

**Nineteenth Annual  
UNC-Pembroke**

# **Undergraduate Research and Creativity Symposium**

THE UNIVERSITY OF NORTH CAROLINA AT PEMBROKE



**PEMBROKE UNDERGRADUATE  
RESEARCH AND CREATIVITY CENTER**

**April 9, 2025**

**Program with Abstracts**

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Dear Students, Colleagues and Guests:

Welcome to the 19<sup>th</sup> Annual Pembroke Undergraduate Research and Creativity Symposium! This event is a campus-wide celebration of undergraduate research and creativity hosted by the Mary Livermore Library. Today you will see the academic accomplishments of some of our best and brightest from all across the UNCP campus. The faculty-mentored student research projects on display represent a wide variety of fields. We are pleased to include 88 presentations of scholarly ventures by approximately 123 students and 38 faculty mentors, representing 17 academic departments.

PURC endeavors 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. We seek to stimulate, support and promote inquiry, discovery and creativity in scholarship and the arts through mentored research experiences with faculty and other regional, national and international scholars and professionals. In this way, the Center facilitates and coordinates preparation in research skills necessary for to the workplace and graduate study.

Undergraduate research continues to flourish on our campus. During this academic year, PURC-funded students received support to conduct research through 18 fellowships and presented research and creative works at approximately 30 conferences. Please join us in acknowledging the accomplishments of our students.

Once again, 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 to Dr. Timothy Ritter and Dr. Charles Humphrey for their ongoing support of undergraduate research on our campus. I would also like to recognize the efforts of Alesia Cummings, Marcus Burger and Elizabeth Jones, whose many behind-the-scenes-efforts made this event possible. Next, I would like to thank the PURC Council whose many years of expertise are invaluable in guiding and supporting undergraduate research on our campus.

The first PURC Forum, hosted in 2007, sought to be a launching pad for student participation in research and formal presentation venues. As such, PURC has grown to become a nexus of creativity and collaboration, a means to find others on campus who seek to go above and beyond in pursuing and pushing themselves in their field. So, please take this opportunity to make the most of the symposium by presenting and discussing your work and engaging with others about their ideas. Use that as a springboard to take your work deeper into your local communities, and expand beyond to local, regional, national and international conferences and workshops!

Brandon Sanderson  
Director, Pembroke Undergraduate Research and Creativity Center



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*Photo by Michael Litty, Videographer, UCM*

# ***19<sup>th</sup> Annual Pembroke Undergraduate Research and Creativity Symposium***

*Wednesday April 9<sup>th</sup>, 2025 -- 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** – Dr. Mary Farwell, Assistant Vice Chancellor for Research Development, East Carolina University

**10:20-11:45 Poster/Exhibit Session** (Library Commons)

**11:45-12:15 Deli Lunch Service** (Adjacent Special Collections)

**12:15-2:00 Musical Performances and Oral Presentations**

12:15-12:25 "A Walk in the Park"

**Jaylen Jones**, composer, tenor saxophone

**Christian Gonzalez**, alto saxophone

**Tramel Denning**, keyboard

**Connor Deel**, bass

**Caleb Moore**, drum set

**Mentor:** Dr. Aaron Vandermeer, Music

12:25-12:35 "Lover Mine," a contrafact of "Take the 'A' Train"

**Jonathan Andrews**, composer

**Christian Gonzalez**, alto saxophone

**Jaylen Jones**, tenor saxophone

**Tramel Denning**, keyboard

**Connor Deel**, bass

**Caleb Moore**, drum set

**Mentor:** Dr. Aaron Vandermeer, Music

12:35-12:43 "Sonata for Eb Alto Saxophone and Piano" by Lawson Lunde (1935-2019),  
-Allegro

**Colt Blackmon**, Eb alto saxophone

**Tomoko Galeano**, piano

**Mentor:** Dr. Lindsey Jacob

12:45-1:00 "Optimization of Polymerase Chain Reaction (PCR) Using Gradient PCR"

**Maricela Andrade**, Biology

**Mentor:** Dr. Crystal Walline

1:00-1:15 "Beyond the Typical Weather Forecast: Harnessing Probabilistic Graphics for Effective Emergency Management"

**Gretchen Gillenwater**, Geology & Geography

**Mentors:** Dr. Daphne LaDue and Dr. Alex Marmo

1:15-1:30 "Impacts of Digital Nomads on Economies"

**Hein Htet**, Business

**Mentor:** Dr. Lydia Gan

1:30-1:45 "Water Quality Trends in the Lumber River: Urban, Industrial, and Agricultural Pollutants"

**Lillian Matthews**, Biology

**Mentor:** Dr. Amber Rock

1:45-2:00 "Two Invading Ant Species Affect Biodiversity in Longleaf Pine Ecosystems"

**Erika Rivera**, Biology

**Mentors:** Dr. Kaitlin Campbell and Dr. Lisa Kelly

# ***19<sup>th</sup> Annual Pembroke Undergraduate Research and Creativity Symposium***

Wednesday April 9<sup>th</sup>, 2025 -- *Mary Livermore Library Commons and Reading Room*

## **Schedule of Events (continued)**

**2:00-3:05      Awards Presentation, Reception and Closing Remarks (Reading Room)**

2:00-2:10      **Dr. Timothy M. Ritter & Marie A. Amero Endowed Research Scholarship –**  
Paulina Captan

2:10-2:20      **Dr. Charles Humphrey Undergraduate Conference Travel Award –**  
Kathryn Bering – Dr. Courtney Alexander  
Trey Watson, Ronnie Williams, Ciara Smith – Dr. Melanie Escue  
Mohammad Kawsar – Dr. Shaohu Zhang

2:20-2:25      **Dr. Humphrey:** Remarks on Undergraduate Research

2:25-2:35      **Undergraduate Research and Creativity Mentoring Award**  
Dr. Courtney Alexander

2:35-2:45      **Undergraduate Research and Creativity Mentoring Award**  
Dr. Silvia Smith

2:45-2:55      **Library Resources and Research Support –** Elizabeth Jones, MLIS, Assistant  
Dean and Director of Patron Services

2:55-3:05      **Closing Remarks by Campus Leadership --** Dr. Scott Billingsley, Professor of History and  
AVC for Faculty Affairs

## **2025 Keynote Speaker: Dr. Mary Farwell**



**Dr. Mary Farwell** serves as Assistant Vice Chancellor for Research Development at East Carolina University. She oversees research development, undergraduate research, and postdoctoral affairs. Dr. Farwell also administers programs that support early career faculty, develops teams to prepare competitive proposals, and oversees competitions for grant submissions to agencies

that limit the number per institution. She received her ScB with Honors in Biology Magna cum Laude from Brown University and her PhD in Biochemistry from the University of California-Berkeley. After an NIH-funded postdoctoral fellowship at UNC-Chapel Hill, she joined the Department of Biology at ECU as an assistant professor and is currently Professor of Biology. She has published 32 articles and has received over \$1.2 million in extramural support. During her research career, she studied protein synthesis and cell death, as well as antioxidant defenses in fish. She has received funding from diverse sources including NIH, American Cancer Society, NC Sea Grant, and NSF. Farwell recently served as a co-PI on an NSF IUSE grant for team science and is currently working on an NSF INCLUDES project for postdoctoral scholars' pathways to academic careers. She is a trained grant proposal writing facilitator with the Council on Undergraduate Research.

## POSTERS

### 1 - Reaction Kinetics Calculations in Excel

**Sarah Alhobishi**, *Biology*

Mentor: **Sivandane Mandjiny**

*Abstract:* Reaction Kinetics studies the rate of chemical reactions. It examines how fast a reaction moves and what factors influence its speed. These things include temperature, reactant concentrations, and whether catalysts were present in the reaction. This project allows us to advance our current knowledge on reactions kinetics. The main issue students encounter in General Chemistry 2 is calculating equations. They tend to struggle the most with the chapters regarding reaction kinetics, phase change, and clausius clapeyron equations. These calculations in Excel will help the students be able to solve the equations more efficiently and accurately. All the students will have to do is plug in the data into the excel application and the equation will be computed for them. The applications are detailed and include hints and directions to prevent students from getting mixed up or not being able to use the application correctly.

### 2 - Public Perception and Cultural Legacy of Black Slave Women

**Ashlee Allen**, *Kinesiology*

Mentors: **Michele Fazio, Christopher Woolley**

*Abstract:* Between 1937 and 1938 photographers and interviewers of the Federal Writers Project and Farmer's Security Association documented slavery, deep-diving into the lives of black, slave women in Athens, Macon, and Augusta Georgia. Using archives from the Library of Congress, this project unpacks black women's roles within the culture and examines the portrayal of these women to the public, underlining any subjective and biased images. This can be seen in interview transcripts as the interviewer will use condescending verbiage to describe the woman's appearance or dialect.

