largely seen through the eyes of many Chicanas advocating for their people and their roots. Chicanos heavily relied on the thought of machismo to marginalize Chicanas throughout their process in justifying Chicana Power in "El Movimiento". Chicana power included two major roles, Chicana Feminist and Chicana Loyalist. Chicana loyalists fought for the cause while holding close Mexican roots. This project will analyze how both contributed in their own ways to "El Movimiento" by focusing on gender oppression, class, and race discrimination. With the help of academic secondary and primary sources, there will be an opportunity in the future to create a digital platform that can be easily accessed by those interested in learning about Chicana history in North Carolina. The research will continue pushing forward for Mexican-American rights in the twenty-first century.

15 - Perceptions of Risk Factors for Child Maltreatment and Social Service Utilization in Robeson County

Elizabeth Chavis, *Sociology & Criminal Justice*

Mentor: **Corey Pomykacz-deSouza, Matthew Schneider**

Abstract:

Child maltreatment is an ongoing and costly issue in the United States and Child Protective Services (CPS) agencies are task with combating this issue and reuniting families. However, research has shown the utilization of reunification services is low. This study focuses on child maltreatment and the utilization of services in Robeson County, NC, from the perspectives of social service workers. Focusing on Robeson County is important because the area is characterized by several risk factors for child maltreatment (CHRR, 2023). Data included 13 semi-structured interviews with social service workers with the DSS. Interviews were transcribed and analyzed using a deductive approach. Three themes have begun to emerge: 1 systemic inequalities and 2 personal characteristics of parents/caregivers and 3 limitations in the quality of provided services particularly pertaining to substance abuse treatment negatively impact service utilization and reunification efforts. These findings suggest improving service quality and communication pertaining to racially diverse communities and those characterized by high rates of substance abuse may increase service utilization and reunification.

16 - The Effect of Stocking Density on Water Quality, Growth, and Survival of Blue Tilapia (*Oreochromis aureus*) in an Aquaponics System Raising Lettuce

Connor Chessick, *Biology*

Tyler Locklear, *Biology*

Jerrod Straiter, *Biology*

Mentor: **Sean Hitchman**, **Bryan Sales**

Abstract:

Agricultural production strives for sustainability and stewardship of the land but realistically it results in overworked land due to profit greed and food insecurity and wastes enormous amounts of freshwater. A solution that recycles water, produces more leafy crops per footage, and offers opportunity for profit would be utilizing an aquaponics system for food production. Aquaponics production utilizes fish waste to provide plants with essential nutrients needed for growth. This experiment began in early February with the cycling of an outdoor aquaponic system at UNCP Garden and Apiary. The study has two primary objectives: 1 examine the effect of stocking density of Blue Tilapia on growth rates, survivorship, and water quality and 2 determine which cultivar of lettuce paired best inside an outdoor aquaponics system containing blue tilapia with different stock densities within each fish tank. However, prior to stocking the system with fish, the system must first cycle for 4-6 weeks to allow for the colonization of nitrifying bacteria that converts ammonia to a more usable form of nitrogen for the plants. In addition, other water quality parameters (e.g., temperature, dissolved oxygen, pH) need to be closely monitored to ensure the successful acclimation of the fish stock. Here, we present information and procedures for successful acclimation and stocking of Blue Tilapia. Results from the stocking density and growth of cultivars studies will be presented at a later date.

17 - Gene Annotation of CNK in *Drosophila Subobscura*

Connor Chessick, *Biology*

Mentor: **Maria Pereira**

Abstract:

Genome annotation is the process of deriving the structural and functional information of a protein or gene from a raw data set using different analysis, comparison, estimation, precision, and other mining techniques. A student with an interest in gene annotation will go through a set of six modules, the modules teach the components (exons, introns, UTRs, etc.) that make up a genome that allow scientists to determine if a gene is a part of the same species or a different species of the same genus. Genomics Education Partnership (GEP) is a national, collaborative, scientific investigation of a problem in genomics. I plan to work on a species that is a relative of *Drosophila melanogaster* called *Drosophila subobscura*. The current focus is on annotating the CNK gene, CNK is said to be a part of the insulin pathway in *Melanogaster* and *Subobscura* it produces a protein that enables MAP-scaffolding, protein binding, and intracellular signal conversion. CNK has two neighboring genes apart of the *Drosophila* genus called I(2k01209 which is a gene that produces a protein to

enable uridine kinase activity and Prosalpha5 which is a proteinase that cleaves peptides. Using the pathways project allows a better understanding of the *Drosophila* genus's evolution and functional pathways, you can view multiple genes already annotated and use that to compare to the other species.

18 - **Modern Parenting: Is Climate Change A Factor?**

Kiki Cohen, *Sociology & Criminal Justice*

Mentor: **Brooke Kelly, Matthew Schneider**

Abstract:

Climate change is a pressing issue that garners significant attention from policymakers, politicians, the media, laypeople, etc. Yet, this attention has not translated into board policy, cultural, and individual-level changes necessary to avoid the worst effects of a rapidly warming world. Over time, we have seen the impact of the climate crisis through phenomena including stronger storms, increasing temperatures, wildfires, etc. Due to the politicization of environmental protection, the public has not made this an easy topic to address. As time passes, future generations are born and climate change trends continue to worsen. This study examines whether or parents are considering climate change as a factor when making family related decisions. The methodology of this study consists of interviewing participants between the ages of 18-55. The research has been granted IRB approval and interview have been conducted over the 2023-2034 academic year.

19 - **Characterization of Dyspnea in Dysautonomia: Challenges in Conducting Longitudinal Patient Reported Outcome Study**

Ava Cox, *Biology*

Dreena Vanderburg, *Biology*

Mentor: **John O'Dell, Silvia Smith**

Abstract:

To characterize the prevalence of shortness of breath in people affected by disorders of the autonomic nervous system, or dysautonomia, we conducted a longitudinal patient reported outcome study in Spring 2023. The 760 enrolled participants completed five surveys, which allowed us to determine the prevalence of dyspnea, its effects on quality of life and on the ability to complete daily activities. In Spring 2024, participants were asked to complete the same questionnaires to determine if there was a change in dyspnea pattern or their diagnoses. We sent three email reminders using REDCap. To increase compliance, we partnered with Normalyte, who offered participants a 50% discount code for one year for their products, which are commonly used to relieve dysautonomia symptoms. The scope of this study is to determine the participant retention rate. Although participants agreed to complete surveys for a three-year period by signing the informed consent document on year one, the participant response rate for year two was 43%. This could be due to psychological and logistical reasons, or to our cohort structure.

20 - Implementation of the BB84 Keypad Protocol Using Excel

Aiden Crabill, *Chemistry & Physics*

Mace Garza Velarde, *Chemistry & Physics*

Daniel Smith, *Chemistry & Physics*

Kaceion Williams, *Chemistry & Physics*

Mentor: **William Brandon**

Abstract:

To enhance student learning of quantum cryptography (QC, an Excel application was implemented simulating the BB84 protocol. This exercise, in conjunction with a pseudo-quantum apparatus combining quantum key distribution with one-time pad encryption, thoroughly introduces undergraduate students to the subject of QC. The apparatus for transmitting information through polarized photons states as encoded random sequences of bits, seamlessly lends itself to using the ubiquitous software, Excel. In fact, the implemented algorithm simulates the entire experimental procedure. Carefully working through the explicit rules (i.e., Excel syntax corresponding to each optical device invariably leads to a better understanding of the physics and hardware.

21 - Annotation of the Fmr1 gene, a Negative Regulator of the Insulin Receptor Signaling Pathway, in Drosophila Suzukii

Thalia Crespo, *Biology*

Mentor: **Maria Santisteban**

Abstract:

The Genomics Education Partnership (GEP) is a consortium of +200 faculty that aims to bring authentic genomics research into the undergraduate classroom. The current focus of the Pathways project, which investigates how the network architecture affects the evolution of genes, is on the insulin signaling pathway. This pathway is highly conserved in metazoans and it is required for development, metabolism, and behavior. Students annotate genes in the pathway in various species of *Drosophila* and their rate of evolution is correlated to the position of the gene in the pathway. I contributed to the project by carefully annotating the Fmr1 gene in *Drosophila suzukii*. The Fmr1 gene is the single fly ortholog of the human FMR1 (fragile X mental retardation). I first assigned orthology and analyzed the genomic neighborhood (synteny, which can highlight changes that may impact rates of evolution. Second, I propose a gene model which helps with identification of the regulatory region and changes in gene exon and isoform structure. The Fmr1 genomic neighborhood was found to be identical to the reference species, *D. melanogaster*, except for a new putative protein-coding gene present upstream of Fmr1 in *D. suzukii*. The structure and number of isoforms showed a high level of conservation between the two species, which may be expected since they are evolutionarily close (~7MYA). An interesting feature of our annotation was finding two isoforms with a non-canonical CUG codon.

22 - How Mental Health Impacts Law Enforcement Calls For Service

Rachal Davis, *Sociology & Criminal Justice*

Brett Sasser, *Sociology & Criminal Justice*

Mentor: **Victoria Kurdyla**

Abstract:

Online interviews are being held with police officers in the state of North Carolina. Within interviews officers will be responding to questions pertaining to a series of vignettes depicting a call involving an emotionally distressed person. Each vignette varies in detail with initial vignettes depicting vague scenarios with limited background information on the emotionally distressed person while later vignettes describe detailed descriptions of the scene with clear mention of a mental health diagnosis. This variation is meant to capture how officers perceive behavior without a clear label as well as how they understand specific mental health labels. Furthermore, officers often respond to scenes only with the detail given by dispatchers which may or may not be detailed. For each vignette, participants are asked what they perceive is happening, what they perceive is the cause of this situation, how dangerous they perceive the scene to be, and how they would secure the scene. Furthermore, participants are asked to describe how they visualize the scene and what degree of force they believe is appropriate. Interview transcripts are being analyzed using thematic analysis to explore larger patterns and themes in how participants understand mental health and utilize this understanding in their responses. Data collection is completed and is expected to be finished in February. This research is part of a student-led project.

23 - Understanding Patterns of Fish Diversity in North Carolina Watersheds

Ellissa DeFeyter, *Biology*

Mentor: **Sean Hitchman**

Abstract:

Information on alpha, beta, and gamma diversity is fundamental to conserving biodiversity and the functions and stability of ecosystem processes. While alpha and gamma diversity are commonly studied, beta diversity is often ignored. Beta diversity reflects two different components: nestedness and spatial turnover. Nestedness of species assemblages occurs when the community at the sites with less species are subsets of the community at the sites with higher species richness. Nestedness generally reflects a non-random process of species loss (Baselga 2010). Spatial turnover implies the replacement of some species by others because of filtering through environmental variables (Baselega 2010). Here, we examine fish diversity patterns in four North Carolina watersheds using datasets from the North Carolina Division of Water Resources. Specifically, we examined spatial and temporal patterns of alpha (local and beta (between diversity within each watershed and the effect of stream ecosystem health on species richness.

24 - Evaluation of Carbon Cycling within a UNCP Campus Pond

Ellissa DeFeyter, *Biology*

Mentor: **Amber Rock, Tanner Williamson**

Abstract:

The cycling of carbon through ecosystems can impact the levels of CO₂ in the atmosphere, which can affect the strength of global climate change. Recently, studies have shown that small freshwater ponds may play a disproportionately large role in the carbon cycle relative to their size. Ecosystem metabolism calculates carbon fluxes and can be defined as the total amount of carbon processed by the organisms in a particular ecosystem. Primary production (photosynthesis absorbs CO₂ from the atmosphere while cellular respiration emits CO₂ to the atmosphere, and ecosystem metabolism evaluates the relative rates of each process. The goal of this project was to estimate ecosystem metabolism in one of UNCP's campus ponds. We used a data logger to collect temperature and dissolved oxygen data from the pond, which we coupled with weather data from a weather station on campus in order to run ecosystem metabolism models in R. Our preliminary results indicated the pond emitted slightly more CO₂ than it absorbed in October 2021 and April 2022. In December 2021, the pond emitted much more CO₂ than it absorbed, and in August of 2021 the pond absorbed much more CO₂ than it emitted.

25 - Analytical Study of Phase Modulation in Semiconductor via Spatial Self-Phase modulation

Riley Edwards, *Chemistry & Physics*

Mentor: **Tikaram Neupane**

Abstract:

The method used for this research is Spatial Self-Phase Modulation. This method uses two different points from two different waves in the same transverse area to modulate a new wave. To do this MATLAB code was used to simulate this equation by changing different factors of the equation to modulate the transverse wave. The factors of this research are sampled to screen distance, wavelength, phase shift, and intensity. This was used to see how a light wave would affect a semiconductor MoS₂ (Molybdenum disulfide which has an absorption coefficient of $1 \times 10^{-5} \text{ cm}^{-1}$). To see changes in the radius and rings of the wave is measured and recorded by changing one of the factors ten times with the others staying at a neutral value. By doing this we can see how Spatial Self-Phase Modulation affects an atomic layer semiconductor.

26 - Probation and Parole

Diana Evans, *Sociology & Criminal Justice*

Mentor: **Renee Lamphere**

Abstract:

Robert Martinson an American sociologist, published a study in 1974 titled "What Works?" The study focused on the flaws of existing prisoner rehabilitation programs and was extremely influential, giving rise to the "nothing works philosophy. Martinson believed "nothing works" because we do not have qualified individuals to implement rehabilitation programs effectively. My project includes a content analysis of all 50 states. This analysis will determine how probation and parole are listed on websites. This analysis will determine whether or not states have a mission statement, compensation/benefits, education/experience, and evidence-based practices, listed on their website. This analysis will answer questions such as: What kind of people are we hiring for probation and parole positions?... Why are people attracted to probation and parole positions?... Which states have evidence-based practices? What does the overall website focus on? These websites will determine what states have information and what states do not. Sometimes the findings of the states that do not have information are just as important as the states that do. This project will present the findings of my research on probation and parole. It will include a content analysis of websites and articles I have read. This project will be influential in the way we look at probation and parole.