### 3 - Poverty and the Lumbee Lived Experience

**Kai Anderson**, *Sociology & Criminal Justice*

Mentors: **Michele Fazio, Christopher Woolley**

*Abstract:* This project seeks to expand on work of the Federal Writer's Project (FWP) by drawing from photos and life histories to examine experiences of poverty in Robeson County, North Carolina. One of the poorest counties in the state today, this project seeks to discover the historical roots of such hardship. Specifically, the intersection of poverty and race is taken into account by looking at the lived experiences of the Lumbee Tribe. Given that these intersections create unique experiences for different social groups and because Native Tribes are often neglected from research, it is important to showcase how poverty among the Lumbee Tribe distinguishes itself from that of other groups.

### 4 - Modeling Human Neurological Disorders: The Role of BK Channel Mutations in *C. elegans* and Their Impact on Motor Behavior

**Iva Angjeleska**, *Biology*

Mentor: **Courtney Alexander**

*Abstract:* *Caenorhabditis elegans* mutations in the SLO-1 potassium channel gene have been linked to behavioral abnormalities and changed motor function; these findings may have similarities to human channelopathies caused by KCNMA1 mutations. The effects of SLO-1 mutations on worm movement, neuromuscular coordination, and stress response in the presence of elevated potassium and calcium levels are examined in this work. To replicate human KCNMA1 mutations, mutant strains were acquired that used CRISPR-Cas9 to mimic the human genetics. Motor deficits were evaluated using behavioral assays such as touch response, gravitaxis, and thrashing tests, and vulnerability to paralysis was investigated through exposure to environmental stressors. It is anticipated that when the wild-type gene is reintroduced, the mutants' severe motor impairments and increased stress sensitivity will be revealed. This study aims to deepen our understanding of ion channel dysfunction mechanisms and may provide insights for therapeutic interventions in human potassium channelopathies.



## 5 - Determination of Acetaminophen in Urine Using a Rapid Mass Spectrometry Technique

**Kathryn Bering**, *Chemistry & Physics*

Mentor: **Paul Flowers**

*Abstract:* Acetaminophen is an analgesic and antipyretic drug that is widely used as the active ingredient in various over-the-counter medications. Metabolic processing of acetaminophen is such that extensive liver damage can result when exceeding therapeutic dosages. The availability of rapid point-of-care assays to quantify acetaminophen in body fluids is therefore essential for timely diagnosis and effective treatment of patients, and a significant research effort towards development of suitable technologies is on-going. Work in our lab aims to develop simple and rapid assays for drugs, toxins, and metabolites in various biological fluids for potential application in clinical settings. In this poster, progress towards the development of an assay for acetaminophen in urine using mass spectrometry is described. This assay entails use of atmospheric pressure chemical ionization and introduction of samples with an atmospheric pressure solid analysis probe (ASAP-APCI-MS). Comparison of neat and acetaminophen-spiked urine specimens indicates the mass spectral signals generated by the urine matrix do not interfere with the primary acetaminophen signals at  $m/z$  values of 152 amu and 110 amu. Work in progress is exploring the feasibility of a standard addition approach to quantify urinary acetaminophen using a urine matrix component as an endogenous internal standard. Support of this research by the UNCP U-RISE Program, funded by the National Institutes of Health, is gratefully acknowledged.

## 6 - Performing the Lawson Lunde Sonata at the North American Saxophone Alliance Region Seven Conference

**Colt Blackmon**, *Music*

Mentor: **Lindsey Jacob**

*Abstract:* From March 14th through 16th, I attended the North American Saxophone Alliance (NASA) Region Seven Conference in Knoxville, Tennessee, where I performed the first movement of the Lawson Lunde Sonata in a masterclass with Dr. Sean Fredenburg, Lecturer of Saxophone and Music Theory at the University of Tennessee at Chattanooga. In the masterclass, I gained valuable knowledge on performance practices, posture, and breath support. I also had the unique opportunity to gain performance experience outside of North Carolina. In addition to performing at the conference, I was able to attend many different masterclasses, lectures, and performances. I made connections with many professional saxophonists, attended lectures and masterclasses with information on saxophone history, playing styles, and techniques, and viewed performances which introduced many new musical ideas.

## 7 - Controlling Leaching During Short-cycle, Plant Production Reduces P Losses

**Evelyn Boakye** and **Braydann Revels**, *Biology*

**Ian Fultz**, *Mathematics & Computer Science*

Mentors: **Jeffrey Beasley**, **Byron Hunt**

*Abstract:* Short-cycle, plant production requires frequent irrigation and readily available nutrients to support plant growth. However, excess irrigation leads to higher leachate volumes and nutrient losses that can slow plant growth while increasing offsite nutrient movement into nontarget areas. The objective of this study was to evaluate the effect reducing leaching has on DRP losses during coleus (*Plectranthus scutellarioides*) production over a four-week production cycle. Coleus plugs were grown in 3-quart containers filled with a 3 pinebark:1 peat:1 vermiculite substrate amended with 0.3 kg N and P<sub>2</sub>O<sub>5</sub> m<sup>-2</sup>. Irrigation was applied at 298 mL (1.05 cm) during a two-minute cycle per day as a standard timed irrigation system versus coleus grown using a sensor that ceased irrigation application once leaching occurred. In addition to recording irrigation application parameters, leachate was captured from one plant per replication for weekly measurement of DRP. No differences in coleus growth index or shoot and root biomasses at four weeks after planting (WAP) occurred between irrigation systems. However, coleus subjected to the controlled leaching system resulted in reductions in cumulative irrigation and leachate volumes of 40% and 69%, respectively, that led to a 45% reduction in cumulative DRP leached compared to coleus following the timed irrigation system. Limiting irrigation volumes reduces leachate volumes to decrease DRP losses without sacrificing coleus growth.



## 8 - Development and Implementation of Technologies for Plastic Recycling

**Maria Bogan**, *Chemistry & Physics*

Mentor: **Cornelia Tirla**

**Abstract:** Plastic pollution is one of the most pressing environmental challenges today. Plastics are ubiquitous in modern products, appearing in clothing, packaging, and electronics, but recycling remains a significant hurdle, as most plastics are either not recycled at all or lose quality during the process. Methanolysis is a chemical recycling method that cleaves ester bonds in polymers to revert them into their monomeric forms; however, it traditionally requires high temperatures and/or pressures to effectively depolymerize polyesters. In this study, we employ methanol and a potassium carbonate catalyst to simultaneously depolymerize multiple polyester plastics in a single solution under ambient conditions, while leaving non-target polymers unaffected. If successful, this approach could offer a single-step method for separating polyesters from mixed plastic waste while preserving the purity of the recovered monomers.

## 9 - Large Language Models Use in Decoding Neighborhood Environments

**Andrew Cart**, *Mathematics & Computer Science*

Mentor: **Shaohu Zhang**

**Abstract:** Neighborhood environments include physical and environmental conditions such as housing quality, roads, and infrastructure, which significantly influence human health and well-being. Traditional methods for assessing these environments, including field surveys and GIS, are resource intensive and often fail to capture dynamic, nuanced community interactions. AI- though machine learning offers potential for automated analysis, the laborious process of labeling training data and the lack of accessible models hinder scalability. This study explores the viability of large language models (LLMs) such as ChatGPT, DeepSeek, and Gemini as tools for decoding neighborhood environments, leveraging their capacity to analyze multimodal data (e.g., street views) at scale. We establish a robust baseline by developing a deep neural network trained on a manually labeled data set of 2,000 images, achieving state-of-the-art performance in detecting six key environmental indicators. We then evaluate multiple LLMs to assess their feasibility, robustness, and limitations in identifying these indicators, with a focus on the impact of prompting strategies, fine-tuning, and few-shot learning. Our experiments reveal critical insights into the opportunities and barriers of LLMs in environmental analysis, including their sensitivity to parameter tuning and contextual reasoning capabilities.

## 10 - Longitudinal Analysis of Dyspnea Severity and Quality of Life in UNCP Dysautonomia Cohort

**Shelley Chavis**, *Biology*

Mentor: **Silvia Smith**

**Abstract:** Dysautonomia is an umbrella term encompassing several disorders that affect the autonomic nervous system. Dyspnea, or shortness of breath, is a commonly reported symptom among patients with dysautonomia. This longitudinal patient-reported outcome study investigates whether participants with a self-reported diagnosis of any autonomic disorder experience a change in dyspnea severity over time (UNCP Institutional Review Board # 39-22). We tested two null hypotheses: (1) dyspnea severity remains unchanged, and (2) quality of life remains unchanged. Participants were categorized into two groups: those with comorbid conditions and those without. They completed the NIH-PROMIS® Dyspnea Characteristics v1.0 and NIH-PROMIS® Global Health v1.2 surveys annually from 2023 to 2025 to quantify dyspnea severity and its impact on quality of life. Statistical analyses are currently ongoing, using paired t-tests in Excel and R to compare scores for all three years. Current results from the first two years indicate that dyspnea severity decreased in individuals without comorbid conditions, whereas those with comorbidities experienced worsening dyspnea severity. Further analysis will be conducted to evaluate whether these trends persist in year three.

### **11 - Distinct Effects of an Organophosphate Toxin vs. Military Blast Exposure in Hippocampal Explants Including Modulation of Disintegrin/metalloproteinase Domain-Containing Proteins and the Out at First (OAF) Member of the Protein Aggregation-Preventing BRICH**

**Bianca Easterling, Biology**

Mentor: **Ben Bahr**

*Abstract:* Space travel exposes the brain to stressors such as turbulence, hypoxia, and radiation, increasing seizure susceptibility. Given the bidirectional relationship between epilepsy and Alzheimer's disease (AD) (Leitner et al. 2023), understanding how neurotoxic insults impact seizure-AD-linked proteins is critical. We conducted proteomic analyses on rat hippocampal explants exposed to the organophosphate neurotoxin paraoxon (Pxn) (Farizatto et al. 2017) or blast waves from military explosives (Smith et al. 2016; Almeida et al. 2021), both of which have been associated with synaptic protein declines. Statistical filtering revealed distinct effects: blasts significantly reduced 12 synaptic proteins, including Camk2a, Camk2b, and Dynamin-1 (-56.73% to -61.58%,  $p < 0.01$ ), while mild Pxn exposure had no impact (10.20% to 5.70%,  $p \geq 0.09$ ). Given that Pxn triggers integrin-cofilin signaling (Farizatto et al. 2019), we assessed integrin-related proteins. Pxn reduced Adam15 by 21% ( $p = 0.019$ ), while blasts increased Adam15 and Adam17 by 16-21%. Pxn also upregulated Out at First (OAF) by 119%, a BRICHOS domain-containing protein that prevents A $\beta$ 42 fibril formation (Poska et al. 2020). Blasts increased eight growth factors and decreased four, while OAF was undetected. These findings suggest blast exposure has a more profound impact on synaptic integrity than Pxn and highlight potential mechanisms linking neurotrauma to AD-related pathology.

### **12 - Southern Fox Squirrel Color Morphology in Southeastern NC**

**Nathan Emerson, Biology**

Mentor: **Katherine Thorington**

*Abstract:* Fox squirrels (*Sciurus niger*) show pelage coloration diversity that in some subspecies including *S. n. niger* allows individual recognition based on coat markings. In Southeastern NC, Weigl et al (1989) categorized coat colors into 4 groups; gray white-belly (WB), gray gold-belly (GB), saddle-back melanistic (SB) or melanistic (ME). By comparing historic data with current findings, we can understand changes in color patterns potentially allowing non-invasive tracking of population trends. Camera trap data were collected from 2021-2025 in Weymouth Woods Sandhills Nature Preserve (WEWO, sandhills) and the Lumbee Tribe Cultural Center (LTCC, coastal plain). We had 72 camera locations at WEWO and 10 at LTCC. We compared Weigl et al's data (% category) and our own to look for shifts in color frequency. These data suggest that southern fox squirrel color frequencies differ at our sights compared to patterns seen earlier. In 59 camera sequences at WEWO we had 21.1% WB, 5.3% GB, 42% SB 26.3 % ME. At LTCC we had 53.3% WB, 0.0% GB, 0.0% SB 40.0% ME from 19 camera sequences. In contrast Weigl et al (1989)'s data show a pattern of sandhills 47.6% WB, 21% GB, 12.9% SB and 8.5% ME, and coastal plain 80.8% WB, 19.2% SB with other patterns not recorded. Additional sequences are being evaluated. This could indicate population changes in response to environmental shifts over time.

### **13 - Sleep Disturbance in People with Dysautonomia**

**Eugenie Feitosa Amidou, Biology**

Mentors: **Silvia Smith, Andrew Latham**

*Abstract:* The autonomic nervous system (ANS) regulates many physiological processes that occur during sleep such as blood pressure, heart rate, and respiratory rate. Cardiopulmonary and neuroendocrine functions vary from wakefulness to sleep states and during different parts of sleep. Sleep Disturbance is commonly reported in dysautonomia. Even though sleeping medication are commonly taken to improve the quality of sleep, they do not directly lead to improvements. The goal of this study is to describe the occurrence of disturbed sleep in dysautonomia and to test the null hypothesis that there is no difference in quality of sleep between individuals that take sleeping aids and those who do not. To

this end, we conducted a patient-reported outcome study in spring 2025 (IRB #036-24) in collaboration

with two non-profit dysautonomia organizations: The Dysautonomia Project and Dysautonomia Support Network. Two hundred participants completed the “Sleeping Medication” and the PROMIS® Sleep Disturbance via survey instruments using the REDCap database, housed on secure UNCP servers. Survey data were analyzed to determine the prevalence of sleep disturbance and to test the null hypothesis that sleeping medications do not improve quality of sleep in this patient population. Our analyses show that sleeping medications are associated with improved sleep quality with a p-value = 0.02. Thus, we can conclude that their sleeping medications usage improves sleep disturbance.

#### **14 - How do Newton’s Three Laws of Motion apply to Prosthetics?**

**Eugenie Feitosa Amidou**, *Chemistry & Physics*

Mentor: **Uma Poudyal**

*Abstract:* The aim of this research was to analyze the three universal laws of motion formulated by Newton and study their application in prosthetics. To this end, we conducted a literature review to examine how Newton’s laws of motion impact the comfort, stability, and functionality of the prosthetics. Newton’s First Law (inertia) explains how a prosthetic limb remains at rest or in motion unless acted upon by external forces, influencing balance and control of the user. The Second Law ( $F=ma$ ) guides force distribution. It explains that the forces applied to do certain actions like standing up will create prosthetic acceleration. Therefore, the weight and material of the prosthetic is important when designing prosthetics to perform user movement efficiently. Newton’s Third Law of Motion is based on action-reaction. Those equal forces in opposite directions applied in everyday life allow for the prosthetic to be balanced and stable, allowing for more dynamic movements. Biomechanics utilizes these laws to develop prosthetic limbs that will improve user’s quality of life and the effectiveness and stability of prosthetics. In short, this study explores the application of Newton’s laws in prosthetics, featuring their importance in prosthetics engineering, rehabilitation, and sports.

#### **15 - Investigating the Effects of Elderflower on Mobility in Parkinson’s Disease C. elegans.**

**Carina Fiorucci**, *Biology*

Mentor: **Courtney Alexander**

*Abstract:* Parkinson’s disease is a neurological disorder that affects movement. Parkinson’s causes a loss of muscle control which includes side effects such as tremors, partial paralysis and speech problems. Research is continually being done to figure out how to lessen the side effects or prevent the cognitive decline in people diagnosed with the disease. For this research study different strands of *C. elegans* are being used to test the effects of elderflower on Parkinson’s. The strands with Parkinson’s were DDP1, DDP2, and JVR406 the stand without was N2 (wild type). The strands were placed on plates with and without elderflower to see if it had any affect on the mobility or lifespan of the *C. elegans*. The mobility tests consist of placing the *C. elegans* in S-Basal and watching for an effect on the curling or bending of the different strands.

#### **16 - FSA Photography and the Mexican Migrant Workers of America**

**W. Jacob Fischak Talbert**, *History*

Mentors: **Michele Fazio**, **Christopher Woolley**

*Abstract:* This presentation focuses on archival photographs of the Farm Security Administration that depict the lived experience of Mexican migrant workers in early twentieth-century America. Dorothea Lange, one of the most prolific FSA photographers, captured the livelihood of many Mexican migrant workers and the difficult conditions they faced in America.

This research takes a deep dive into how the work of Lange encapsulated the role of Mexican migrant workers in shaping the American agricultural setting. Photographs captured by Lange, such as those taken in Imperial Valley, California display the sentiment of Mexican migrant workers as they adjusted to their living conditions, revealing the complex relationships between poverty, migration, and labor. Lange’s work illuminated the conditions Mexican migrant workers faced before the Bracero Program’s formalization of temporary agricultural labor. By exploring these historical sources, this project traces the long-standing disputes regarding immigration and labor that persist today. This project aims to

emphasize how Mexican migrant workers have been consistently underappreciated, despite their vital role in sustaining the U.S. labor force, even in times of national crisis.

### **17 - A Comparative Analysis of Two Case Studies of Food Intoxication in North Carolina**

**Estrellita Garcia Regino**, *Biology*

Mentor: **Marliu Santos**

*Abstract:* The research project is a comparative analysis of Salmonella and Clostridium difficile outbreaks that occurred in North Carolina over the past decade. The Salmonella outbreak was traced back to multiple factors, including improper temperature control of food items, potential lapses in employee hand hygiene practices, and the possibility of cross-contamination in the kitchen. In response to the situation, the hotels implemented strict cleaning procedures, enhanced food safety training, and revised their employee health monitoring policies. In contrast, the C. difficile case study revealed unusual transmission occurring in community settings among patients who had no recent history of antibiotic use, raising concerns about healthcare-associated infections (HAI). Its implications go beyond C. difficile, suggesting that healthcare-associated pathogens can become community threats and stressing the need for public health approaches that connect healthcare and community settings. Food intoxication remains a significant public health concern worldwide, with outbreaks posing serious risks to individuals and their communities. The research project investigates factors, epidemiological methods, and health official responses that influence the outcomes of these cases and illustrates the importance of epidemiological investigations in identifying risk factors and improving public health policies.