27 - Oral Histories on the Quality of Life of 1st and 2nd Generation Latinos

Teresa Fernandez, *Kinesiology*

Mentor: **Joseph Sweet**

Abstract:

The Latino population is growing exponentially in the United States every year (Cavazos-Rehg et al. Immigration has always played a part in the growth of this country. While the US economy would be nothing without the Latino workforce, the statement only goes to show how they are being exploited for cheap labor (Mandeel, 2014. Targeting the undocumented community today would include things such as inability to get a drivers license, traveling to certain states with a risk for deportation, limitations to healthcare, and inability to work (SB1718, 2023. Even if not directly affected by policies that hurt undocumented immigrants, documented Latinos are at a high risk for racial profiling and discriminations (Abraído-Lanza et al, 2016. That is what is included in policies such as SB1718 (F. Many more politicians seek to make these policies in their home states. Many myths and hurtful vocabulary surround members of the Latino communities already, now policies such as SB1718 are being implemented to harm them (Araujo, 2016. Stereotypes follow Latinos around and even have implications for health risks due to discrimination (Abraído-Lanza et al, 2016.

28 - Utilizing Cis Editing Techniques and Bioinformatics to Alter Plant Senescence with CRISPR/CAS9

Dean Foggan, *Biology*

Mentor: **Seth O'Conner**

Abstract:

World hunger is still a major problem throughout the globe. To curtail this, scientists utilize the molecular editing tool CRISPR-cas9 to engineer advantageous crop traits such as altered senescence. This project has three goals: 1 clone a CRISPR construct to target cis regulatory regions of atNAP—an Arabidopsis thaliana transcription factor involved in senescence, 2 using bioinformatic tools, explore a connection between senescent tissue and gene evolutionary age, 3 generate a cis-editing gRNA database for all Arabidopsis genes with a lethal knockout phenotype. Nine gRNAs targeting known transcription factor binding sites in the atNAP promoter region were designed. Expression analyses revealed atNAP is strongly and uniquely expressed in the senescent leaf petiole and global analyses demonstrated that many evolutionarily conserved genes have their highest expression in the senescent leaf petiole. Further, to make cis-editing easier, a cis-editing gRNA database was created for “lethal phenotype” genes that contained 1,988 gRNAs. In summation, we developed cis-editing tools in *A. thaliana* as well as discovered an interesting connection between evolutionary age and senescence.

29 - **Molecular Biology of Prion Diseases**

Riley Fox, *Biology*

Mentor: **Marilu Santos**

Abstract:

This research project consisted of discussing the prion protein, and elements such as how it was discovered, its genetic makeup, diseases, how it affects different beings, and possible future research. My plan is to compact the research paper I have written into a poster format to be presented at the PURC conference.

30 - **Spectroelectrochemical Assay for Acetaminophen in Blood Serum**

Keirah-Lee Garry, *Chemistry & Physics*

Mentor: **Paul Flowers**

Abstract:

Spectroelectrochemistry (SEC describes the simultaneous application of electrochemical and spectroscopic techniques, most commonly involving the measurement of variations in light absorption or emission by samples undergoing electrolysis. Though SEC methods have been used for decades to investigate the fundamental traits of electrochemical systems, more recent applications have emphasized their use for quantitative chemical analysis. Research in our lab has been focused on the development of SEC assays for clinically relevant compounds, and we have developed a method for the determination of the popular analgesic / antipyretic drug acetaminophen in pharmaceutical products. As abuse of acetaminophen contributes to thousands of emergency room visits and hundreds of deaths in the US each year, we are adapting our SEC assay to the analysis of human

serum in hopes of developing a rapid point of care assay that could assist in the diagnosis of acetaminophen overdose. Our calibration studies indicate the presence of serum decreases the sensitivity of the assay in comparison to serum-free buffer media, possibly due to the formation of acetaminophen-protein complexes which prevent electrolysis. Results of these and related studies are summarized in this poster, along with ideas for future work to modify the assay procedure for improved analytical performance.

31 - Carolina Stone Tool Technology

William Godwin, *Sociology & Criminal Justice*

Mentor: **Robert Spivey**

Abstract:

"Carolina Stone Tool Technology" presents an accessible typology of spear points and arrowheads associated with Indigenous tribes of the Carolinas. Through the use of diagrams, timelines, and photo examples, a cursory account is given of these intriguing cultural artifacts.

32 - Minor League Baseball - Behind the Logo

Christopher Green, *Sociology & Criminal Justice*

Mentor: **Dennis Edgell**

Abstract:

Baseball, often hailed as America's pastime, holds a special place in the cultural and social fabric of the nation. This study shifts the focus from the commercialized realm of Major League Baseball (MLB) to the grassroots level of Minor League Baseball (MiLB). Employing the framework of Symbolic Interactionism, this research examines how shared experiences and social interactions contribute to the evolving meanings of MiLB team logos. This study delves into the geographical, historical, and sociological dimensions of select MiLB teams, exploring their significance in their respective locales and within the broader American urban hierarchy, from Class A to Triple-A levels. This study will also explain alternate identities such as *Copa de la Diversión*. Geographically, the analysis includes the spatial distribution of teams. Historically, the study traces each team's lineage, achievements, and local impact. Sociologically, it scrutinizes the cultural and traditional facets. This project aims to explore further understanding of the intricate interplay between sports, culture, and society, as reflected through the lens of team logos and their evolving symbolism.

33 - Sexualization and Gender Role Ideologies on Men's and Women's Magazine Covers

Genesis Gregory, *Sociology & Criminal Justice*

Mentor: **Miranda Reiter**

Abstract:

In the past decade or so, there has been an increase in sexually objectified portrayals of women in mainstream media, including magazine covers. Female cover models, even on magazines marketed towards women, are reduced to their bodies, which tend to be sexualized and objectified. Therefore, they are viewed as having her worth and appeal based on her appearance. On the other hand, male models on men's magazines are less likely to be sexualized, and more likely to display power and dominance. Gender role ideologies are also expressed in article topics displayed on magazines covers. These articles tell men and women what they need to read and learn about- what topics are important in their daily lives, and what they should focus on. Sexualization and objectification of models have been shown to decrease self-esteem and promotes self-hatred among consumers, and it is likely that readers internalize topics of articles as things they should focus on in their own lives. We are interested to compare messages that these magazines send their male and female readers about what they should look like, how they should dress, and on what they should focus and about what they should learn.

34 - Characterizing Changes in Shortness of Breath and Its Effects on Quality of Life Over Time: Insights from a Dysautonomia Patient Reported Outcome Study

Holly Hansen, *Biology*

Mentor: **Andrew Latham, Silvia Smith**

Abstract:

As of this time, there is no systematic assessment of shortness of breath, or dyspnea, in dysautonomia. In Spring 2023 we conducted a patient reported outcome study and enrolled 760 participants who completed three NIH-PROMIS® instruments to determine: 1 the prevalence of dyspnea in dysautonomia in the absence of dyspnea-causing comorbid conditions, and 2 the impact of dyspnea on quality of life. Individuals who are affected by conditions that can cause dyspnea (n=128 were not included in the subsequent analyses. We tested the hypothesis that there was no change in dyspnea and its related impact on quality of life and the ability to complete daily functions over the course of one year. Although retention rate for year two was low (42%, we found there is a difference in the proportion of individuals with dyspnea ($p = 0.00072$ from year two of the study as opposed to year one. We conducted a paired t-test for each of the three NIH-PROMIS® instruments and found no statistically significant difference in quality of life for those with dyspnea between year one and year two.

35 - Cross-Linguistic Speech Emotion Detection

Najmul Hasan, *Mathematics & Computer Science*

Mentor: **Shaohu Zhang**

Abstract:

This research investigates the efficacy of existing machine learning models in cross-linguistic emotion recognition. It focuses on adapting and fine-tuning state-of-the-art deep neural networks and natural language processing (NLP) techniques to interpret emotional states in multilingual speech. The study will evaluate the models' performance on diverse linguistic datasets to enhance their sensitivity to the nuances of emotional expressions in various languages. The outcomes of this research could contribute to more accurate and inclusive emotion detection technologies and provide insights into the complex interplay between language and emotion.

36 - Influence of Amendment Type on the Establishment of Highbush Blueberry

Cassandra Helms, *Biology*

Mentor: **Bryan Sales**

Abstract:

Blueberry is an acid-loving perennial with a shallow root system adapted to soils with a high amount of organic matter. It is a major agricultural commodity worldwide, and North Carolina is the fifth highest producer of blueberry in the U.S. Most commercial production of blueberry in North Carolina is in Bladen County, where soil type and a high-water table, results in low production costs. Identifying affordable pre-plant amendments and cost-effective planting methods could expand commercial blueberry production in North Carolina. This study seeks to investigate the growth and establishment of Northern Highbush Blueberry (*Vaccinium corymbosum* ArabellaBlue® 'FC14-062' with locally sourced organic amendments. Plants will be established on either a raised bed or a flat bed and incorporated with one of four different amendments: pine sawdust, pine straw, pine shavings with horse manure, and biochar. The blueberries will be planted on the UNCP Acres property in sandy loam soil with fertigation and irrigation delivered through a drip irrigation system. Plant growth and soil physiochemical soil characteristics will be monitored throughout the growing season. Pruning weights will be determined by treatment, followed by harvest weight in the second growing season. The results from this study may influence general commercial blueberry production within Robeson County and other upland soils throughout North Carolina.

37 - Healing the Future: The Emotional and Psychological Well-being of Indigenous Youth

Angelina Henhawk, *American Indian Studies*

Mentor: **Jane Haladay**

Abstract:

Suicide rates are skyrocketing among Indigenous youth, compared to the total population from 1999 to 2010, suicide rates were at almost 17% for Native Americans of all ages. This is much higher than the overall U.S. rate of almost 12%. Indigenous individuals endure the highest rates of lifetime traumatic events, including interpersonal violence, child abuse and

neglect, negative stereotypes and micro-aggressions, and poor health; physically, mentally, and emotionally. These incidents jeopardize the identity and society of Indigenous people. The need for emotional and mental support for these youth is evident, and contemplating how to provide such assistance becomes a pressing matter. The purpose of this study is to increase public awareness of the emotional and psychological well-being of Native youth and the importance of affirmative action. The data acquired is based on firsthand narratives from students at the University of North Carolina at Pembroke about their experiences regarding their emotional and psychological wellbeing. Adolescents from Indigenous communities need to be heard and understood because they are the future.

38 - Service-Learning Biodiversity Surveys at the Lumbee Tribe Cultural Center

Grace Herron, *Biology*

Adeline Kelly, *Biology*

Mentor: **Kaitlin Campbell**

Abstract:

Insects are used as bioindicators because they are sensitive to changes in their surroundings. Their diversity can tell us about restoration success and the general health of ecosystems. Since 2019, UNCP courses have been partnering with the Lumbee Tribe Cultural Center (LTCC) to aid them in achieving their conservation goals. Partnerships with Service-Learning courses include Entomology, Invertebrate Zoo., and Conservation Biology. These partnerships assist in surveying biodiversity and achieving aims for conservation monitoring. Due to ants' ease of sampling, relationship to ecological function, and known responses to habitat disturbance, ants have been strongly promoted as bioindicators in the courses, though all biodiversity has been inventoried. The partnership aids students in the courses in applying information and learning methods of surveying organisms, data analysis, and science communication. The entomology class noticed changes in ant abundance and declines in richness due to the invasive Asian Needle Ant. In total, 11 ant species were found. Students created signs about the findings, and 12 are printed and hanging along the trails at the LTCC with information on insects/arachnids in the area and how they play a crucial role in the environment. The significance of this research is that gathering baseline data about important bioindicator groups can demonstrate changes in total biodiversity at the Cultural Center and the effectiveness of conservation initiatives.

39 - The Impact of Honeydew versus Non-Honeydew insects on Ants in Longleaf Pine Savannas

Bailey Hrobak, *Biology*

Mentor: **Lisa Kelly, Kaitlin Campbell**

Abstract:

Ants are vital for the ecological food chain in many ecosystems. Longleaf pine savannas are important biodiversity hotspots and provide food, nesting materials, and habitat for the

ants. Ants thrive in the soil, leaf litter, and decayed logs. Food availability and abundance determine the success of ant colonies. Ants consume sugars secreted by honeydew insects as a source of carbohydrates. Insects also prey on non-honeydew insects as their source of proteins. The goal of this study is to determine how the quantity of different types of food resources, such as these two groups of insects, relate to ant biodiversity. The hypothesis is that the availability of food positively affects ant abundance and richness. We collected insects at three longleaf pine savannas using pitfall traps and sweep nets for ants, and sweep netting and sticky traps for honeydew and non-honeydew insects. There was a greater abundance of non-honeydew insects (3242 on sticky traps, from 3926 from sweep nets than honeydew insects (203 on sticky traps, 1158 from sweep nets. A total of 500 ants were collected from pitfalls and 671 from sweep nets representing 17 species. Ants protect plants through the consumption of eggs and larvae of pests, and they act as seed dispersers and soil regulators. Ants sustain the ecosystem through their roles as predators, herbivores, and seed dispersers. The relationship between ants and other insects is essential for environmental regulation in the longleaf pine savannas.

40 - Fin Photo Identification in Cape Fear River, NC

Vanessa Hughes, *Biology*

Mentor: **Brandon Sanderson**

Abstract:

The goal of this research project was to survey and identify individual bottlenose dolphins (*Tursiops truncatus*) in the Cape Fear River Basin. This geographic area of the East Coast is underrepresented in current research, and the purpose of identification is to document individuals, estimate abundance of dolphins, and assess the health of the dolphin population. The identification of individuals involves fin photo-identification and assessment of dolphin dorsal fins by analyzing distinctive notches and distinguishing marks on each fin.

41 - Political Influence on Censorship and Higher Education Faculty in the Humanities and Social Sciences in North Carolina

Jenna Humble, *Sociology & Criminal Justice*

Mentor: **Matthew Schneider**

Abstract:

The social sciences and humanities are intimately intertwined with current social, political, and cultural events in the world. The goal of the social sciences and humanities is to understand the impact of these events. Conservative politics has increasingly begun to aim its political agenda at politicizing the social sciences and humanities. This has been shown especially recently through efforts to censor scholars within these fields, particularly taking aim at topics such as gender studies, African American studies, and Critical Race Theory. This can be harmful, as identifying issues in the world around us allows us to solve them,

but we can only identify them and learn if we can discuss them with scholars in the fields that are at risk of being censored any further. For this study, 15-20 higher education faculty members in the social sciences and humanities will be interviewed to gain a deeper understanding of if/how they feel political censorship impacts them in their careers and how they navigate teaching subjects that are increasingly politicized.