### **18 - Characterization of Immobilized Invertase in Calcium Alginate Beads**

**Preethi Gnanamurugan**, *Nursing*

**Christian Oxendine** and **Travis Thibodeaux**, *Chemistry & Physics*      Mentor: **Sivanadane Mandjiny**

*Abstract:* This study investigates the immobilization of invertase enzyme in calcium alginate beads with chitosan and its characterization. The immobilized invertase was used to catalyze the hydrolysis of sucrose into glucose and fructose. The reaction was monitored using 3,5-dinitrosalicylic acid (DNS) reagent, which detects reducing sugars by a colorimetric method, measured at 540 nanometers using a spectrophotometer. A standard glucose curve was prepared, followed by analysis of enzyme activity in different sucrose concentrations. The study also examines the role of deionized (DI) water instead of buffers (sodium phosphate buffer and tris buffer), as sodium phosphate buffer destabilizes alginate beads and Tris buffer interferes with glucose detection due to Schiff's base reaction. Results will determine the efficiency and stability of the immobilized enzyme for potential biochemical and industrial applications.

### **19 - Estimation of Combustion Enthalpies using QM corrected Energetics**

**David Gort**, *Chemistry & Physics*

Mentor: **Benjamin Killian**

*Abstract:* Bomb calorimetric combustion analysis of variants of phthalic anhydride performed in the lab produces results that conflict with current literature values. Using standard quantum mechanical computational methods, we seek to estimate the enthalpy of combustion for these compounds for comparison with the experimental calorimetric values. In this work, we investigate basis set convergence and validate the calculated enthalpy of combustion for several classes of organic compounds as a control dataset.

### **20 - Proteomic Insights into Brain Vulnerability and Resilience: Dietary Supplementation with Panax quinquefolius Mitigates Synaptic Decline**

**MyKayla Greene**, *Chemistry & Physics*

**Kinsley Adams**, *Biology*

Mentor: **Ben Bahr**

*Abstract:* Cognitive health is a critical focus in preventing age-related conditions such as dementia and Alzheimer's disease. This poster investigates the impact of dietary supplementation with Panax quinquefolius (American ginseng) on brain health markers in a model of mild cognitive impairment

(MCI) using middle-aged Fischer rats. Six weeks of supplementation reduced cognitive deficits and improved synaptic integrity and behavioral performance, as shown in previous findings. To elucidate the

molecular mechanisms underlying these effects, this study explores proteomic changes associated with axonogenesis and synaptic connectivity (e.g., VAT-1, Rab-10, CAMKV), as well as protein clearance pathways, including the ubiquitin-proteasome system (e.g., PSB6, NEDD8) and the autophagy-lysosomal pathway (e.g., LAMP1, cathepsin B). These pathways are critical in mitigating age-related lysosomal stress and other brain-compromising conditions. By identifying proteomic signatures indicative of dietary healthiness, such as the preservation of proteome components under brain stress, this work contributes to a growing body of research on optimizing cognitive resilience. Findings will integrate proteomic and behavioral data to provide a comprehensive understanding of how dietary interventions like *Panax quinquefolius* supplementation protect brain health.

## **21 - A Comparison of ChatGPT and DeepSeek as Learning Tools in Acupuncture Education**

**Zining Guo, Business**

Mentor: **Xin Liu**

*Abstract:* Acupuncture is increasingly used in medical treatments, and the rise of artificial intelligence offers new possibilities for acupuncture education. This study compares ChatGPT and DeepSeek as learning tools, focusing on their ability to assist in acupoint selection, treatment details, and professional explanations. How can ChatGPT and DeepSeek can give detailed diagnostic directions and instructional explanations in acupuncture case teaching?

*Method:* Extract 14 cases from Lee's 2023 study in "JMIR Medical Education", input them into ChatGPT and DeepSeek using identical instructions, and compare the number of acupoints generated by each AI with the actual points used. Submit the results to TCM professionals for evaluation.

*Result&Discussion:* DeepSeek generated more acupoints on average compared to ChatGPT. Both AI tools classified the acupoints and suggested additional treatments. However, DeepSeek offered more comprehensive details, including treatment frequency, lifestyle recommendations, and explanations for each treatment option. Both AI tools can provide diagnostic directions for acupuncture learning, but the specific diagnostic plans still need more rigorous screening. Compared to ChatGPT, Deepseek can provide more rationale for acupuncture education.

## **22 - Active Zone Heterogeneity at the Mouse Neuromuscular Junction Analyzed using 3D Simulation Programs**

**Julisa Hernandez Feria, Biology**

Mentor: **Robert Poage**

*Abstract:* Monte-Carlo Cell (MCell) is a computational tool used to simulate molecular movements and reactions within and between cells, producing realistic 3-D cellular models of cellular microphysiology. The active zone (AZ) model extends understanding of the interaction between voltage-gated calcium channels and fusion-related proteins on docked synaptic vesicles. By converting one computational model from MDL to Python, I aim to generate more powerful and realistic models with improved functionality. I plan to combine MCell with a membrane potential simulator (NEURON) to simulate electrical signaling details in nerve terminals. The graphical interface, CellBlender, simplifies the process of creating and improving computational models. I am using Blender, CellBlender, MCell3, and MCell4 to rebuild the current known NMJ model and run experiments at the Pittsburgh Supercomputer Center to assess and improve the models, both control and diseased configurations.

## **23 - Echoes Of The Past: Exploring North Carolina's Indigenous Historical and Archaeological Sites**

**Sheena Holbrook, American Indian Studies**

Mentors: **Michele Fazio, Christopher Woolley**

*Abstract:* North Carolina's landscape holds a rich tapestry of Native American history, marked by ancient mounds and archaeological sites that offer invaluable insights into the lives of Indigenous peoples who inhabited this land for millennia. This project aims to create a comprehensive digital map of these significant locations, fostering preservation, education, and research while prioritizing

collaboration with the state's Indigenous tribes. By leveraging advanced technologies like LiDAR and GIS, and integrating existing archaeological data with oral histories, my project builds an accessible and

interactive platform that illuminates the historical and cultural significance of these sites, ensuring their protection and promoting a deeper understanding of North Carolina's Indigenous heritage. Through the spatial analysis of artifacts and site distributions, the map will reconstruct and display the historical trade and migration networks that linked North Carolina's Indigenous populations with those of distant regions.

#### **24 - 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.

#### **25 - The Use of Black Soldier Flies (*Hermetia illucens*) as a low-cost Blue Tilapia (*Oreochromis aureus*) Diet and Food Waste Management**

**Jazmyn Jenson, Biology**

**Mentors: Sean Hitchman, Jeffrey Beasley**

*Abstract:* Aquaculture requires many costly inputs such as the rising cost of fishmeal as a main food source. To decrease the costs of aquaculture, Fly larvae could be used as a primary food source in replacement of traditional fishmeal. Fly larvae as the primary food source allow for a high protein intake at a lower cost. To continue the cycle, the fly larvae populations can be sustained with food waste, allowing for a low cost, self-replenishing food source. The objective of this study was to measure the growth differences of Blue Tilapia when fed commercial fish meal versus Black Soldier Fly (BSF) larvae in an effort to decrease costs associated with aquaculture. Four 100-gallon stock tanks were used, each housing 35 Blue Tilapia fingerlings. Two tanks were fed BSF larvae, and two groups were fed commercial fingerling fishmeal. Each tank was fed 3% of their combined body weight daily. Daily measurements were taken for dissolved oxygen and temperature within each tank to ensure water quality. Measurements for fish length and weight were recorded every two weeks. This study is ongoing, so no conclusive results have yet to be determined.

#### **26 - Determination of pKa of Weak Acids Using Conductance Method**

**Harlem Jones and Emily Hunt, Chemistry & Physics**

**Mentor: Sivanadane Mandjiny**

*Abstract:* The determination of the acid dissociation constant ( $K_a$ ) is crucial in various scientific fields, including biochemistry and pharmaceutical sciences. In this study, we aim to determine the pKa values of weak acids using the conductivity method, an alternative approach to the conventional titration method with sodium hydroxide. The pKa of a weak acid plays a fundamental role in buffer solution preparation, making its accurate determination essential for research laboratories and pharmaceutical applications. Our experimental methodology involves measuring the electrical conductivity of weak acid

solutions as a function of pH. Conductivity is expected to change with the degree of ionization, allowing us to calculate the pKa value. To validate our results, we will compare conductivity-derived pKa values with those obtained using a standard pH meter. If successful, this study will demonstrate the reliability and feasibility of using conductivity measurements as a viable method for pKa determination in undergraduate chemistry laboratories. This experiment provides an opportunity to explore an unconventional analytical technique, enhancing our understanding of acid-base equilibria. Furthermore, for a freshman chemistry student, this hands-on experience fosters a deeper comprehension of chemical principles beyond traditional titration methods.