42 - Mutualistic Dietary Relationships of Honeydew Insects, Invasive Fire Ants, and Invasive Plants in Longleaf Pine Savannas of North Carolina

Hunter Ivey, *Biology*

Mentor: Lisa Kelly, Kaitlin Campbell

Abstract:

Fire ant (*Solenopsis invicta*) diets consist of many different foods, including sugary plant juices obtained from honeydew insects, facilitating rapid colony growth and possibly invasion of new sites. Longleaf pine savannas are areas of conservation concern in North Carolina. Our previous work indicated fire ant establishment, and invasive ryegrass (*Lolium* spp.) was a significant component of fire ant diets, despite ryegrass not appearing in these sites. We hypothesized that mutualistic relationships between fire ants and honeydew insects are allowing fire ants to access ryegrass. We are using ITS2 and *rbcLa* DNA barcodes to compare plant diets of fire ants and honeydew insects. Sanger sequencing based on ITS2 showed ryegrass in the diets of both honeydew insects and fire ants, while the *rbcLa* showed no ryegrass in the diets of either. We plan to use next-generation sequencing to compare the diets of honeydew insects and fire ants. Invasive plants could provide a novel food source for invasive fire ants, and the connection between the diets of honeydew insects and fire ants could suggest a potential pathway for the arrival of these invasive plants into the fire ant diet.

43 - Analyzing and Comparing the Volume of Microplastics in the Lumber River Upstream and Downstream of Lumberton

Hunter Ivey, *Biology*

Mentor: Sean Hitchman

Abstract:

As plastic waste breaks down, the microplastics produced inadvertently end up in our waterways, which has led to microplastics being present in nearly every aquatic ecosystem around the world. Through biomagnification, these microplastics build up in the bodies of organisms over time, ultimately ending up in humans. The environmental and health risks of microplastics have been widely recognized, and legislation on both the national and international levels have been issued in order to help slow the effects of microplastics in aquatic ecosystems. We believe that the majority of the microplastics in the Lumber River can be traced back to the large towns and cities that sit on its watershed. Specifically, we believe that the abundance of microplastics will be much higher downstream from the city

of Lumberton as compared to the abundance of microplastics upstream from the city. By filtering water collected from both upstream and downstream of the city of Lumberton, staining the filter paper, and analyzing the dyed microplastics, we were able to create a summary of the distribution and abundance of microplastics in the Lumber river. This study will serve as a pilot study for further research into how the microplastics in the Lumber river behave in regard to the soil, flora, and fauna.

44 - Impact of Presenting at the Entomological Society of America Annual Conference November 2023

Hunter Ivey, *Biology*

Mentor: **Lisa Kelly, Kaitlin Campbell**

Abstract:

In November 2023, I traveled to attend the Entomological Society of America's annual conference in National Harbor, Maryland. While there, I presented my research, "Connections Between Invasive Plants and Diets of Honeydew Insects and Fire Ants in Longleaf Pine Savannas". This was my second year where I was able to attend this conference thanks to PURC, and it continued to improve my understanding of research in the academic world, help me to meet new peers in my field, and provide experience in presenting my research to my peers and professionals in my field. Additionally, I was able to build connections with people in the world of entomology and ecology that will help me as I pursue my career into my PhD.

45 - Street Art and the Making of Community and Cultural Identity: A Photo Exploration of Fayetteville's Wall of Honor

Brooklyn Jackson, *Sociology & Criminal Justice*

Mentor: **Matthew Schneider**

Abstract:

Street art allows those that create it to communicate and those who view it, understand and learn. Street art can be spray painting your favorite tv show character on the side of an abandoned building, creating a mural to pay homage to public figures, historical events while spreading a message to the community in which it resides. Art has the capability to touch the human spirit in an emotional and spiritual way and create an opportunity to share stories of the full spectrum of human existence (Gutierrez-Vicario, 2016). On a deeper level, art is a democratic form of expression. In this essay, I will be talking about the complexity of the "Wall of Honor" in Fayetteville, North Carolina and how African American murals have a history of fighting for a voice in a system of control and how color-blind ideologies try to maintain its white supremacy.

46 - Synthesis and Spectral Analysis of [Co(trien)(ampy)]Cl₃

Audrey Jacobs, *Chemistry & Physics*

Mentor: **Mark McClure**

Abstract:

The compound [Co(trien(ampy)]Cl₃ was synthesized by a reaction between [Co(trienCl₂)]Cl and 2-(aminomethylpyridine (ampy) using a mixture of ethanol and water as a solvent. The mixture was refluxed for ~4 hours then let rest at room temperature for one week. The crystals formed were removed by hand and dried. The product was dissolved in deuterium oxide and characterized by ¹H and ¹³C NMR using an Anasazi Eft-90 NMR spectrometer. Analysis of the spectra confirmed the successful formation of the desired compound with characteristic peaks corresponding to the asymmetric nature of the compound. The integrated proton spectrum confirms the chemical shift of the triethylenetetramine (trien) ligand.

47 - Determination of Isoelectric Point [pI] for Amino Acids and Peptides: A Stimulation Tool

Audrey Jacobs, *Chemistry & Physics*

Mentor: **Siva Mandjiny**

Abstract:

This program was designed to calculate the isoelectric point [pI] of amino acids, as well as simulate their movement in a solution of a user-defined pH. The program is able to draw titration curves for single amino acids. The titration curve page allows the user to view the pK_a values of the amino group, the carboxyl group, and the side chain where applicable. The isoelectric point is graphically displayed on the titration curve screen with the pK_a values, in addition to being displayed numerically on the solution screen above the solution. The program is also able to estimate the pI of peptides and show appropriate movement in solution when the user inputs the string of amino acids in single letter code.

48 - Presenting at the International Saxophone Symposium: Implementing Intervallic Improvisation Strategies in an Adam Hutcheson Masterclass.

Jaylen Jones, *Music*

Mentor: **Lindsey Jacob**

Abstract:

At the International Saxophone Symposium, an event hosted by the United States Navy Band at George Mason University, I performed in a masterclass by Adam Hutcheson, an accomplished saxophonist who has played at various notable jazz festivals and events around the world. During the masterclass he talked about the place large intervals have in improvisation and the various ways they can be used. Other topics discussed include

optimal practice strategies, why musically communicating with your fellow musicians is important, and the difference between improvising consciously vs. unconsciously. The purpose of this poster is to demonstrate the advanced improvisation techniques I have learned from the masterclass.

49 - Prevalence and Distribution of Superbug *Staphylococcus aureus* (MRSA) Across Three Counties in North Carolina, USA

Sayed Kabir, *Biology*
Mentor: **Marilu Santos**

Abstract:

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a strain of staphylococcus bacteria resistant to commonly used antibiotics. Widely known as "superbug", this bacterium is highly communicable and often classified as hospital-acquired (HA) and community-acquired (CA). Approximately 25% of all hospital-acquired isolates are oxacillin-resistant (ORSA). However, in the United States, there has been an increase in the frequency of community-acquired ORSA infections. This study aims to survey the presence of CA-MRSA and CA-ORSA and identify factors such as age, socio-economic status, and population densities associated with their acquisition and infection. Samples were taken from public locations such as retail, public service, and recreational areas in Cumberland, Hoke, and Robeson Counties in NC. Identifies surfaces were swabbed, the samples were transported to the Microbiology Laboratory, UNCP and inoculated onto selective chromogenic screening agar. The growth was screened after 24 hours for petite denim blue colonies indicative of MRSA and pink colonies indicative of ORSA. From a total of 68 locations, 44% were found to be positive for CA-MRSA. While 38% were found positive for ORSA. Data collection and analysis showed that lower-income counties had a higher rate of MRSA in collected samples. Data supports the link between bacterial presence and age, as a greater percentages of MRSA were found among locations tailored towards youth.

50 - The Seasonality and Outcomes of Same-Sex Aggressive and Mating Interactions in Eastern Box Turtles (*Terrapene carolina*)

Matthew Ketner, *Biology*
Mentor: **John Roe**

Abstract:

Eastern Box Turtles are a widespread terrestrial reptile that have been the focus of much ecological research. However, we don't have an understanding of their social interactions and how these may contribute to population dynamics. Here, we studied social behaviors of box turtles in two populations, one in the Sandhills and another in the Coastal Plain, using radio telemetry. We tracked 55 individuals and recorded whether they were interacting with other individuals in either mating or same-sex aggressive behaviors. We captured turtles and measured their mass and straight-line carapace length after behavioral

observations. We expected these interactions to be seasonally variable and that during same-sex interactions the aggressor would be larger in body size. We observed 63 same-sex and 73 mating interactions. We only observed males in same-sex aggressive interactions, in which the aggressor was larger in straight-line carapace length 64.7% of the time and larger in mass 76.5 % of the time. The most observed behaviors were mounting (32.3% overturning (16.1%, biting (4.8%, and scratching (1.6%. Mating interactions peaked in August, while social interactions were bimodal, peaking in spring (May and late summer/early fall (August – October. This supports our hypotheses that social interactions are seasonally variable, and that body size influences outcomes of aggressive interactions in males. Currently, we are using radio telemetry to track juvenile box turtles and record their behaviors. With this information, we plan to document when these behaviors/interactions begin and what it means for the timing of sexual maturity. Such information could improve our understanding of population dynamics in box turtles.

51 - Preliminary Study on Dual-Phase Polarimeter with Wollaston Prism

Nicolas Kincaid, *Chemistry & Physics*

Francisco Pedroza-Rojas, *Chemistry & Physics*

Mentor: **William Brandon, Tikaram Neupane**

Abstract:

The role of Jones matrices and their corresponding computational study is crucial in modern optics and photonics research, particularly for investigating polarized-resolved optical properties in optoelectronics, bioimaging, and ocean optics via Dual-Phase Polarimeter. This study focuses on establishing the fundamental computational details of output intensity from the Wollaston prism (WP, which functions for both crossed and parallel polarized light. The experimental setup is carefully devised to measure the intensity of each of the two output beams generated by a rotating polarizer positioned between a vertically linear polarizer and the Wollaston prism. The work concentrates on deriving the Jones matrix for the rotating polarizer and its application in experimental design. Results show that the amplitude of the cross-polarizer output is significantly lower (approximately four times smaller than the output from parallel polarizer, as expected from the experiment's nature. Additionally, the parallel polarizer output conforms to the Malus law, a finding verified through both computational simulations and experimental observations.

52 - Hooves for Hawks: Benefits of Animal Assisted Intervention for College Student Mood and Optimism

Isabella Locklear, *Psychology*

Mentor: **Rachel Morrison**

Abstract:

Previous research has demonstrated the benefits AAIs can have on college student mood and stress (Parbery-Clark et al., 2021; Robino et al., 2021); however, little is known about its potential impact on optimism. The purpose of this study was to determine if the implementation of an AAI would impact students' short-term affect and optimism levels. The hypotheses were that the AAI would promote greater optimism levels and positively impact mood. For this pretest-posttest within subject's design, two miniature horse and handler teams from the non-profit organization Stampede of Love to served as the AAI. Participants comprised of 55 college students who attended a 2-hour AAI event on campus at the beginning of the semester. Even though participant optimism and mood were moderately positive prior to the AAI, these dimensions significantly increased following the interaction. Further research is needed to determine the effect of the type of animal used for the AAI and how AAI can promote student optimism. The time of year should also be accounted for to determine which point in the academic semester that these AAI interventions may be most impactful.

53 - Plants in Space: Developing assays to test effects of microgravity on *Arabidopsis thaliana*

Kyra Locklear, *Biology*

Mentor: **Seth O'Conner**

Abstract:

As interest in space flight and potential colonization grows, efforts are being made to explore the genetic mechanisms of plant growth in space. Without sending a plant to space, a clinostat can be used to simulate microgravity by slowly rotating plants. Using an AC motor rotating a 3 rpm and a continuous servo motor connected to an Arduino UNO board, tests were run using *Arabidopsis thaliana* (*A.thaliana* seeds plated on an agar plate. To explore genetic influences on spaceflight, data from RNA-seq experiments on *A.thaliana* root expression in microgravity. One such gene was AGP24. Further analyses showed that AGP24 appears to be an orphan gene and while it is robustly expressed, there is no evidence it is translated into a protein. To determine if AGP24 is involved in microgravity response, guide RNAs were designed to target AGP24 using CRISPER - CAS9. In summation, this work approaches microgravity research in three ways: technologically, by creating two clinostats, bioinformatically, by analyzing RNA seq data, and molecularly by designing CRISPER guides for future cloning.

54 - Spectroelectrochemistry on a Shoestring

Malia Locklear, *Chemistry & Physics*

Mentor: **Paul Flowers**

Abstract:

This poster summarizes our research on the design, fabrication, and characterization of a cost-effective device for chemical analysis that is tailored for use with common laboratory

instruments. The device permits quick, convenient loading of samples using a syringe without the need for disassembly / reassembly. It may be used for both electrolysis and light-absorption measurements, either separately or simultaneously (a technique known as spectroelectrochemistry, SEC). Inexpensive materials are used to fabricate the device, including a plastic cuvette, graphite pencil leads, thin silver wire, carbon foam, and plastic tubing. At a total cost of less than \$6, our device is an economical alternative to commercially available devices priced at hundreds to more than one thousand dollars. The performance of this device is being evaluated through a series of measurements on a standard chemical compound, and results so far compare favorably to those obtained using a commercial device.

55 - Impact of Attending the 44th International Saxophone Symposium

Julian Locklear, *Music*

Daniel Henry, *Music*

Mentor: **Lindsey Jacob**

Abstract:

Our poster highlights some of the performances and presentations that we observed while attending the 44th International Saxophone in January of 2024. Over the two days of the symposium, we attended multiple saxophone quartets with a range of performance experience (undergraduate, graduate, and professional). There were several hundred presentations throughout the two days. Small ensembles and quartets performed diverse classical pieces, premiere pieces, and jazz repertoire while professionals gave masterclasses on numerous subjects surrounding everything saxophone. At the end of each day attendees gathered to watch large performances hosted by the United States Navy Concert Band and United States Navy Band Commodores. The experience gained from attending the event made us consider more how we play with our tone quality and the music we play as an art form.

56 - The University of North Carolina at Pembroke Herbarium Digitization

Shannon Lowry, *Biology*

Mentor: **Lisa Kelly**

Abstract:

A herbarium is a collection of preserved plant specimens that can be used in many different ways, like academic studies, taxonomic referrals, and public outreach. Digitizing a herbarium's collection allows these specimens to reach a broader audience and not be restricted to the academic realm. Digitization and outreach can be made possible by herbaria databases like SERNEC, or the Southeast Regional Network of Expertise and Collections, which hosts 233 collections across the southeastern United States. Through a collaboration with North Carolina State University, most UNCP Herbarium (PEMB) was digitized for SERNEC in 2017. In 2019, PEMB acquired the North Carolina Zoo Herbarium

(NCZP. We are continuing to expand the PEMB collection and are now doing in-house digitization. The PEMB Herbarium utilizes the SERNEC database, making the collection accessible online. Labels can be transcribed and all the crucial information is accessible to the general public. We have digitized ~200 specimens, filed the NCZP specimens, transcribed hundreds of labels on SERNEC, and georeferenced ~4% of the PEMB collection. Although we made great strides in the summer of 2023, efforts are still ongoing.

57 - Molecular Analysis of Honeybee (*Apis mellifera*) Pollen from the UNCP Apiary

Shannon Lowry, *Biology*

Mentor: **Lisa Kelly**

Abstract:

Honeybees (*Apis mellifera*) play a significant part in the pollination services of agriculture and their local environment, acting as highly effective pollinators of our food crops and wild plants. Bees perform the majority of pollination for our cultivated crops with bee-pollinated crops contributing to one-third of the human dietary supply. With the creation of the University of North Carolina at Pembroke (UNCP Garden in 2014, an apiary was also created to enhance flower pollination. Honeybee pollen has been collected from the UNCP Apiary for several years. The DNA from two pollen samples was extracted using a commercial kit with the hopes of discovering their botanical origin by locating and sequencing the gene of interest, *rbcL*, which encodes for the large subunit of ribulose biphosphate carboxylase, an enzyme that is in the chloroplast. This study found that honeybees collected pollen from *Camellia sinensis*, an ornamental nonnative evergreen flowering plant, and pollen from the genus *Rubus*, a large group of native flowering plants commonly known as blackberry. This discovery can provide insight into honeybee interactions with pollination gardens and their plant preference.

58 - Media Vs. Reality: Various Effects, Coping Skills and Social Support of Children of Sexual Abuse

Heather Lowry, *Sociology & Criminal Justice*

Mentor: **Abigail Reiter**

Abstract:

Media coverage of child sexual abuse can raise societal awareness, inform the public about signs of abuse, and help people appreciate the value of programs and regulations that protect children. Though there is scientific evidence that childhood sexual abuse increases the risk of crime, violence, and further abuse, it is important to remember that media portrayals of child sexual abuse may not always accurately reflect the effects and coping mechanisms of survivors. Methods of data collection will consist of content analysis of movies from the 1990s and more recently to determine whether the consequences, coping mechanisms, and social support depicted in the media are accurate. Does the media reflect the reality of coping skills and effects associated with sexual and physical child abuse?

While media coverage can be useful in spreading awareness, it is vital to weigh the risks and advantages and make sure that it accurately portrays the impacts and coping mechanisms of child abuse survivors. The media also have a societal obligation to support programs and policies that safeguard children.

59 - Compressive Strength of 3d Printed Parts

Psi Lupton, *Chemistry & Physics*

Mentor: **Steven Singletary**

Abstract:

Additive Manufacturing (AM, also known as 3D printing, has gained in popularity over the past several years as the cost of printers has dropped and the range of available print materials has increased. With the proliferation of products on the market with parts made by additive manufacturing there are certain concerns on the strength of these parts. In addition, the literature addressing these concerns have not been able to keep up. The goal of this study is to fill some of the gaps in literature we are currently facing. For this part of the study, our main concern is on how different print parameters affect the compressive strength of individual parts.

60 - Fast Fashion: Understanding Patterns of Consumerism

Cara Martin, *Sociology & Criminal Justice*

Mentor: **Melanie Escue**

Abstract:

Fast fashion, an industry that harms the environment and exploits human labor, is an ongoing contemporary issue not widely understood. The purpose of this study is to examine the contributing factors in fast fashion consumerism, including, but not limited to, body image, race, ethnicity, socioeconomic status, and gender among students attending the University of North Carolina at Pembroke. Participants will be asked via an online survey to indicate if they participate in environmentally friendly shopping and if there are any preventative factors. The importance of this research is to understand what barriers are contributing to environmental injustice, and how we can remove those barriers amongst various identity groups through civic and community engagement. Understanding patterns in fast fashion consumerism allows us to find strategies to combat environmental harm, human rights violations, and foster inclusive practices.

61 - Measurement and Display of Water Quality in Select Areas of the Lumber River

Lillian Matthews, *Geology & Geography*

Mentor: **Amber Rock**

Abstract:

The purpose of this research was to measure and display the water quality of the Lumber River by testing for nutrients, physical characteristics, and Escherichia coli. To do this we repeatedly collected samples from four selected boat ramps along the Lumber River and tested these samples using a YSI ProDSS, Hach test kits, a turbidimeter, and Colilert kits. We then projected this data onto a map using the program ArcGIS. We hypothesize that the cities, the wastewater plant, and agriculture will affect the water quality and have negative implications and that there will be a need for better water quality maintenance. We hypothesize that the cities and agriculture will create overabundant nutrients that can cause algal blooms and that the wastewater plant will cause higher amounts of E. coli and other coliform bacteria. Anoxic environments created by algal blooms could disrupt the entire ecosystem of the river and the area surrounding it. High amounts of E. coli could cause the people who use the river recreationally to get sick. Currently, our research is yet to be complete, however, we plan to create a paper on this research and present our findings to the Lumber Riverkeeper.

62 - Mapping of the Lumber River in Robeson County and its Process

Lillian Matthews, *Geology & Geography*

Mentor: **Nathan Phillippi**

Abstract:

The scope of this research was to accurately portray the Lumber River through the cartography software, ArcGIS Pro, and to describe the process of creating river maps. The available data and maps prior to this research were lacking detail and were simple outlines of the river. This research intends to provide the public with a detailed scope of the Lumber River. Data was obtained from the United States Geological Survey, the United States Department of Agriculture, Natural Earth, the United States Census Bureau, and local documents

63 - Imposter Syndrome, Race, and Gender

Kei'Ana Mims, *Psychology*

Mentor: **Abby Nance**

Abstract:

This study was conducted with the goal of understanding the role both race and gender play in the feelings of imposter syndrome. The sample consisted of 164 participants ranging from ages 18 to 52. Hypotheses one and two were that people of color would report experiencing higher levels of imposter syndrome than non-people of color, and BIPOC (Black, Indigenous, and People of Color) would report experiencing higher levels of imposter syndrome than White people. Hypotheses three and four were that non-women of color would report more feelings of impostorism than non-men of color and that white women would report more feelings of impostorism than white men. Finally, hypotheses

five and six were that men of color would report higher levels of impostorism than women of color, and BIPOC men would report higher levels of impostorism than BIPOC women. None of these hypotheses were supported. These findings contradict the findings of other studies.

64 - Impact of Attending and Presenting the 2024 APS Annual Convention May 2024

Kei'Ana Mims, *Psychology*

Mentor: **Kelly Charlton**

Abstract:

In May of 2024 I will be attending the 2024 APS Annual Convention. While this will be my second time attending, it will be my first time presenting my own research as first author. My study is titled "Perceptions of Health Information." This trip is only possible because PURC, the Maynor's Honors College, and Dr. Charles Humphrey are helping fund it. This will provide me with more experience presenting research, especially research that I was a part of constructing and conducting. I will once again, get the chance to meet researchers from around the world, and I will also be working as a student volunteer at the conference this year so I will be gaining more volunteer hours to add to my cv. I'm very excited to see all of the research that will be presented this year.

65 - Impact of Attending and Presenting the 2023 APS Annual Convention May 2023

Kei'Ana Mims, *Psychology*

Mentor: **Kelly Charlton**

Abstract:

In May of 2023, I attended my first national research conference (2023 APS National Convention. Dr. Kelly Charlton made me first author on a poster for a research study titled "Covid, Childhood Experiences, and Personality." In addition to Dr. Charlton giving me this opportunity to learn how to create and present a research poster, PURC gave me funding that helped me afford to make the trip. This trip allowed me to meet psychological researchers from all over the world. I talked with students (both undergraduate and graduate as well as Ph.D. holding researchers. I learned how to present research, developed my speaking skills, and I learned so much from hearing about the work that others have done.

66 - Perceptions of Health Information

Kei'Ana Mims, *Psychology*

Mentor: **Kelly Charlton**

Abstract:

The purpose of this study was to analyze personality traits that influenced belief in different alternative health practices. The sample consisted of 107 undergraduate students (66.4% women, 30.8 men, and 2.8 non-binary, ranging from ages 18 to 60). The first hypothesis was that a negative correlation would be found between intellectual humility and unwarranted beliefs. The second hypothesis was that a positive relationship would be found between intellectual humility, open-minded thinking, and a participant's likelihood to change their opinion when presented with new information. Hypothesis one was not supported. There was no correlation found between intellectual humility and unwarranted beliefs. However, there was a correlation found between a lack of intellectual overconfidence. The second hypothesis was supported. Intellectual humility and open-minded thinking were positively correlated. Additionally, a negative correlation was found between unwarranted beliefs and open-minded thinking, with positive correlations being found between age and intellectual humility, as well as age and respect for other's viewpoints.

67 - POTS vs. EDS (A Study of Correlation)

Ariana (Gracie) Montanez, *Biology*

Olivia Peal, *Biology*

Mentor: **Silvia Smith, John O'Dell**

Abstract:

Postural orthostatic tachycardia syndrome (POTS) is a type of autonomic dysfunction characterized by orthostatic intolerance, rapid heart rate, dizziness, and blood pooling. This group of inherited disorders causes defective collagen proteins or other proteins that work to interact with collagen. This faulty interaction results in damage to skin, joints, and blood vessel walls. We conducted a patient-reported outcome study and enrolled 750 adult participants with a self-reported formal diagnosis of any type of dysautonomia. We tested the null hypothesis that there is not a statistically significant relationship between POTS and EDS. We used R (multiple regression analysis) to determine any correlation between POTS, EDS, and different demographic variables, including any interactions between race and gender. At the 95% confidence interval, multiple variables (EDS, female, and white and demographic interactions (age*female, age*white, age*Hispanic, female*white, and age*female*white) were significant, showing the predictive effect on whether a person will have POTS.

68 - Dark Personalities: How do Pathologies Succeed and Advance?

Jorden Moore, *Psychology*

Mentor: **Shilpa Regan**

Abstract:

This study investigated how normal personality traits are viewed compared to both narcissistic and psychopathic traits in the workplace. The results found that there were

significant differences in willingness to work for these individuals, hiring potential, workplace fraud, and perceived confidence.

69 - OK Boomer: How We React to Racism Varies By Their Age

Shakira Moran, *Psychology*

Mentor: **Brian Smith, Kelly Charlton**

Abstract:

This study explores how younger adults perceive and react to racism from an older adult compared to younger adults. Prior research has shown that older adults are more at risk of being categorized with stereotypic intergroup similarities of ageist beliefs by younger adults (Wisdom, 2005). We hypothesized that younger adults would be more lenient and excuse an older adult for expressing racist attitudes. In addition, we also hypothesized that younger adults would be more critical of a younger adult expressing racist behavior. We decided to use a vignette to investigate how negative stereotypes toward older adults impact how younger adults react when an older adult expresses racist attitudes.

Participants were asked to read a vignette of an individual varying by age stating a racist comment in a public setting and then to write how they would react and respond. The results supported our hypothesis. While the racism displayed in the vignette was equally perceived as racist regardless of the individual's age, participants were more likely to excuse the racist attitudes and behavior exhibited by older adults, as they expected adults to behave in a racist manner. While it is commendable that younger adults will confront racism from peers in their age group, excusing racism from older adults showcases how normalized ageism beliefs are.

70 - Concise Method to Determine Planck's Constant Using LED's: The "Electrophoto Effect"

Jordan Morgan, *Chemistry & Physics*

Mentor: **William Brandon**

Abstract:

Exploiting light emitting diodes (LEDs) in introductory and intermediate level physics labs to estimate Planck's constant is a very popular pedagogical activity. Although the experimental methods vary slightly, the common underlying characteristic is the inherent ambiguity in choosing a "cut-in" voltage. Essentially, this is the voltage near the barrier potential at which the forward diode current and hence the light output begin to increase rapidly. In this study, a method for concisely determining this voltage is presented.

Excluding a very few LEDs suffering from extensive indirect transitions our experimental method gives Planck's constant to within one percent error. Our final value for Planck's constant (~0.4% error) is compared to that obtained from a commercially available apparatus (~28% error). Finally, we show evidence of a new material composition used in the latest green LED construction that addresses the "green-gap" problem. One of the

researchers of this study predicted over ten years ago that such “well-behaved” green LEDs, although unavailable at that time, would soon be fabricated.

71 - Impact of Train-Induced Seismic Waves on Groundwater Monitoring Wells

Sydney Nadeau, *Geology & Geography*

Mentor: **Madan Maharjan**

Abstract:

Seismic waves generated by earthquakes exhibit varying characteristics based on distance and magnitude, exerting stress on specific locations. Similarly, these waves affect hydroseismicity in monitoring wells, attributed to poroelastic deformation induced by dynamic stress from passing seismic waves. As seismic waves propagate, their frequencies attenuate with increasing distance from the source. Trains, albeit generating seismic waves of lesser intensity compared to earthquakes, can still significantly influence hydroseismicity depending on factors such as load size, car type, duration, and proximity to monitoring wells. Through the deployment of three loggers within on-campus monitoring wells, we observed notable fluctuations in water level data corresponding to periods likely coinciding with train passages. Despite the railway tracks being located on the opposite side of campus, discernible changes in water level data aligned with the expected timing of train transits.

72 - Determining the Species of Plants Commonly Pollinated by Honeybees (*Apis mellifera*) via Nucleotide Sequencing Collected Pollen at UNCP

Sydney Nadeau, *Biology*

Mentor: **Lisa Kelly**

Abstract:

It is known that honeybees (*Apis mellifera*) pollinate hundreds of different plants, and figuring out common species of plants they favor is important to determine which kind of plants the bees prefer between crops, ornamental, native, or invasive plants on and around the UNCP campus. Pollen was collected at the UNCP apiary at the university garden. Using PCR, we were able to amplify the *rbcL* (ribose biphosphate carboxylase gene) in different types of pollen, and we used the GenBank genetic sequencing database to obtain nucleotide sequences for the pollen samples used in the study. To discover what species of plants our pollen samples came from we performed nucleotide BLAST searches of previously published sequences for all our samples. Our study found that pollen had been collected from *Camellia sinensis* and different species of plants from the *Rubus* family, along with many other plant species that I am currently researching. It is good to know which plants Honeybees prefer to successfully raise them and provide a constant flow of resources for them to stay as healthy as possible and to keep the bees from leaving and finding a new place to call home. In the future I would like to take more pollen samples to get a wider variety of plants the bees prefer.