## **27 - Annotation of the foxo Gene in Drosophila takahashii and Its Link to Human Health**

**Walid Kadi Hamman**, *Biology*

Mentor: **Maria Pereira**

*Abstract:* The foxo gene plays an important role in metabolism regulation and aging-related disorders. It contributes significantly to one of the most important cellular signaling pathways, referred to as the insulin/insulin-like growth factor signaling pathway (IIS). The foxo gene has been previously annotated, and its functions have been studied to a considerable extent in *D. melanogaster*, which is a species of fruit fly. However, more research is needed to identify its function in other *Drosophila* species. In this study, we annotated the foxo gene in *Drosophila takahashii* in order to have a better understanding of its structure and conservation compared to its *D. melanogaster* counterpart. To complete the annotation, we used computational tools from the Genomics Education Partnership (GEP), such as experimental analysis data of the genome of both species, and bioinformatic search tools provided by the National Center for Biotechnology Information (NCBI). We identified important functional coding regions of the gene (CDSs) that play a role in protein production and compared them to *D. melanogaster*. Given that nearly 77% of human disease-related genes have counterparts in *Drosophila*, studying the functionality of the foxo gene in different *Drosophila* species can help advance our understanding of the insulin signaling pathway and, therefore, help frame our knowledge of its impact on human health.

## **28 - Optical Properties of TMDCs Atomic Layers Using Various Transition Metals**

**Jenna Kim**, *Chemistry & Physics*

Mentor: **Uma Poudyal**

*Abstract:* Transition Metal Dichalcogenides (TMDCs) are two-dimensional structures that are made of one transition metal and two chalcogen atoms. These materials with a single to a few atomic layers exhibit unique electronic, optical, and mechanical properties making them suitable for application across different fields of science. In this project, we measured the absorption spectra of MoSe<sub>2</sub>, WSe<sub>2</sub>, TiSe<sub>2</sub>, and ZrSe<sub>2</sub> using two different CCD spectrometers, one for UV-VIS and one for VIS-IR. For MoSe<sub>2</sub>, we observed a peak at ~ 566 nm showing strong absorption at that specific wavelength. For WSe<sub>2</sub>, peaks were observed at ~ 432 nm and ~475 nm. For ZrSe<sub>2</sub> and TiSe<sub>2</sub>, we observed broad absorption over the visible range. Understanding these materials' absorption in the visible range will be helpful for exploring their potential applications in optoelectronic devices like photodetectors, solar cells, and light-emitting diodes (LEDs).

## **29 - To Cure or not to Cure: Gene Editing Therapy vs Non-Curative Treatment Options for Sickle Cell Disease**

**Analise Lang**, *Biology*

Mentor: **Silvia Smith**

*Abstract:* This is a critical review of the various treatment options for Sickle Cell Disease (SCD). SCD is a hereditary blood disorder that affects millions worldwide, primarily those of African, Middle Eastern, Mediterranean, and South Asian descent. Although gene therapy treatments are in development and in use for some forms of SCD, it might also be beneficial to focus on developing better non-curative treatments. The two main successful non-curative treatments used to manage SCD are hydroxyurea, introduced in 1984, and blood transfusions. There has been recent progress in different forms of gene therapies that could be used to treat SCD including hematopoietic stem cell transplantation (HSCT),



CRISPR/Cas9 gene editing, and lentiviral vectors(LV). Currently, the only successful curative treatment is allogeneic HSCT, a treatment that carries a high risk of graft-versus-host-disease and can only be

applied in extreme cases. Improvements in gene therapy treatments, although impressive, are still distant from general application. Individuals with SCD have an increased risk of developing myeloid leukemia, a risk that is potentially increased by the use of hydroxyurea. Meanwhile, because there is currently only one curative treatment that is limited to extreme cases, it is hypothesized that it may also be helpful to develop better non-curative treatments to improve the quality of life of individuals with SCD, without increasing their risk of developing conditions like myeloid leukemia.

### **30 - Pembroke Farms and Lumbee Self-determination**

**Savanna Lowery, History**

**Mentor: Michele Fazio**

*Abstract:* This project will examine Pembroke Farms and its connection to the Lumbee people. In this project, I aim to not only discuss the history and establishment of Pembroke Farms, but also the implications that its establishment has had on Lumbee self-determination during a period of extreme hardships. During the Great Depression, countless people all over the United States faced extreme economic hardships. Robeson County and the Lumbee people were not an exception. In efforts to alleviate financial pressures placed upon farmers across the United States, the Farm Security Administration was put in place as part of Franklin D. Roosevelt's New Deal program. Under the FSA, Pembroke Farms was established to help Lumbee farmers in Robeson County. I will examine how the establishment of Pembroke Farms and the FSAP photographs helped to aid the Lumbee people in the fight for self-determination and federal recognition.

### **31 - Species Diversity of Honey Bee (*Apis mellifera*) Pollen at the UNCP Apiary**

**Shannon Lowry, Biology**

**Mentors: Lisa Kelly, Kaitlin Campbell**

*Abstract:* Honey bees (*Apis mellifera*) play a significant part in pollination services of agriculture and the environment. Bees perform the most pollination for cultivated crops, with bee-pollinated crops contributing to one-third of the human diet. Honey bee pollen was collected from hives using front mounted pollen collectors for several years in different seasons. We sorted and matched the pollen to Pantone color charts and extracted the DNA using a commercial kit. We used DNA sequences of *rbcl*, which encodes for a chloroplast enzyme, to identify the botanical origin. Early work found that pollen collected in March was composed of *Camellia sinensis*, *Prunus persica*, *P. virginiana*, *Rubus trivialis*, and *Taraxacum officinale*, which is consistent with late winter flowering plants. Plant pollen in late winter provides essential proteins used to produce the first spring bees and build up the hive populations prior to the honey flow. In continuation of this project, we expanded our study to identify key plants for late fall resources, which are used by bees to make sturdy bees that survive the winter. We identified and compared the species richness in the pollen at two UNCP apiary sites. On-campus hives collected pollen of greater biodiversity and quantity. The White Hive's preferred plant species were *Commelina caroliniana*, *Murdannia keisak*, and *Richardia scabra*. These findings help us determine the honey bees' preferred plant species and to create a pollen color chart for the apiary. With this research, we can provide insight into honey bee interactions with pollination gardens.

### **32 - Litter in the Lumber River**

**Lillian Matthews, Biology**

**Mentor: Jerry Griffith**

*Abstract:* Litter in freshwater ecosystems threatens both environmental and human health. The Lumber River, a National Wild and Scenic River in southeastern North Carolina, experiences pollution from human activities, particularly in high-traffic areas like McNeil's Bridge. This study analyzed litter collected at McNeil's Bridge to identify major waste contributors and assess potential environmental impacts. Trash was gathered, sorted, and recorded using the Trash Blitz app. Results showed that plastic

was the most common waste type, making up nearly one-third of the total trash, followed by metal, paper, and glass. Styrofoam, plastic utensils, food packaging, and tobacco products were frequently found, posing risks of chemical leaching and habitat disruption. The presence of glass bottles suggests

long-term pollution concerns due to slow degradation rates. Findings align with global trends, emphasizing the need for conservation efforts and public awareness. Further cleanup initiatives and educational outreach may help mitigate pollution and protect the Lumber River's ecological integrity.

### **33 - Parenting Practices: Influences as an Adult**

**Kennedy McNeill** and **Haley Gordon**, *Psychology*

Mentor: **Shilpa Regan**

*Abstract:* Helicopter parenting is described as a parenting style that consists of high parental involvement and low parental autonomy granting (Padilla-Walker & Nelson, 2012). This parenting style has been linked to multiple negative effects on young adult children's mental health including depressive symptoms, higher anxiety, lower self-control, lower self-esteem, and lower life satisfaction. This research will examine how these parenting behaviors influence grit, personal accountability, anxiety, coping, narcissism, and conflict resolution in young adulthood. This research will provide insight into how parenting styles shape key aspects of emerging adult's well-being.

### **34 - Family and the Farm Security Administration: The Photography of Arthur Rothstein**

**Skyla Miller**, *Sociology & Criminal Justice*

Mentors: **Michele Fazio**, **Christopher Woolley**, **Abigail Reiter**

*Abstract:* This presentation examines Arthur Rothstein's images from the Farm Security Administration, whose work focused on the portrayal of black and white families. The FSA originated in the late 1930s with the goal of creating jobs and fixing the unemployment problem shortly after the New Deal was passed. My research seeks to answer two questions: were black and white children photographed differently during the FSA and what is the impact in describing and captioning each group differently? Digital images housed at the Library of Congress reveal a range of portraits that illustrate Rothstein's intent to capture the changing dynamics of family life during the Great Depression. A consideration of the images will reveal how race and class informed the documentation of American life in this federally-funded project.