73 - Design and Implimentation of Blood Clot Detection System in COVID-19 paitents

Hozaifa Owaisi, *Mathematics & Computer Science*

Mentor: **Haitao Zhao, Joong-Lyul Lee**

Abstract:

Our research holds promise for cardiovascular healthcare, particularly for Covid-19 patients vulnerable to blood clots. Predicting thrombogenesis is critical for timely intervention. Our model, based on arterial ultrasound, is non-invasive and offers predictions, enhancing patient care efficiency. Unlike previous Machine Learning approaches, we pioneer this Deep Learning (DL) implementation, enabling intricate pattern extraction. We optimize hyperparameters for R^2 , MSE, exploring normalization, optimization algorithms, and learning rates. Variations in hidden layers, nodes, and activation functions refine thrombogenesis prediction. Our goal is a reliable model for clinical use, enhancing patient outcomes by swiftly identifying thrombosis risks in Covid-19 and high-risk patients.

74 - Immobilized Enzyme Bioreactor

Christian Oxendine, *Chemistry & Physics*

Malia Locklear, *Chemistry & Physics*

Lindsay Branch, *Biology*

Dina Abumohsen, *Biology*

Mentor: **Siva Mandjiny**

Abstract:

This research builds upon the study of lactate dehydrogenase (LDH, an enzyme extensively involved in anaerobically converting pyruvate to lactate. Previously, we developed resilient, reusable beads composed of calcium alginate for immobilizing LDH. Optimal immobilization conditions were determined to be at 25°C and pH 8.3, with an LDH concentration of 8.7 mg/mL, where LDH demonstrates its peak enzymatic activity at 595 U/mg. In this updated approach, we employed a pump to maintain a continuous bioreactor, ensuring a constant flow of substrate through the encapsulated beads. The specific activity of our enzyme was determined to be 97 $\mu\text{mol min}^{-1} \text{mg}^{-1}$.

75 - Creating an Indigenous Archive

Ahelayus Oxouzidis, *American Indian Studies*

Mentor: **Jennifer Randall**

Abstract:

The ongoing project aims to ethically archive knowledge given by Elders from the Lumbee Nation in Pembroke, NC. We are righting wrongs done by past archivists and ethnographers to create an entirely Indigenous archive. The work done in the past as part of the Farm Security Administration took good photos but failed to report these people's identities ethically and referred to them as "mixed breed" instead of using their preferences to describe who they are. Our interviews were structured in a way that is more respectful and Indigenous in style than what past ethnographers did. This reshapes the way interviews are being done because it simply makes it more culturally respectful to Native Elders. The hope is that we create a rift in archiving methods by introducing an Indigenous form of archiving as a model for other archivists who take an interest in learning more from our Native inheritances. For one component of our project, we are working on a community exhibit that will take FSA photos and showcase them at the UNCP library where people from around the community can come, see the photos, and name the people so the Library of Congress can change the description of the people in the photos. One of our many goals is to create a shift in the way Oral history work is done with Native people so that it is done in a more respectful manner and archived in a way that doesn't disrespect the people being interviewed.

76 - Genomic Annotation on Unique F Element in *Drosophila willistoni*

Rosa Parker, *Biology*

Mentor: **Timothy Anderson, Maria Santisteban**

Abstract:

While scientists have been studying *Drosophila* fly species for over a century, the discovery of this newly found fourth chromosome presents an exciting opportunity for further exploration. Through utilization of the GEP browser and software, previously unexplored regions within this chromosome can now be evaluated, bringing us closer to unraveling the functional significance of each gene and understanding their evolutionary trajectories across species. This data is helpful for comparing the similarities or anomalies between *D. willistoni* and *D. melanogaster*'s genome. By annotating these regions, we lay the groundwork for a deeper understanding of the unique F elements present in non-model fly species, enriching our knowledge of *Drosophila* biology. Furthermore, this research partnership not only advances scientific inquiry but also hosts educational opportunities for students. Engaging in hands-on research outside the traditional classroom setting provides students with valuable experience and exposure to innovative software, preparing them for future endeavors in the field of genetics and beyond.

77 - The Role of POTS and Age in Developing MCAS

Olivia Peal, *Biology*

Gracie Montanez, *Biology*

Mentor: **John O'Dell, Silvia Smith**

Abstract:

Postural orthostatic tachycardia syndrome (POTS) is a type of autonomic dysfunction characterized by orthostatic intolerance, rapid heart rate, dizziness, and blood pooling. One comorbid disorder associated with POTS is mast cell activation syndrome (MCAS). This occurs when mast cells, which are immune cells that are found around small nerve fibers, connective tissue, intestines, bones, skin, and other organs, excessively degranulate and release histamines. We conducted a patient-reported outcome study and enrolled 750 adult participants with a self-reported formal diagnosis of any type of dysautonomia. We tested the null hypothesis that there is not a statistically significant relationship between MCAS and POTS. We used R (multiple regression) to determine any correlation between POTS, MCAS, and demographic variables, including any interactions between race and gender. At the 95% confidence interval, in their relation to MCAS, POTS and age were statistically significant (p -value = 0.00676 and 0.03195, respectively, showing that POTS and age have the greatest predictive effect on whether a person will have MCAS. No statistical significance was found with the interaction variables.

78 - The Optical Properties of Quantum Dots

Francisco Pedroza-Rojs, *Chemistry & Physics*

Nicolas Kincaid, *Chemistry & Physics*

Mentor: **Tikaram Neupane**

Abstract:

The optical properties of Cadmium Selenide (CdSe) Quantum Dots (QDs) play a pivotal role in modern technology, particularly in fields like optoelectronics, biomedical imaging, and solar cells, owing to their size-dependent tunable optical and electronic characteristics. This study focuses on measuring the linear absorption and emission spectra of CdSe QDs of varying sizes—2.2 nm, 3.8 nm, and 6.5 nm in diameter—all falling within the visible region. As anticipated, the absorption spectra exhibit a shift towards lower energy (or longer wavelength) as the QD size increases. Using Lambert Beer's law and empirical formulations, we accurately estimated the size and concentration of QDs based on their absorption spectra. Furthermore, the emission spectra of the QDs demonstrate a blue shift in frequency, with the emission energy lower than the first absorption peak, indicative of a Stokes shift. Specifically, the Stokes shifts were measured to be 17.1 nm, 18.4 nm, and 21.5 nm for QD sizes of 6.5 nm, 3.8 nm, and 2.2 nm, respectively. Acknowledgement: This work is supported by PURC (Pembroke Undergraduate Research and Creativity Center at UNCP).

79 - Pulse Laser Plasma Diagnostics

Francisco Pedroza-Rojs, *Chemistry & Physics*

Nicolas Kincaid, *Chemistry & Physics*

Mentor: **William Brandon**

Abstract:

Utilizing the fundamental 1064 nm output of a pulsed Nd:YAG laser we created and subsequently characterized some nominal values of the ensuing plasma in air (i.e., laser spark). Utilizing the emission associated with the ratio of carefully selected O2 spectral lines we were able to estimate an average plasma temperature at about 1.8×10^5 K. In addition, the duration of the plasma (lifetime) was determined to be approximately 14-17 ns. Essentially, the spark temperature was calculated from the ratio of two O2 emission lines measured with a spectrometer, while the plasma lifetime was directly measured utilizing a fast photodiode and oscilloscope. We also address potential improvements to harden the apparatus design in performing future experiments.

80 - Neighborhood Microscope: Leveraging Big Data Sources to Examine Health and Well-being in Urban and Rural NC Neighborhoods

Md Mushfique Rahman, *Mathematics & Computer Science*

Andrew Cart, *Mathematics & Computer Science*

Kai Anderson, *Sociology & Criminal Justice*

Mentor: **Shaohu Zhang, Melanie Escue**

Abstract:

Specific elements of the built environment play a crucial role in enhancing accessibility, subsequently affecting both people's physical and mental health outcomes. For instance, improved road networks and public transportation systems can increase access to essential resources such as healthcare and nutrition facilities. Simultaneously, the presence of parks and recreational trails can encourage physical activity, leading to lower rates of obesity and diabetes, while poor access to healthy food, the lack of recreational facilities, and higher crime rates all contribute to higher obesity rates. While genetics contribute to disease risks, the environment is a significant factor, with approximately 70 to 90% of disease risk variations linked to environmental factors. We aim to use a variety of big data sources, including social media platforms like Twitter, Google Street View (GSV), health data, and crime data, to compare the community health outcomes in NC.

81 - Two Invading Species Affect Biodiversity in Longleaf Pine Ecosystems

Erika Rivera, *Biology*

Mentor: **Kaitlin Campbell**

Abstract:

Longleaf pine savannas are biodiversity hotspots. Red-Imported Fire Ants (RIFA) and Asian Needle Ants (ANA) may have a significant impact on biodiversity. We surveyed invasive ant nests and ant diversity to identify changes in nest density, richness, and abundance over time. Surveys of RIFA nests were conducted along belt transects in 2017, 2022 and 2023 in 3 Longleaf pine savannas. Surveys of ANA nests were conducted along belt transects in 2023. Pitfall traps were used to measure the abundance and richness of ants. RIFA was the most abundant ant species in 2017. In 2022 our data revealed 1 the ANA was the most

abundant ant species across sites, 2 RIFA abundance/nest densities decreased, 3 a decrease in native ant abundance and richness, 4 total ant abundance increased 65% due to ANA populations. In 2023, new methods were used to survey the impact of ANA the diversity of ants in these habitats: soil samples, leaf litter samples hung in Berlese funnels, and a variety of bait traps. These savannas are some of the most diverse in terms of fauna and flora in NC, it is paramount to understand the impact of these invasive ants to mitigate any environmental effects of the species.

82 - Two Invading Ant Species Affect Biodiversity in Longleaf Pine Ecosystems

Erika Rivera, *Biology*

Mentor: **Lisa Kelly, Kaitlin Campbell**

Abstract:

Longleaf pine savannas are biodiversity hotspots, therefore establishment by invasive Red-Imported Fire Ants (RIFA, *Solenopsis invicta* and Asian Needle Ants (ANA, *Brachyponera chinensis*) may have a significant impact on biodiversity. The goal of our research is to survey invasive ant nests and ant diversity to identify changes in nest density, richness, and abundance over time. Surveys of RIFA nests were conducted along belt transects in 2017, 2022 and 2023 in three longleaf pine savannas. Surveys of ANA nests were conducted along belt transects in the summer of 2023. Pitfall traps were used to measure the abundance and richness of ants in 2017, 2022 and 2023. Data from 2017 showed RIFA was the most abundant ant species. In 2022 our data revealed 1 the ANA was the most abundant ant species across sites, 2 RIFA abundance and nest densities decreased, 3 there was a decrease in native ant abundance and richness, 4 and total ant abundance increased by 65% overall due to increases in ANA populations. In 2023, new methods were conducted to survey the impact of ANA in these systems and to survey the diversity of ants that may be in these habitats. These methods are: Soil samples, leaf litter samples that were hung in Berlese funnels, and a variety of bait traps. These savannas are some of the most diverse in terms of fauna and flora in North Carolina, so it is paramount to understand the impact of these invasive antsto mitigate any environmental effects of the species.

83 - Effects of Childhood Trauma: Depression, Substance Abuse, and Deviance

Tiffani Roberts, *Psychology*

Mentor: **Shilpa Regan**

Abstract:

People who experienced 4 or more adverse childhood experiences were found to be at a higher risk for depression and lower risk for tobacco abuse. It is believed that our sample did not reflect higher risk of substance abuse and deviance due to resilience.

84 - Dysautonomia as a Sequela of Mild Traumatic Brain Injury

Karlee Roberts, *Psychology*

Fernando Carranza Toledo, *Biology*

Mentor: **Silvia Smith**

Abstract:

Dysfunction of the autonomic nervous system, or dysautonomia, can be a sequela of mild traumatic brain injury (mTBI) and concussive disorders. This study aimed to conduct a literature review to identify the common types of dysautonomia that can result from mTBI and concussion to contextualize our collaboration with the 'Carolina Concussion and Mild TBI Clinic,' which is enrolling participants for our "Dyspnea in Dysautonomia" study. We found that paroxysmal sympathetic hyperactivity (PSH), post-concussive orthostatic tachycardia (OT), and chronic traumatic encephalopathy (CTE) are the most common types of dysautonomia that develop as sequelae of mTBI and concussion. PSH results from overactivity of the sympathetic nervous system and presents with tachycardia, hypertension, hyperthermia, and tachypnea, OT with an increase in heart rate with orthostasis, while CTE is a progressive neurodegenerative disorder. The etiology of dysautonomia following mTBI and concussion involves injury or functional problems within the hypothalamus, and the aberrant release of catecholamine. Thus, PSH, OT, and CTE are the most common types of dysautonomia following mTBI and concussive disorders.

85 - Letters from War: Historical Memory and Contemporary Contexts

Mason Schwenneker, *History*

Mentor: **Scott Hicks**

Abstract:

Through close reading of primary sources and filming onsite, influenced by memory studies and public historiography, this project examines how individuals who witnessed the 1941 attack on Pearl Harbor described in their correspondence to others what they saw. An intimate, personal form of written communication, their letters reveal feelings regarding World War II prevalent at the time. The letters selected for study were composed within two weeks of the attack, identified using WorldCat, and limited to digitally-available archival material. This poster focuses on two letters: one by a US Navy nurse stationed on Pearl Harbor, the other by a civilian. The letters provide descriptions of the events while attempting to comfort the family members to whom they were written. My poster describes my visit to Pearl Harbor in Hawaii in March; showcases original photographs that contextualize the letters in situ; and reflects on concepts of memory, narrative, and the memorialization of history. My project preserves memories of individuals impacted by the attack while producing a multimedia account of historical memory and reflecting on the practice embodied integrative historical scholarship.

86 - Ignoring the Binary: Exploring the Complexity of Gender in American Indian Communities

De'Maurion Shelley, *History*

Mentor: **Jamie Mize**

Abstract:

Gender is a term that has many definitions. This is because it is subjective and our personal experiences and beliefs determine its meaning. To guide this project, gender will refer to the socioculturally constructed norms that relate to the expressions of one's sex. Regardless of one's personal definition, experience, or beliefs about gender, we cannot—and must not—ignore its importance in our societies. When we look at American Indian communities, the role of gender is often seen in every aspect of daily life, defining the type of work done and by whom, the distinctions between the types and levels of spiritual power, political power, and areas of influence, among other things. Importantly, there must be recognition and appreciation for the fact that Native conceptions of gender did not match the binary present in Western culture. This project will explore the complexity of gender in American Indian communities, with particular attention given to those who would now be labeled as two-spirit.

87 - Climate Change and Rising 100-Year Flood: Mapping Flood Prone Areas in Robeson County

Rajwardhan Shinde, *Mathematics & Computer Science*

Mentor: **Madan Maharjan**

Abstract:

Flooding is a significant global concern. This research tackles this issue by identifying flood-prone regions in Robeson County, NC, using hydrological modeling techniques such as the 100-Year Flood and Rain on Grid Mapping Model. These models, combined with climate change projections, help highlight areas in Robeson County at high risk of flooding. The methodology involves a blend of statistical analysis and hydrological modeling to simulate various flood scenarios in the Lumber River basin under different climate scenarios. Initial findings show that regions surrounding the City of Lumberton are susceptible to flooding during 100-Year flood. These findings provide crucial insights for county officials to mitigate future floods, prepare better, and enhance land use planning accordingly. However, the accuracy of the results is limited due to the lower resolution of Digital Elevation Models (DEMs and land cover data. To improve flood mapping resolution, there is a need for higher-accuracy topographical and historical climate data. The flood hazard assessment methodology and open-source models developed in this study can potentially be adapted for flood risk mapping in other areas.

88 - Translating Thoughts to Text: A Deep Learning Approach for EEG to Text Translation

Rajwardhan Shinde, *Mathematics & Computer Science*

Mentor: **Haitao Zhao**

Abstract:

Brain-computer interface (BCI) is an emerging interdisciplinary field that focuses on using technology to interpret the human brain. This study explores one of the possible applications of BCI to help individuals with speech impairments by translating their thoughts into words and emotions. This project aims to translate electroencephalogram (EEG) signals into text. This project provides a new way of expression for those who are unable to speak or convey their emotions. We utilized the ZuCo EEG dataset, where subjects were asked to read text on the screen, and their EEG signals were recorded for every individual sentence. We employ deep learning techniques such as sequence-to-sequence decoding and pre-trained transformer models to convert EEG waves into text. We also employ emotion classification on generated text to classify EEG signals into emotions. This project not only contributes to the field of BCI being one of the first projects in the field of EEG to text prediction but also promises to help those with speech impairment.

89 - Evaluation of Liquid Crystal Variable Retarder (LCVR)

Daniel Smith, *Chemistry & Physics*

Mentor: **William Brandon, Uma Poudyal**

Abstract:

Liquid Crystals (LC) play an important role in modern technology and various LC applications will continue to expand for the foreseeable future. A Liquid Crystal Variable Retarder (LCVR) consists of a transparent cuvette-type cell filled with a solution of liquid crystal (LC) molecules which function as a variable waveplate, where the orientation of the LC molecules is determined by the alignment layer in the absence of an applied voltage. This investigation, involving the evaluation of an LCVR as an undergraduate research project, will continue to serve the UNCP physics department as a high-level pedagogical laboratory for years to come. In addition to presenting our success in characterizing the LCVR's non-linear retardance as a function of driving voltage, we will comment on some potential high-level applications.

90 - CRISPR/Cas9 Cis-editing in Arabidopsis Thaliana

Alexis Strickland, *Biology*

Mentor: **Timothy Anderson**

Abstract:

Plants that senesce earlier can be taken out of the field faster and minimize vulnerability to disease and extreme weather. Clustered Regulatory Interspaced Short Palindromic Repeats (CRISPR Cas systems are used to introduce precise genome modifications in model organisms. In this study, the model flowering plant *Arabidopsis thaliana* is used to study the SENESCENCE ASSOCIATED UBIQUITIN E3 LIGASE1 (Saul gene. Saul is responsible for plant senescence and has only been studied using gene knockout experiments. The problem with gene knockouts is that when used, knockouts cause the plant to germinate but will die prematurely due to early senescence. To avoid the negative consequences of a Saul gene knockout, cis-editing of the promoter region targeting transcription factor binding sites allows for the investigation of differing transcription levels of the Saul gene and the impact on early senescence.

Alteration of upstream regulatory regions of Saul is hypothesized to cause early senescence to *A. thaliana*. Three transcription factor binding sites have been identified for disruption and gRNA's have been designed and cloned into a CRISPR Cas9 gene editing vector.

91 - A Theoretical Perspective on Dark Matter (Presentation 1) & Tardigrades & Panspermia (Presentation 2)

Fallon Taylor, *Chemistry & Physics*

Mentor: **Benjamin Killian, Jerry Griffith**

Abstract:

A Theoretical Perspective on Dark Matter begins with $E=mc^2$ and expounds upon special relativity and electromagnetism. Using math and physics equations I was able to derive other equations that beautifully describe the 'infraspectral' dark photonic nature that may potentially represent dark matter, a current enigma at the forefront of cosmology and astronomy.

Tardigrades & Panspermia is a modern take on astrobiology's theory of panspermia. It takes the report of near indestructible tardigrades having been introduced onto the moon in a state of cryptobiosis and applies it to the nature of 'exoevolution' and the origin of life on Earth as well as the rest of the cosmos.

92 - Violence and Death at Dollar Stores

Aaliyah Valdez, *Sociology & Criminal Justice*

Mentor: **Tracy Vargas**

Abstract:

My methods for collecting data for this research is mostly likely going to be through interviews with current or former dollar store workers, about their experiences working at those stores. I will be asking questions about money and if they feel like they are being paid fairly, the community they work in, health care, and safety hazards. Dollar store policies, automated scheduling, create hazardous work conditions, and consumer redlining. Dollar

stores have an automated scheduling system to keep labor costs as cheap as possible and also keeps workers from not being full-time in order to not have to give employees benefits. Because of this there aren't many workers in the store at once, usually only one sales associate and one manager in the store at once. The sales associate usually works the register and the manager stocks the shelves, so workers are on their own with no help. This makes register lines long and service slow, making customers wait longer and having bad reviews.

93 - Towards Equitable Privacy-Preserving Machine Learning Algorithms

Patrick Valente, *Mathematics & Computer Science*

Aurelio Medina, *Mathematics & Computer Science*

Mentor: **Selvarajah Mohanarajah**

Abstract:

Through our research, we have been exploring the interconnections between privacy, fairness, and accuracy in Artificial Intelligence (AI) and Machine Learning (ML) algorithms, uncovering any potential conflicts between the privacy safeguards and bias mitigation techniques, identifying possible synergies between the two, and proposing viable solutions to enhance both privacy and fairness in AI/ML systems simultaneously, all the while we have been creating proof-of-concepts in order to evaluate the efficiency and accuracy of the proposed solutions.

As AI/ML technologies become more pervasive in society, the need for reliable, secure, and unbiased AI/ML models becomes critical. Unfortunately, there have been numerous real-world incidents where privacy breaches and biased decisions have been attributed to ML systems. ML algorithms make decisions based on training data, and any biases or imbalances present in the data can lead to unfair outcomes. Moreover, when developing ML models for people-oriented tasks, safeguarding the privacy of individuals who contribute their data for training and testing the model is crucial.

94 - Time to Diagnosis in a Dysautonomia Cohort: Insights from a Patient Reported Outcome Study

Dreena Vanderburg, *Biology*

Ava Cox, *Biology*

Mentor: **Silvia Smith, John O'Dell**

Abstract:

Dysfunction of the autonomic nervous system, or dysautonomia, can be difficult to diagnose due to a broad symptom presentation. Studies have reported the time from symptoms onset to diagnosis being from 6 months to 30 years. The protracted diagnostic period leads to poor health outcomes and can negatively affect patients. To characterize the time to diagnosis we conducted a patient reported outcome study and enrolled 750 participants with a formal diagnosis of an autonomic disorder. We tested the null

hypothesis that diagnosis is made within six months following symptom onset. The goal of this study is to increase the awareness of challenges in diagnosing autonomic disorders and managing this patient population. Our analysis indicates that it takes on average 8 years (SD 10.4 for dysautonomia patients to receive a formal diagnosis, indicating that this patient population frequently endures a prolonged wait before receiving a proper diagnosis and treatment. The diagnostic delay stems from various factors, including misdiagnoses attributing symptoms to anxiety to a lack of awareness or dismissiveness among clinicians toward the nuanced manifestations of dysautonomia.

95 - **Computation Study of Spatial Self-Phase Modulation In Semiconductor**

Xander Vasquez Amores, *Chemistry & Physics*

Mentor: **Tikaram Neupane**

Abstract:

The generation of Gaussian beam is a key step for research in nonlinear optical properties such as Spatial Self-Phase Modulation (SSPM). This research focuses on the generation of the Gaussian beams using a MATLAB code for the SSPM simulation using 532 nm wavelength laser. In SSPM, the positive phase shift is considered to study the impact of various parameters on strength of nonlinearity such as sample to screen distance, magnitude of positive phase shift, etc. Among them, the phase shift is a key parameter to modulate the light beam through the atomic semiconductor. When phase shift is changed the farther away the phase is from zero the more rings are being created. With the help of the number of rings, radius of diffraction is measured as well.

96 - **Northern Christian Textbooks: The Education of Formerly Enslaved Persons**

Brennan Walker, *History*

Mentor: **Laura Hakala**

Abstract:

In the period following emancipation, there was a movement for the mass education of formerly enslaved persons and poor white individuals through the American Tract Society and the Freedmen's Bureau. My research will focus on the American Tract Society and the three books they published for the education of formerly enslaved persons. This research is important because it looks into the education of formerly enslaved persons through the themes presented in the textbooks, which will allow us to further understand how formerly enslaved persons transitioned from being property to functioning members of society at the time. The American Tract Society was an evangelical organization founded on May 11, 1825. This organization published tons of Christian literature. These Christian messages can be found in the textbooks for formerly enslaved persons. The scholarship surrounding the American Tract Society highlights the impact of Northern education of Southern freedmen and the impact that the American Tract Society had on the Southern population. I am inserting myself into the scholarly literature surrounding the American Tract Society by

focusing on the religious messages throughout the textbooks and highlighting the potential positive or negative impact that it had on formerly enslaved persons. In my presentation, I will argue that the American Tract Society, while attempting to educate formerly enslaved persons, reinforces harmful Christian ideologies perpetuated during slavery.

97 - Using Pollen DNA Barcoding as an Investigative Tool for Analyzing Honeybee Diets

Demitrius Willig, *Biology*

Mentor: **Lisa Kelly**

Abstract:

Honeybees are a fundamental part of many ecosystems, and over the last couple of decades we've seen a drastic decrease in their populations due to habitat loss and pollution. By observing the food preferences of these bees, however, we can increase our understanding of them and find ways to better protect them. DNA barcoding is a process that takes small sections of DNA strands from a specific gene/genes to identify the species of origin. After finding two distinctive colors of pollen (orange & green in samples collected from our campus apiary, I amplified the *rbcl* gene using polymerase chain reactions (PCR). The nucleotide sequences were then placed into NCBI's BLAST software to determine the best match in GenBank. The orange pollen most likely belonged to *Taraxacum officinale* or the common dandelion. The green pollen most likely belonged to the *Prunus virginiana*, also known as the choke cherry. The nucleotide sequence for *T. officinale* matched only 87% of the sequence of our orange pollen sample, and there was 93.90% identify to that sequence. The nucleotide sequence for *P. virginiana* matched only 91% of the sequence of our green pollen sample, and there was 99.64% identify to that sequence. The results showed that honeybees in the campus apiary are visiting common dandelions and choke cherry trees on occasion. Future steps would include the gathering of more pollen samples to create a bigger picture into the visitation of our honeybees.

98 - Voter Registration Drive 2024

Allison Jones, *Political Science & Public Administration*

Mentor: **Josiah Marineau**

Abstract:

A deep dive in what working a voter registration looks like. This presentation will include: the importance of voting, why we have voter registration drives, how to properly conduct a voter registration drive, and personal experience when doing the voter registration drive.

99 - The First Shift: The Exploitation of US and Migrant Children

Kayla Wingfield, *English, Theatre & World Languages*

Mentor: **Peter Grimes**

Abstract:

Prior to the Fair Labor Standards Act of 1938, minors in the U.S. were working in harmful occupations to support families. While the act aided only 6% of 850,000 children in the beginning, the law would become influential in regulating work situations for children (Bureau of Labor Statistics). In recent years, its precedent has been increasingly challenged. Some states are pushing to loosen laws protecting children from unsafe labor. The exploitation is especially true of low-income and migrant children, and will continue to put them in harmful environments, leading to cases of physical and mental suffering. In researching for my project, I have compared labor issues pertaining to present-day migrant children with those of pre-Labor Act children. My project, a short fiction piece, explores the topic and creates a narrative to both inform and move readers. The story follows the intertwining lives of two characters: a 12-year-old Maya boy from Guatemala and the other a white man who was a pre-Labor Act child worker. I hope to bring greater awareness of current child exploitation issues while encouraging people to see the complexities of the issue such as children voluntarily working.

100 - Retesting Histo-Clear Use on Sticky Traps Prior to DNA Amplification

Sierra Wright, *Biology*

Mentor: **Lisa Kelly, Kaitlin Campbell**

Abstract:

To investigate the plant diets of honeydew insects, we are analyzing their consumed DNA. When collecting insects with sticky traps, the surfaces of specimens can be covered in adhesive and DNA from surrounding plants. Solvents used to free trapped insects, plus any residual glue, may possibly interfere with downstream DNA work. Decontamination and safe insect removal are required to avoid these problems. The goal of this study is to standardize our practice as there are several ways to decontaminate and remove trapped insects. We tested two batches of honeydew insects collected by hand from the same plants. Some insects were placed on a sticky trap, while control insects were stored in ethanol. Sections of sticky traps containing insects were soaked in Histo-Clear to remove the glue. 4% bleach was used to decontaminate insect surfaces. DNA was extracted and amplified with ITS2 primers, and gel electrophoresis was used to visualize amplicons. Then amplicons were sent to a commercial lab for Sanger sequencing. The gel and Sanger results were inconclusive so we are repeating DNA work. This study is important for its application as a part of standardizing sample preparation methods.