### **35 - Effects of Elderflower Extract on Parkinson's Disease in Nematodes**

**Gracie Montañez**, *Biology*

Mentor: **Courtney Alexander**

*Abstract:* Parkinson's disease (PD) is a neurodegenerative disease characterized by signs and symptoms of tremors, shaking, bradykinesia, pain, cognitive changes, and postural instability; and is the most common neurodegenerative disorder in the world. PD occurs when neurons slowly die and thus neurotransmitters, such as dopamine and norepinephrine, are unable to communicate with effector organs. The cause of PD is unknown however current studies are suggesting that certain genes are responsible for the disease. Nematodes offer a unique way to study PD due to their conserved nervous system signaling and observable behaviours. Nematodes have short lifespans and allow for high-throughput screening, which allows for rapid testing of potential treatments for PD. Our research aims to answer the question, "Does elderflower mitigate PD response in nematodes?". By looking at protein aggregates in the worms, we can determine if elderflower decreases or increases the amount of protein aggregates. We anticipate that elderflower will reduce the number of protein aggregates seen by a confocal microscope.

### **36 - Fluid Mechanics in Blood Circulation**

**Alyson Murray**, *Chemistry & Physics*

Mentor: **Uma Poudyal**

*Abstract:* Blood circulation is essential to life, and fluid mechanics helps us understand how blood flows. This study explores how the laws of Physics govern blood circulation in the body, considering

factors like pressure, resistance, and vessel flexibility. Using equations of fluid mechanics, such as the Continuity equation, Poiseuille's law, and Bernoulli's Principle, we can explain essential concepts like how blood pressure works and why blood flow changes in different body parts. Understanding these

principles helps diagnose and treat heart and blood vessel diseases more effectively. These findings highlight the importance of better understanding key concepts in physics to grasp the movement in the world around us.

### 37 - Enthalpy Calculations

**Alyson Murray**, *Biology*

**Yasha Abid**, *Chemistry & Physics*

Mentor: **Sivanadane Mandjiny**

*Abstract:* Understanding chemical reactions is essential in making sure that all elements are balanced. In this experiment, we designed a program to help calculate the enthalpies associated with a chemical reaction. Thermochemistry is a fundamental aspect of chemistry that deals with the energy changes occurring during reactions. By analyzing these reactions, we can figure out how much energy is utilized or released in a chemical reaction. We will work on thermochemistry alongside Dr. Mandjiny. We will be covering the enthalpy of the reaction and Hess's law, as well as changes in free energy, enthalpy, and entropy with equilibrium constant. We will design an Excel sheet that automatically calculates the energies associated with a reaction. Some of the resources we will be using are the assigned textbook for this class and Microsoft Excel, which will be helpful for us when taking General Chemistry 2 and Biochemistry because we strive to become doctors. Learning this will help build a strong foundation in science that will carry us throughout our time teaching. The research and data we will conduct have the potential to make a significant contribution to our understanding of these concepts.

### 38 - Place and Race/Ethnicity: A County-Level Examination of Alcohol-Related Fatalities in North Carolina

**Xavier Nixon** and **Allyson Taylor**, *Mathematics & Computer Science/Sociology & Criminal Justice*

Mentor: **Melanie Escue, Shaohu Zhang**

*Abstract:* A leading cause of death in North Carolina, excessive drinking has contributed to a quarter of all traffic deaths and a loss of over 5,500 lives in 2022 alone. Excessive drinking has also strained the North Carolina economy, resulting in nearly \$10 billion in loss. Prior research has examined area-level correlates of acute and chronic alcohol-related deaths, yet findings for urban and rural counties are mixed. Despite advancements in scholarship, there remains a need for studies to investigate the potential unique place-based predictors for alcohol-related fatalities to provide optimal health-related support to communities. Moreover, racial and ethnic composition is an underexplored area of inquiry when evaluating alcohol-related deaths. The current study advances place-based scholarship on alcohol-related

deaths by examining the role of rurality and racial/ethnic composition in North Carolina counties. Utilizing a series of ordinary least squares regression analyses, findings indicate that living in rural counties is associated with a greater rate of both acute and chronic alcohol-related deaths. Moreover, counties with a higher percentage of racial and ethnic minorities experienced a greater rate of acute alcohol-related deaths, but not chronic alcohol-related deaths. Importantly, our findings urge scholars to critically consider how health outcomes are operationalized, as this can hold drastically different implications for policy, programs, and practice.

### 39 - Avian Intelligence: Cognitive Adaptations, Behavioral Markers, and Methodological Advances in Wild Populations

**Daugherty Norris**, *Biology*

Mentor: **Katherine Thorington**

*Abstract:* Avian intelligence can be defined as the cognitive abilities demonstrated by birds, including problem-solving, social learning, memory, and causal reasoning that evolved to increase survival and

fitness. Unlike traditional human-based intelligence measures, which focus mainly on associative learning and behavior, avian cognition can be assessed through behavioral markers such as tool use, threat recognition, spatial memory, and adaptive foraging strategies. Additionally, Herzing (2013)

suggests evaluating intelligence through a combination of multiple non-human-centric criteria. Examples include female Budgerigars who prefer mates with diverse foraging skills, suggesting an understanding of cooperative benefits in raising offspring. The New Caledonian Crow demonstrates causal reasoning through its understanding of water displacement. In North Carolina, Northern Mockingbirds can recognize and remember human faces and House Sparrows adjust their behavior based on social influences. Avian cognition is often tested through foraging puzzles and problem-solving tasks, studied both in wild and captive populations. Building on several methodological approaches, I plan to develop feeder-based puzzle systems for studying cognition in wild bird populations in Robeson County. Understanding avian cognition not only sheds light on evolution of intelligence but also has broader implications for conservation and behavioral ecology.

#### **40 - Capital, Connectedness, and Constraints in College: Experiences and Needs of Immigrant Students in the US Rural South**

**Magally Ortiz- Rojas, Sociology & Criminal Justice**

**Mentor: Melanie Escue**

*Abstract:* Prior studies have found that immigrant college students confront legal, financial, and social barriers to navigating higher education institutions. Specifically, the role of campus engagement and supportive campus climate (King, McQuarrie, and Brigham 2020; Mishra 2020; Valadez et al. 2021), family responsibilities (Gonzales and Roth 2015; Hook and Glick 2020), and legal and financial barriers (Silver 2012) all shape the academic experiences of immigrant college students. While much research has been conducted in immigrant-friendly states, like California, more work is needed in restrictive immigrant states, like North Carolina. In North Carolina, undocumented and DACAmented students are ineligible to receive in-state tuition and state-based financial aid which makes funding their education more difficult. United States citizens, with at least one first- generation immigrant parent, may still confront barriers when navigating college due to their parent's legal status, lack of education, and being a non-English speaker. Using a qualitative approach, this study explores the academic experiences of 1st, 1.5-, and 2nd generation immigrant college students and alumni who navigate an anti-immigrant climate in North Carolina. Special attention is focused on intersecting barriers to the academic success of this vulnerable student population.

#### **41 - "Being a child of immigrants meant being on my own to figure out my college experience." Voices of Immigrant College Students in the U.S. Rural South**

**Magally Ortiz- Rojas, Sociology & Criminal Justice**

**Mentor: Melanie Escue**

*Abstract:* Prior studies have found that immigrant college students confront legal, financial, and social barriers to navigating higher education institutions. For those without permanent legal status, navigating higher education becomes even more complicated as they are barred from receiving federal loans and aid, and in some cases state aid and in-state tuition, to fund their education. Even for 2nd generation immigrant students, those born in the U.S., they often navigate the education system alone as their parent(s) may lack the knowledge of the U.S. education system, sometimes lack English fluency, and may be undocumented or hold a temporary status. Building on preliminary findings from 2024, this mixed-methods study offers a more in-depth look at how rapidly changing immigration policies and growing anti-immigrant climate across the U.S. underscores the experiences of 1st, 1.5, and 2nd generation immigrant students attending college in the U.S. Rural South. Specifically, we elaborate on the role of legal status in both directly (i.e., student is undocumented or holds a temporary status) and indirectly (i.e., student is second-generation, but family members are not U.S. born citizens) blocking access to critical forms of financial, cultural, and social capital. Implications for future research, policies, and college programming are offered to support this overlooked, and often hidden, college

student population.

**42 - The Effectiveness of Cognitive Behavioral Therapy in Managing OCD: A Self-Study**  
**Cadence Oxendine, Biology** Mentor: **Velinda Worix**

*Abstract:* Obsessive-Compulsive Disorder (OCD) is a chronic condition characterized by intrusive thoughts and repetitive behaviors that can significantly impact daily functioning. This investigation documents a 12-week study on the effectiveness of Cognitive Behavioral Therapy (CBT) in managing OCD while simultaneously exploring its application for students with Attention Deficit Hyperactivity Disorder (ADHD) in an educational setting. Using techniques such as cognitive restructuring, exposure and response prevention (ERP), and mindfulness, this study examines the impact of these strategies on OCD symptoms and student self-regulation skills. Data sources include journal reflections, student interviews, classroom observations, and expert insights from professionals. The findings aim to identify practical, evidence-based strategies that enhance both well-being and social-emotional learning (SEL) outcomes for students.

**43 - Characterization of Immobilized LDH Enzyme**  
**Christian Oxendine and Travis Thibodeaux, Chemistry & Physics**

Mentor: **Sivanadane Mandjiny**

*Abstract:* This study explores the immobilization of the Lactate Dehydrogenase (LDH) enzyme in calcium alginate beads with and without additives such as chitosan and silica to evaluate its enzymatic activity and stability. LDH immobilization offers benefits such as cost-effectiveness, mechanical stress resistance, and ease of separation, making it a valuable approach for enzyme-based applications. The immobilized enzymes were prepared using calcium alginate gels under various conditions, incorporating chitosan or silica to enhance the mechanical properties. Enzymatic activity was assessed using a Cary 60 UV-Vis spectrophotometer, with kinetic data analyzed via spectrophotometry at 340 nm. Results demonstrated that immobilized enzymes exhibit reduced activity compared to the free enzyme, with calcium alginate-silica showing the highest activity among immobilized forms. Additionally, the study highlights the significance of using Tris buffer over phosphate buffer for storing alginate beads to maintain structural integrity. These findings contribute to advancements in enzyme immobilization techniques for industrial and biomedical applications.

**44 - Lesson Planning for Emotional Well-Being**  
**Keely Oxendine and Cassandra Elkins, Art**

Mentor: **Naomi Lifschitz-Grant**

*Abstract:* Art Education students were awarded a PURC Travel Grant to attend the 2024 North Carolina Art Education Association (NCAEA) annual professional development conference in Asheville, North Carolina from November 15-17, 2024. The presentation entitled “Lesson Planning for Emotional Well-Being” guided art teachers on how to create effective lessons to encourage students to initiate self-reflection through their artwork. It addressed the constant changes in students’ emotional, physical, and cognitive development and the environmental situations students face daily. Participants learned how to develop lessons that encouraged students to create deeper connections to their life experiences and emotions in their artwork. Examples of art lessons that teach adolescents emotional intelligence and creativity skills using visual art mediums were shown. Art lessons that are designed to respond to developmental needs in adolescence with a focus on identity development were discussed. Participants walked away from this session with strategies on how to create lessons that help students experiencing developmental changes express their shifting identities and concerns.

**45 - An Ethical Guide to Archiving Indigenous Knowledge**  
**Ahelayus Oxouzidis, Psychology**

Mentor: **Michele Fazio**

**Abstract:** The ongoing project aims to ethically archive knowledge given by Elders from the Lumbee Nation in Pembroke, NC. With help from the Lumbee tribe the goal is to right the wrongs done by past archivists to create an entirely Indigenous archive. The work done in the past was part of the Farm Security Administration which took good photos but failed to report these people's identities ethically

and referred to them as "mixed" breed instead of using their preferred titles. Our interviews were structured in a way that is more respectful and Indigenous in style than what past ethnographers did. The way to do this is to implement important cultural methods that are mutually beneficial and culturally competent to Lumbee people. This reshapes the way interviews are conducted that is more culturally respectful to Native Elders. I hope to create a rift in archiving methods by introducing an Indigenous form of archiving as a model for other archivists and researchers. I created a community exhibit where I have identified 8 people and are looking to continue increasing this number to contact the Library of Congress to change the names. I am looking at the way the Lumbee were described in the archives and use preferred terminology from the Lumbee tribal elders on how they wish to be represented. One of the goals is to create a shift in the way Oral history work is done with Native people so that it is more respectful and archived in a way that doesn't disrespect the people being interviewed.

**46 - Conducting Mosquito Surveillance Near the Agricultural Research Site in Pembroke, NC**

**Kayla Patrick, Biology**

Mentor: **Haley Caldwell**

**Abstract:** Mosquito surveillance, including identifying species and viruses they carry, is crucial in protecting public health. When high numbers of arbovirus-carrying mosquitoes are present, strategies to eliminate them and lower human cases are paramount. Although surveillance is conducted throughout the US, some areas are overlooked due to a lack of funding and expertise including Robeson County. The main arboviruses transmitted in North Carolina are La Crosse encephalitis (LACV), West Nile virus (WNV), and Eastern equine encephalitis (EEEV). These viruses are vectored by *Aedes triseriatus*, *Culex* species, and *Culiseta melanura* respectively. They can cause serious neurologic sequelae like comas. Moreover, no vaccine is available for these diseases; meaning patients receive supportive care only. We hypothesized that *Aedes* and *Culex* species would be the most abundant due to trap site attributes. The

ACRES trap site is uncultivated farmland a few miles from Pembroke and is located near a river. A gravid trap and CDC-blacklight trap were utilized. 66 mosquitoes were then speciated and homogenized. The MagMAX isolation kit was used to extract nucleic acid and then qRT-PCR was performed to test for viruses. We found numerous *Aedes* and *Culex* species, with many *Coquillettidia perturbans* mosquitoes, which are vectors of WNV and EEEV. These preliminary results support our hypothesis, but further mosquito surveillance should continue to better characterize mosquitoes and circulating arboviruses.

**47 - Using Comparative Genomic Techniques to Track the Evolution of the SDR Gene in Drosophila Species**

**Kevin Reza Villa, Biology**

Mentors: **Timothy Anderson, Maria Periera**

**Abstract:** The Genetic Education Partnership (GEP) is a nationwide collaboration between various institutions in the United States dedicated to teaching bioinformatic and genomic techniques. The GEP Pathways Project uses *Drosophila melanogaster* as a model organism to investigate genes associated with the insulin pathway. *Drosophila* is crucial to the biomedical field and it's used in studies that include genetics, developmental biology, neuroscience, behavioral studies, and Human disease research. The Secreted Decoy of InR (SDR) gene was identified by the Pathways Project as a gene of interest. This gene is crucial in maintaining nervous system functions in the developmental stages of the flies as well as maintaining the integrity of the blood-brain- and blood-retina-barriers in adult flies. The Sdr gene of *D. melanogaster* was used to find orthologs in the following species: *D. takahashii*, *D. rhopaloa*, *D. bipectinate*, *D. ananassae*, *D. willistoni*, and *D. busckii*. Once identified these orthologs were used to study the evolutionary relationship between the various *Drosophila* species through a comparative

analysis of their synteny, protein sequences, and nucleotide sequences. By conducting a synteny analysis, multi-sequence alignment of protein sequences, and tracking the codon usage bias across the species nucleotide sequences, it was determined that the SDR gene is conserved across 5 of the 7 species analyzed with *D. willistoni* and *D. busckii* being the most significant outliers.

**48 - Monitoring *E. coli* and the Effects of Storm Events on Water Quality in the Lumber River**

**Lori Savage, Biology**

Mentor: **Amber Rock**

*Abstract:* The Lumber River is a vital natural resource in Southeastern North Carolina, providing numerous benefits to the region. However, the river faces threats from pollution sources, including animal feedlots and runoff from both developed and agricultural areas. In collaboration with Winyah Rivers Alliance (WRA), we assessed the impact of pollution on the Lumber River by measuring water quality parameters such as temperature, dissolved oxygen, nutrients, and *Escherichia coli* (*E. coli*) concentrations. Due to its potential to cause illness, WRA monitors *E. coli* levels weekly as part of their summer Swim Guide program, and we sampled 11 sites on the Lumber River in 2024. In addition, we investigated how major storm events affected water quality in the river. We hypothesized that low to moderate rainfall events would temporarily decrease water quality and increase *E. coli* concentrations due to increased runoff. In contrast, large storms may dilute bacterial loads by greatly increasing water volume in the river. We conducted water quality testing before, during, and after two significant storm events in summer 2024. In both cases, *E. coli* levels exceeded the EPA standard for recreational waters immediately after the storm. Other indicators of decreased water quality were also found, though these effects were temporary; water quality returned to pre-storm levels relatively quickly.

**49 - On the Road with Zora Neale Hurston: Songs of Community and Labor in the FWP**

**Mason Schwenneker, History**

Mentors: **Michele Fazio, Christopher Woolley**

*Abstract:* This project examines the working atmosphere and the representation of race, and ethnicity in songs that author Zora Neale Hurston learned while traveling throughout the US South and the Caribbean as a folklorist in the 1930s. From the work song, "Dat Old Black Gal," to the social song, "Uncle Bud," Hurston performed and recorded the songs herself in 1939 as a part of a fieldwork recording expedition by the Florida Division of the Federal Writers' Project while conducting interviews and telling stories. Each recording features a brief introduction describing the song, where Hurston first encountered it, and the song's origins. The creation of a digital story map visualizes the extent of her travels throughout the 1930s and documents communal expression shaped by each location, illustrating the typical jobs of workers of African descent, such as railroads, turpentine camps, or farm fields.