101 - Testing DNA Recovery in Sticky Trap Insects Treated with Histo-Clear

Sierra Wright, *Biology*

Mentor: **Kaitlin Campbell, Lisa Kelly**

Abstract:

To investigate the plant diets of honeydew insects, we are analyzing their consumed DNA. When collecting insects with sticky traps, the surfaces of specimens can be covered in adhesive and DNA from surrounding plants. Solvents used to free trapped insects, plus any residual glue, may possibly interfere with DNA recovery. Effective and safe insect removal are required to avoid these problems. We tested two batches of aphids collected by hand from the same plants. Some insects were placed on a sticky trap, while control insects were stored in ethanol. Sections of sticky traps containing insects were soaked in Histo-Clear to remove the glue. We used 4% bleach to sterilize insect surfaces. The DNA was extracted and amplified with ITS2 primers, and then amplicons were sent to a commercial lab for Sanger sequencing. The Sanger results were inconclusive after original and repeated DNA work. Moving forward we are using two identical batches of flatid insects that were collected from separate locations to repeat the experiment without bleaching. We are using flatid insects because they are larger than aphids which makes DNA recovery easier. We will determine if using Histo-Clear to remove insects from sticky traps compromises the DNA by comparing Sanger sequencing results of Histo-Clear and control samples. This study is important for its application as a part of standardizing sample preparation methods.

102 - Using Molecular Dynamic Simulations to Examine Molecular Behaviors of Biomass Derivatives

Kimberly Yard, *Chemistry & Physics*

Mentor: **Sivanadane Mandjiny**

Abstract:

Fluid catalytic cracking, a process where crude oil is converted over zeolite catalysts into useful materials poses a great issue because of the extensive use of fossil fuels. Biomass, specifically lignin, have shown to potentially be an alternative to crude oil feed stocks for the production of these desired materials but requires optimization of catalysts for lignin upgrading. Because of the promise that lignin holds as a potential renewable feedstock source, the properties of lignin derivatives such as guaiacol, anisole, and cresols require extra consideration because of their critical roles as intermediates in the conversion of lignin to fuels. The development of accurate computational models of their liquid phases is a key step in understanding the molecule's behavior before catalytic studies can be performed effectively. To create an accurate depiction of the lignin derivatives, molecular dynamics (MD) simulations of liquid guaiacol, anisole and cresol isomers from 330-390 K have been performed to examine their local interactions and motions, and long-range diffusion. These simulations will be later compared to experimental quasi-elastic neutron scattering (QENS) experiments to allow for parameter adjustment of the various liquids.

103 - Determining the dominant plants that honeybees use to harvest pollen in North Carolina

Noemi Yisra'EL, *Biology*

Mentor: **Lisa Kelly**

Abstract:

Knowing what plants honeybees are most drawn to will help us cater to them. Such as the areas they collect from and the vegetation that pollinate. This will allow us to increase pollination and plant reproduction. In this research, we amplified the *rbcl* gene in the pollen by using the polymerase chain reaction (PCR). The amplified DNA was sent a company called Azenta for nucleotide sequencing. The nucleotide sequences were uploaded to BLAST nucleotide software. This matched the sequences with the sequences of plant species in GenBank. The results for the dark green pollen was *Prunus laurocerasus* (Cherry laurel). The results for the dark orange pollen was *Taraxacum officinale* (Common dandelion). The results for the bright yellow pollen was *Camellia sinensis oblata* (Tea Tree). To further investigate the relationship between pollen and honeybees, we could analyze pollen DNA from different seasons. This study gives us a better understanding of the plants that honeybees interact with more often. This study shows us that *T. officinale*, *C. sinensis*, and *P. laurocerasus* were the more dominant plants honeybees choose to go to.

104 - Dietary Dupplementation in Middle-aged Rats Evaluated Across Behavioral, Synaptic, and Proteomic Measures

Kinsley Adams, *Biology*

Zachary Powell, *Biology*

Mykayla Greene, *Chemistry & Physics*

Reece Hicks, *Chemistry & Physics*

Mentor: **Ben Bahr**

Abstract:

A healthy diet reduces the likelihood of contracting Alzheimer's disease (AD) by 40%, thus related biomarkers are important. Middle-aged Fischer rats were fed ginseng chosen from screened extracts that improve neuronal maintenance. We found the 6-week supplementation reduced aging-related cognitive deficits, with synaptic protection evident as well. Among the significant changes induced by the dietary treatment, chemoproteomics techniques identified 20-80% expression increases in components of the ubiquitin-proteasome protein clearance system and in proteins linked to trafficking for axonogenesis (PSB6, NEDD8, Rab-10, VAT-1, CAMKV; $p < 0.035$). Validation steps are using immunoblotting for proteins exhibiting >50% increased expression. The ginseng extract also upregulated synaptic and protein clearance pathway markers in hippocampal explants. Synapse loss is known as the best correlate of cognitive decline in aging, thus synaptopathy likely contributes to the reason aging is the prominent AD risk factor, being downstream of tau/amyloid-related pathology. Health disparities research will help determine tissue and blood biomarkers that are fundamental to AD pathophysiology and risks.

Exhibits

- Introduction to Engineering Design projects

Kendall Chavis, *Chemistry & Physics*
Joseph Cimadamore, *Chemistry & Physics*
Aiden Crabill, *Chemistry & Physics*
Riley Edwards, *Chemistry & Physics*
Micah Ferguson, *Chemistry & Physics*
Jose Garcia Vergara, *Chemistry & Physics*
Gavin Hardison, *Chemistry & Physics*
Christopher Holmes, *Chemistry & Physics*
Seth Hunt, *Chemistry & Physics*
Nicolas Kincaid, *Chemistry & Physics*
Seth Lowery, *Chemistry & Physics*
Arturo Mendoza-castillo, *Chemistry & Physics*
Allyson Tedder, *Chemistry & Physics*
Xander Vasquez Amores, *Chemistry & Physics*
Christina Wilson, *Chemistry & Physics*
Mentor: **Steven Singletary**

Abstract:

The inaugural Introduction to Engineering Design class presents their semester projects. The course introduces students to the Engineering design process which allows the class to take projects from ideas and concepts to physical objects. Objects are then tested and evaluated. Lessons learned from the testing phase are then used to improve and refine the objects which are then reprinted and retested.

- The Gift of Art: Mexican Drink Set

Daniela Cruz, *Art/Biology*
Mentor: **Jessica Dupuis**

Abstract:

Mexico drink set. It includes the plate with the skull in the middle to give life to the Day of the Dead in Mexico. It incorporates the same colors that the jug has. It goes with two cups with hand-carved designs and the color of the bottom goes with the bottom of the water jug as well. The water jug contains the word Mexico in huge letters. The color of the words is in a black glaze surrounded by a border of vines above and below it with a red heart in the middle. The jug also incorporates the marigold flowers used for the Day of the Dead and the agave considering that Mexico is famous for the use of agave. Throughout the jug design, there are engravings such as squiggly lines or typical Mexican designs that would be seen on other ceramic pieces. The word carving of Mary the Virgin demonstrates how

important she is in Mexican culture specifically for the Catholic religion. The added details around the carving are similar to those that you would find in Mexican art which can be pedal-like features or circles. The piece of the jigsaw enclosure with the monarch butterfly represents the bright colors that you would see in Mexican culture. Specifically, monarch butterflies are from Central Mexico. Incorporating this piece, you will see that the wings of the monarch butterfly are in jigsaw pieces, which represents a change, such as how the flower petals are represented as jigsaw puzzles.

- The Gift of Art: Ceramic Brain

Daniela Cruz, *Art/Biology*

Mentor: **Jessica Dupuis**

Abstract:

The ceramic piece of the brain allows one to see what the brain can contain inside when it's split in half. It allows us to have a deeper view of what life might contain. Usually someone looks at items, objects, or life as a whole and not the things that are seen at a deeper level. The ceramic piece of Mary the virgin the shows her in all her glory. She is surrounded with Mexican designs that are seen on cups or plates. She is held up by Gabriel the angel and the surrounding part of her has a 3d look. The whole process of making this pieces was through hand building and details of her gown are hand carved. Adding the bottom portion to the slab of clay allowed me to make a bowl in order to have holy water in it or also small flowers be placed inside.

- Haunt Monika

Monika Czartoszewski, *Art*

Mentor: **Carla Rokes**

Abstract:

This project involves constructing an image and redrawing it with Prismacolor pencils on midtone paper. Utilizing the boundaries of the paper along with the chosen palette depicted, I create a narrative with subtle messages about my self-identity. Haunt Muskie by C418, a song that the title is referencing, has a recently viral transition portion between two sections in the song that inspired the visual transition within the portrait. On a deeper level, the subtle shift between the expressions and the mix of colors within the work showcase a hidden allegory towards my identity as a queer individual, on top of a more face-value visual shift between my past and present.

- Exploring Methods of Eastern, Western, and Nontraditional Bookbinding: A Journey Towards Creativity and Stylistic Fusion

Ray Eddy, *Art*

Mentor: **Brandon Sanderson, Michael Berntsen**

Abstract:

This research project involved an in-depth study into the processes and nuances of Cyanotype and bookbinding. Cyanotype is one of the oldest forms of printmaking, utilizing UV rays and photo negatives to create prints of text and imagery. After accumulating a series of cyanotypes featuring original poetry I constructed a hand-bound book that pulls inspiration from traditional Eastern and Western bookbinding methods with a heavy emphasis on contemporary nontraditional methods.

- Up To Her Knees

Ray Eddy, Art/English

Mentor: **Brandon Sanderson**

Abstract:

To make a sculpture that explores and exhibits the repetitive consuming nature of mania, I spent four months in the spring of 2023 peeling 58lbs of oranges and drying their peels. I then made a plaster cast of my legs from the knee down and glued the dried peels to the outside. When I was younger I was told a story of an exemplary manic episode in which an individual had peeled so many oranges and left them all over their living space that they were described as being "up to her knees" in them. This progression of actions deeply fascinates me so i made this work in an attempt to get on the inside of that experience within a different context. Spending months peeling various types of oranges methodically to be recycled into this sculpture required a much slower and thorough examination into the nuances of the action and the consuming aspects of repetition.

- Progress as Depicted in Relief Printing

LaNiya Harris, Art/Sociology & Criminal Justice

Mentor: **Brandon Sanderson**

Abstract:

The theme of this woodcut is Growth. From the roots up the challenges in a life's journey become less painful. For in growth, new experiences and lessons teach us to heal. In the poster and exhibit session I explain the theme of my work and also the technical process of the wood carving, where the image is produced by reducing the surface with chisels. The remaining flat areas are rolled up with ink and that produced the printed image.

- Surrealism within Abstraction of Human and Floral Forms Through Florographical Lens

Aly Horn, Art

Mentor: **Brandon Sanderson**

Abstract:

For this grant, I continue my previous research based on floriography from the summer of 2022. Although the last project was focused on the natural forms of flowers and their identifiable parts, in this one, I explore further abstraction of their form by synthesizing something that has portions of both flowers and humans. When I create these forms, I look towards artists that work in the genre of surrealism for inspiration on the visual aspects depicted. However, floriography and its study will remain my focal point as I want to focus more on the Asian symbolism behind many florals that thrive there. One prominent one is hanakotoba in Japanese culture. Their language of flowers intertwined with many of the cultural traditions prevalent in Japan today.

- **My Experiences with Printmaking Survey Processes**

Abby Kelly, Art

Mentor: **Brandon Sanderson**

Abstract:

I will present the works that I created in the Art 1400 course, Introduction to Printmaking, under Professor Brandon Sanderson. These may include wood carvings and plexiglass engraving amongst other options. The processes will be on display and will be demonstrated during the Symposium event.

- **Woodcutting: An Outlet for Creativity**

Sean Musselwhite, Art/Chemistry & Physics

Mentor: **Brandon Sanderson**

Abstract:

The use of woodcutting as a medium for printmaking has been around since the 9th century, originating in China. By cutting into the wood block, the artist can create divots that will not pick up ink and thus can create interesting patterns and designs within the piece itself. This project has been put together to show how art can be an outlet for expression. Through printmaking you can create pieces that you can produce and share with those who you care for, expressing your creativity and ideas through the medium.

- **Screenprinting Processes in Fine Art**

Taylor Oldham, Art

Mentor: **Brandon Sanderson**

Abstract:

This exhibit showcases the process of screen printing. This process entails photographically transferring the image onto a silk mesh screen and then you push ink through it to print multiples. Screen printing is interesting as you can print it on almost any surface. Screen printing is also the main printing process that is used for printing out posters and images on t-shirts. It is also used in electronics and other manufacturing. It is a relatively complex process and can be completed in either analog or digital approaches.

- Part of Me

Keely Oxendine, Art

Mentor: **Carla Rokes**

Abstract:

My artwork is based from an artist research project of the artist Christina Troufa. She creates foreshortened self portraits that include iconographic symbolism. The artwork presented is my own self portrait depicted in a foreshortened view with symbolism of a teddy bear significant to my relationship and pregnancy.

- Exploring the Charm of Nature

Kayla Patrick, Art/Biology

Mentor: **Brandon Sanderson,**

Abstract:

This project utilized the cyanotype photographic printing technique to capture the innate beauty of nature. Cyanotype is a type of photographic printmaking where an object is placed on a media that has been coated with a light sensitive solution, and after being exposed to a UV light, an image is transferred onto the media. The process was invented in 1842 by an Englishman, Sir John Herschel. I initially wanted to portray what it is like to work in a scientific or research lab, but I had a hard time trying to figure out how to portray that. Consequently I changed my topic to nature itself. I love the outdoors and admiring the natural world around me. There is something peaceful in looking at the falling leaves and watching the breeze flow through the trees and grass. Through this project I attempt to give the viewer a look at the beauty behind the world around us.

- Understanding Abstract Art through Painting

Jessica Plessinger, Art

Mentor: **Joseph Begnaud**

Abstract:

The legitimacy of abstract art compared to figurative or representational art has been discussed since it was first being done. Especially today, there are several people who look

at abstract art and think it is “too easy, doesn’t make sense, anyone could do this”. However, understanding abstract art requires basic knowledge of the elements and principles of design. There are several aspects of an abstract piece that must work together in order for it to be successful. For this presentation, I will be displaying two of my own abstract paintings and describing the technical and conceptual process behind them, emphasizing the use of elements and principles of design.

- Understanding Abstract Art in the Woodblock Relief Print

Jessica Plessinger, Art

Mentor: **Brandon Sanderson**

Abstract:

Following the intent of my painting exhibit, I will discuss the process of creating abstract art in relation to the elements and principles of design in woodblock relief printmaking. The woodblock prints on display utilize color, balance, line and repetition to create a successful final piece. Acknowledging the process behind creating abstract art can help people appreciate work they may not immediately understand.

- Horror & Humor Applied to Printmaking

Veronica Rapp, Art

Mentor: **Brandon Sanderson**

Abstract:

In Japan, there exists the urban legend of Aka Manto. It is said to be a yokai (spirit that appears when using a public restroom alone at night. You'll hear a knock on your stall and a voice that will ask, "Red paper or blue paper?" This is a trick question, as choosing either will result in a blade through the neck or strangulation, respectively. Pretty spooky, though also admittedly pretty funny. This project depicts my interpretation of this scenario through the form of etching. This technique has existed as far as 1513 and can be applied to various materials, such as metals, rubber, acrylic, etc. Plexiglass is used for my piece, then once etched it is prepped with oil based inks and run through a press to print onto paper. This style of printmaking was my personal favorite to experiment with as it worked best with my art style. Horror and comedy, while being my two favorite genres, are not very easy to combine into one. I feel the sharp lines of etching and my cartoonish style work well together to achieve this rare blend. I hope with this presentation I can share a unique way to create art that some may not have known about.

- Interpreting the Written Word

Ireland Rhoads, Art

Mentor: **Carla Rokes**

Abstract:

This drawing uses Visual Interpretations of written language, by creating an image using a mixed media process. My inspiration came from the song “This Must Be the Place (Naive Melody)” off Speaking In Tongues by the Talking Heads. My next step is the exploration of media and sketching. I used acrylic paint, watercolor, and colored pencil, while also creating sketches exploring compositions. This helped me create a solid background depicting a wallpaper pattern with a hand holding a heart and a house nestled in the middle of the heart. Working on this project was a process that helped me create a balanced composition and unity between written language and imagery.

- Uncovering the Rich Cultural Heritage of Korean Mythology and Legends through Relief Carving

Christina Wilson, Art

Mentor: **Brandon Sanderson**

Abstract:

Korean mythology and legends are a vital component of the country's cultural heritage, yet they remain under-researched and largely unknown in the West. This grant proposal seeks funding to conduct a comprehensive study of Korean mythology and legends to preserve, document and disseminate this rich cultural heritage. This study will explore the unique aspects of Korean mythology and legends, their significance, and their influence on contemporary Korean culture. This information will then be presented through linoleum relief carvings of Korean cultural ideas that are influential in not just modern-day Korea but in the West as well.

- Slit-Mouthed Woman in Drypoint Intaglio

Cameron Lowery, Art

Mentor: **Brandon Sanderson**

Abstract:

The slit-mouth woman is a fairy tale or urban legend in Japanese culture. It is said that if you're walking alone at night you might come across a woman (that's actually a spirit) that wears a mask. She'll ask you "Do you think I'm pretty" and if you reply 'no' she'll kill you on the spot. But if you reply yes she'll take off her mask revealing her mouth that has 2 slits on each side leading up towards her ears. This story is illustrated through the process of drypoint intaglio, which was first developed as a method to decorate armor in the middle ages.

- Photography: Old Tennis

Mykayla Brady, *Art*

Mentor: **Willis Glasgow**

Abstract:

This project is meant to showcase what happens when creativity and a camera come together. Through photography creatives and viewers are able to connect and see each others vision. "Old Tennis" combines a passion for a hobby and a fun environment into timeless photos that are worth more than words.

Performances

- Dirty Laundry

Ray Eddy, *Art/English*

Mentor: **Brandon Sanderson, Michael Berntsen**

Abstract:

This series of poetry is a catalog of the underbelly of a relationship. Thematically exploring yearning, desire, and anxieties this series is a chronological perspective of the development of said relationship. Written over the course of August 2023 until March of 2024 it serves as a sort of diary of poetry from one person to their partner.

- Sarabande by Arcangelo Corelli

Daniel Henry, *Music*

Julian Locklear, *Music*

Mentor: **Lindsey Jacob**

Abstract:

Arcangelo Corelli lived from 1653-1713 inside Italy. He became a virtuosic violinist throughout the 18th Century; however he is most known for his compositions through the Baroque styles and especially his work with chamber music. The piece Sarabande is originally the name of a dance developed in 16th Century Spain but was popularized later in France. A Sarabande is typically a slower, emotional style which can be expected here. This piece was adapted from Corelli's Sarabande in E minor Opus 5, No. 8, and was arranged by Himie Voxman for Saxophone duo. Throughout this performance, there will be many dissonant and clashing notes between the melody and accompanying line. The focus is to showcase an important skill demonstrated by the New Century Saxophone Quartet, blending contrasting lines. The dissonant and clashing notes will be presented and released in more delicate methods yet blends smoothly into the entire snapshot of the piece itself.

- Chaotic Evil 2.0 by Silas Seigler

Silas Seigler, *Music*

Mentor: **Aaron Vandermeer**

Abstract:

"Chaotic Evil 2.0" is the first original composition that is being performed. One year ago I wrote a song entitled "Chaotic Evil". It debuted in February 2023. While writing the original C.E. I knew I wanted to perform it again but make it completely different hence why it's called "2.0". I wanted to write something using the 2:3 bembé clave used in Afro Cuban music. At the time I used Tito Puente's 1958 album Top Percussion. The reason why I used this album is because the album outlines the clave pattern clearly. The album is also

performed with just vocals, drums and a cowbell which is outlining the clave. The name comes from the role playing game Dungeons and Dragons.

- **Henrietta's Hymnbook**

Silas Seigler, *Music*

Mentor: **Aaron Vandermeer**

Abstract:

"Henrietta's Hymnbook" is the third original that is being debuted. This tune is dedicated to my grandmother Henrietta Malone Seigler. My grandmother raised me my entire childhood. Not only was she an amazing caregiver, she too loved music. She sang soprano in her church choir in New Jersey and played the piano. In late June, Henrietta passed away at the age of 96. May her legacy live on and may she rest in power.

Dr. Timothy M. Ritter and Marie A. Amero **Endowed Research Scholarship**



Dr. Timothy Ritter served as a physics professor at UNC Pembroke for 21 years. He held numerous leadership roles in support of the sciences at UNCP, include Director of the Pembroke Undergraduate Research and Creativity (PURC) Center and Director of the NC Region IV Science & Engineering Fair. Dr. Ritter has established this endowed research scholarship in support of undergraduate research at UNC Pembroke.

This generous gift will support an undergraduate research scholar each academic year. UNCP is grateful for this support to undergraduate research endeavor.

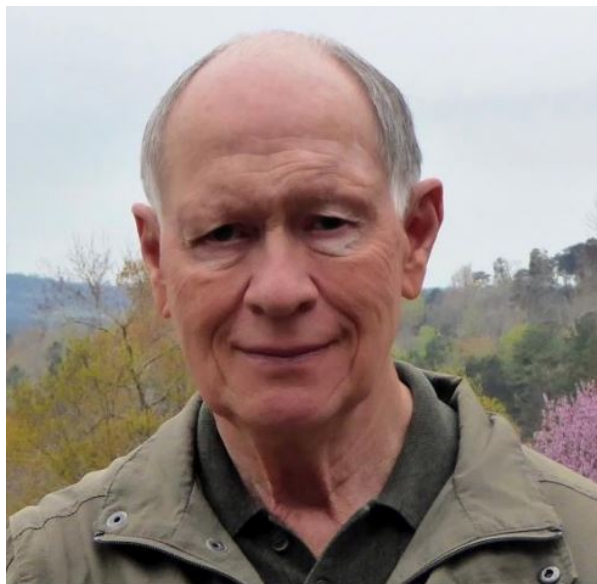
Dr. Ritter began his career at UNC Pembroke in 1996 after graduating from the State University of New York at Buffalo (SUNY Buffalo) with a Ph.D. in condensed matter physics. From 2002 – 2014 he led a multidisciplinary, multi-University microgravity research team known as the “Weightless Lumbees.” This undergraduate research group had eight teams of students fly themselves and their experiments on NASA’s microgravity research aircraft. Dr. Ritter was also the director of the Region 4 North Carolina Science and Engineering Fair for over 15 years. Dr. Ritter’s dedication to undergraduate research led to him being selected as the second director of the Pembroke Undergraduate Research and Creativity Center (PURC). His tenure as the PURC director was interrupted when he was recalled to active duty with the United States Navy in order to serve as an assistant professor at the United States Naval Academy. Professor Ritter’s academic and military careers were cut short in 2015 when he was diagnosed with amyotrophic lateral sclerosis (ALS). Dr. Ritter and his wife Marie currently live in North Myrtle Beach South Carolina.

Each year, an award (maximum \$3,000) shall be provided to one undergraduate student performing research in Chemistry, Physics, or Science Education Grades 9-12 (Biology, Chemistry, Earth Science, and Physics) through the Pembroke Undergraduate Research and Creativity (PURC) Center. The student shall have a minimum QPA of 2.5. The student shall be selected by the PURC Council.

The student shall have a faculty advisor, who will approve the research project and expenses. Approved expenses are costs directly associated with research, including supplies, equipment, and travel (no student stipend allowed). A maximum of one-half of the total annual award may be used for conference expenses if the student is presenting at the conference. A maximum of one-sixth of the total annual award can be used if the student is attending the conference (without presenting).

Dr. Charles Humphrey Undergraduate Conference Travel Award

Charles Humphrey graduated from Pembroke State College in 1965 with a BS in Chemistry (Cum laude) followed by 2 years as a technician at Bowman Gray Medical School. While there, he completed coursework at Bowman Gray and Wake Forest University in anticipation of entering graduate school if financial aid became available. A Fellowship was offered by Clemson University in 1967. Charles obtained a PhD in Nutrition/Biochemistry from Clemson in 1972. Charles' research interests at Clemson involved animal nutrition, infectious diseases, and use of microscopy/electron microscopy. These interests and skill-sets have kept him "hooked" his entire career.



In 2016, Dr. Humphrey generously created the "Dr. Charles Humphrey Undergraduate Conference Travel Award" to encourage both undergraduate research and faculty mentorship. With this award, PURC has awarded a discrete number of conference travel awards to undergraduates to attend regional, professional conferences with a faculty mentor. This award opens the door for students who have never conducted research to experience an academic conference.

Undergraduate Research and Creativity Mentoring Award



Dr. Haitao Zhao is an Assistant professor in the Department of Computer Science at UNCP, joining the faculty in 2022. His academic journey began at Zhengzhou University, China, where he completed his B.S. in Computer Science. He then advanced his studies in the United States, earning an M.S. in Computer Science and a Ph.D. in the program of Integrated Bioscience with a focus on Machine Learning and Data Mining from the University of Akron, Ohio.

Dr. Zhao's research interests lie in Machine learning, Bioinformatics, and Data Analytics. He is committed to the development and application of Machine Learning algorithms across various interdisciplinary fields. He is currently Co-PI on a 2-year, \$600,000 Business-Academia Partnership Program grant

with Corvid Technologies and Institute of Digital Engineering. This project aims to leverage machine learning for the prediction of rapid thrombosis in COVID-19 patients. Additionally, Dr. Zhao is the PI on a grant dedicated to decoding brain activity into texts/emotions through the analysis of brain wave data using deep learning.

Dr. Zhao believes in the power of engaging undergraduate students in research to develop their problem-solving, promote self-learning abilities and prepare them for life-long learning. He encourages his students to apply for grants from PURC (Pembroke Undergraduate Research and Creativity) center, to participate in his on-going research projects. He has been actively involved in mentoring undergraduate students to develop undergraduate students' critical thinking skills and foster their creativity and innovation. Dr. Zhao is grateful for the supportive environment provided by the PURC, which offers undergraduate students valuable opportunities to engage in research activities and expand their academic horizons beyond the classroom.

Undergraduate Research and Creativity Mentoring Award



Dr. Amber Rock is an Assistant Professor of Biology and Environmental Science. She earned a B.S. in Biology from Lycoming College and a Ph.D. in Ecology, Evolution, and Environmental Biology from Miami University in Ohio. She joined UNCP in 2018 and teaches a variety of courses in environmental science, freshwater ecology, botany, and writing. Dr. Rock strives to integrate research and service into her courses so that students leave her classes having gained knowledge, career-focused skills, and an understanding of how science can

be used to benefit local communities. Several of her classes involve service-learning, partnering with Winyah Rivers Alliance, a local non-profit organization, to conduct water quality monitoring in the nearby Lumber River. She loves getting students out of the classroom and into the local freshwater ecosystems – in fact, getting as muddy as possible is one of the objectives for her Freshwater Ecosystems course!

Dr. Rock's primary research interests include how environmental and human factors affect water quality, and how the effects of changing water quality propagate through aquatic food webs. Currently, aquatic systems are being impacted by a myriad of human-caused environmental changes, including climate change, industrial chemical pollution, invasive species, and eutrophication, all of which can influence aquatic ecosystems and negatively impact water quality. Mentoring undergraduate students in research is one of her favorite parts of working at UNCP, and she feels honored to be able to help students follow their interests and grow as scientists. Students in her lab primarily work on projects on and around the Lumber River, collecting data on physical, chemical, and biological measures of water quality. Her partnership with Winyah Rivers Alliance has also created opportunities for students to conduct more applied research that can be used in outreach and community engagement efforts. Other projects in her lab include using high-frequency sensors and data loggers to examine ecosystem metabolism in two of the retention ponds on UNCP's campus. Students participate in all aspects of the research process, including project development, data collection and analysis, and presenting at conferences.

Since arriving at UNCP, Dr. Rock has mentored 14 students in research, and several of those students have continued their studies in graduate school or are currently working in environmental science-related fields. Her students are strongly encouraged to present their research at local, regional, and national conferences. She is thankful for programs and offices such as PURC that provide support for mentoring students in research. Dr. Rock is always excited to develop new projects with students and encourages anyone with an interest in aquatic ecology to stop by and talk about research possibilities.

2024 Pembroke Undergraduate Research and Creativity Council

Prof. Brandon Sanderson, Professor of Art, Director of PURC

Dr. Maria Santisteban, Professor of Biology

Dr. Matthew Hassett, Assistant Professor of Sociology and Criminal Justice

Dr. Renee Lamphere, Professor of Criminal Justice

Prof. Sailaja Vallabha, Senior Lecturer of Chemistry/Physics, Rise Co

Dr. Zachary Laminack, Assistant Professor of English

Dr. Alice K. Locklear, Professor of Social Work



*Pictured from left to right are: Brooke Blackmon, Sierra Wright, Erika Rivera and Shannon Lowry
Photo Credit: Dr. Lisa Kelly, Biology*



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