**50 - Empathy and Advocacy: Insights from the 2025 NCSA Conference**

**Ciara Smith, Sociology & Criminal Justice**

Mentor: **Melanie Escue**

*Abstract:* I attended the North Carolina Sociological Association's annual conference on February 28, 2025, in Raleigh, North Carolina. During the conference, I participated in the panel "Fostering Empathy and Flexibility in Academic Policies for Student Health Needs", sponsored by the Student Issues Committee. Being part of this panel provided me with the opportunity to bring my insights and concerns about student mental health needs on campus to a larger audience of academics and community members. Furthermore, this experience enriched my own understanding of student mental health challenges and ways for me to advocate for students at my own university. Attending this conference also allowed me to expand my understanding of sociological research and develop peer and professional connections that will greatly benefit my transition into the professional world.

**51 - Characterization of Refractive Index and Thermal Expansion Coefficient via Michelson Interferometer**

**Daniel Smith, Chemistry & Physics**

Mentors: **Tikaram Neupane, Uma Poudyal**

*Abstract:* The Michelson interferometer is a powerful optical instrument widely used for precise



wavelength, refractive index, and thermal expansion measurements. Utilizing the principle of interference enables high-precision optical analysis, making it an essential tool in experimental physics. This study presents the determination of refractive index and characterization of thermal expansion coefficients of materials. By leveraging its high precision in measuring optical path differences, the interferometer successfully characterized the refractive index of Plexiglass materials within an 8% error

margin. Additionally, the thermal expansion coefficients of aluminum were determined by observing the shifts in interference patterns due to temperature changes, providing valuable insights into the materials' behavior under thermal stress. The results demonstrate the versatility and accuracy of the Michelson interferometer in material characterization. Acknowledgment: This work is supported by the Pembroke Undergraduate Research and Creativity (PURC) Center at the University of North Carolina at Pembroke.

## **52 - Dorothea Lange's Photography of Immigrant and Migrant Women**

**Abelina Sosa Capote**, *Education*

Mentors: **Michele Fazio, Christopher Woolley**

*Abstract:* This presentation will demonstrate how Dorothea Lange, a Farm Security Administration photographer, documented a range of women and their children in immigrant camps. Known for taking the project's most iconic image, "Migrant Mother," Lange also photographed different ethnic backgrounds using similar compositions. My research will explore subject position, representation, and region within these images to offer a comparative analysis of how Lange captured migrants and immigrants in the 1930s to highlight the realities of work and poverty they faced every day.

## **53 - Population Demography of Brown-headed and White-breasted Nuthatch in Weymouth Woods Sandhills Nature Preserve**

**Madison Spencer**, *Biology*

Mentor: **Katherine Thorington**

*Abstract:* In the sandhills region of North Carolina, nuthatch species can be used as an indicator for the health of pine forests. To assess the population demography of our two resident nuthatch species we mapped nuthatch territories using behavioral cues. We compiled data for two seasons, the 2023 season was 18 weeks and 2024 was 19 weeks. We found 32 Brown-Headed Nuthatch (*Sitta pusilla*) territories in 2023. Five of these territories had at least one nest. In 2024 there were a total of 30 territories with 1 nest found. We found 27 White-Breasted Nuthatch (*Sitta carolinensis*) territories in 2023 and 23 territories in 2024. No nests were found. To provide community level context. We tracked the bird community using the eBird app, recording all birds seen and heard during mapping surveys. In 2023 we detected 95 bird species and in 2024 97 species. Simpson's Diversity index (D) was calculated with the highest diversity values occurring in May (2023 = 29.258 and 2024 = 30.747) and the lowest values in February (2023 = 18.140 and 2024 = 15.714). The total value of Simpson's D in 2023 is 28.332 and in 2024 it is 29.651, suggesting similar diversity between years. We are continuing to monitor the bird community and the demography of the nuthatch populations to assess the impacts of weather fluctuations and climate change on Nuthatch species as indicators of forest health in the sandhills region of North Carolina.

## **54 - Giving Voice to Scottish Immigrant Quarry Workers**

**Kristin Stowell**, *Mass Communication*

Mentors: **Michele Fazio, Christopher Woolley**

*Abstract:* My project illustrates the life histories of Scottish immigrant quarry workers collected by Mari Tomasi through the Federal Writers' Project (FWP) during the 1930s as well as photographs taken by the Farm Security Administration in Barre, Vermont, a granite mining town, to explore the impact Scottish immigrants had on the local region and to consider how their culture and labor contributed to the granite industry at large. Collaborative conversations about oral history projects and ethical practices continue to play a large role in the development of this project: who recorded these conversations and for what purpose, who participated in the interviews, and what role do they serve in preserving cultural

memory and history today. For example, research has shown that the lived experience of Scottish immigrants within Barre was heavily dependent on community collaboration for the upkeep of town survival and was a driving economic force for the granite industry. Examining the words of Scottish immigrant workers will provide further insight on their assimilation and how their culture remains a prevalent aspect of Vermont state history and, more generally, within the U.S.

**55 - Race and Place: Examining the Role of Race and Rurality on the Health Outcomes of Residents Living in North Carolina**

**Kristin Stowell**, *Mass Communication*

Mentor: **Melanie Escue**

*Abstract:* Prior studies reveal the profound impact of neighborhood contextual factors on residents' health and well-being. However, few studies have examined health outcomes at the intersection of race and place. Situated within the framework of the racial/ethnic segregation and place model and the ethnic density hypothesis, the current study examines the role of race and rurality on the health of racial and ethnic minorities living in North Carolina. We focus our multivariate analysis of race, place, and health on two geographically distinct areas in North Carolina – Durham County and Robeson County. Census data from 2017 – 2021 reveal disparities in key determinants of health between these counties, with residents living in Robeson County – a rural area – having dramatically lower educational attainment and much higher rates of poverty than Durham County – a largely urban area. Robeson County provides a unique rural setting that offers important insight into the predictors of health among residents living in the poorest county in North Carolina. Our findings offer directions for future research and implications for health-focused programs and policies aimed at reducing health disparities through the joint lens of race and place.

**56 - Analyzing Resources Factors Impacting Export Intention: A Case Study of Panxi CNC Equipment Co.**

**Ruiying Sun**, *Business*

Mentor: **Xin Liu**

*Abstract:* The growth of global trade brings opportunities for the export of small and medium-sized enterprises, but it also brings risks and challenges for the development of enterprises. This study takes Panxi CNC Equipment Co. as a case study of the key factors affecting the export intention of small and medium-sized enterprises. Under the Resource Based View, this study identifies R&D investment, market perception, technology, and previous performance, which may be important for the firm's intention. RBV is combined with the Organizational Ambidexterity theory to explore the role of resource exploitation and exploration on the firm and then how to affect the export its intention. This study is based on RBV strategy, mainly using qualitative interviews and data analysis methods. We focus on Panxi CNC Equipment Co., whose main business is heating stoves, to analyze the feasibility of exporting to the U.S. market and make recommendations for its export decision. This study provides a reference for the internationalization strategy of manufacturing enterprises and has practical significance for the export development of small and medium-sized enterprises. At the same time, this study enhances the community residents' understanding of pellet heating furnace equipment and enhances the residents' attention to energy saving and environmental protection.

**57 - Beyond the “Southern Rural Mortality Penalty”: The Role of Environmental Toxins and Social/Emotional Support on Mental Health in Rural North Carolina**

**Allyson Taylor, Xavier Nixon and Ronnie Williams**, *Sociology & Criminal Justice*

Mentor: **Melanie Escue, Shaohu Zhang**

*Abstract:* Prior research has explored the urban-rural health divide, often finding rural areas to be at a disadvantage for many chronic diseases and high mortality rates. Despite growing evidence that residents in rural areas experience issues related to healthcare access, health promotion behaviors (e.g.,

access to green spaces, lack of healthy food options), and structural disadvantage, there is limited understanding of health disparities between rural areas. The current study advances scholarship of regional rural health inequalities by examining the role of environmental stressors and social/emotional support on the mental health of residents living in 78 rural counties within North Carolina. This quantitative study utilizes data from the 2022 CDC PLACES dataset and Community Data Platform

from Healthy Communities NC to determine if, and to what extent, living within close proximity to Toxic Waste and Hazardous Facilities relates to mental distress. Moreover, we evaluate if social/emotional support mitigates the influence of environmental stressors on the mental health of rural North Carolinians. Our findings underscore regional variation in mental distress and the unique implications for environmental toxins for residents living in the Coastal Plains. Importantly, we emphasize the pressing need to examine the place-based and structural factors that distinguish rural areas, and resultant mental health outcomes, in the U.S. rural south.

### **58 - Comparative Analysis of Ecosystem Metabolism Between Two Small Ponds with Differing Hydrology**

**Martina Van Etten**, *Biology*

Mentor: **Amber Rock**

*Abstract:* A major driving factor for Earth's changing climate is human impacts on the carbon cycle, specifically on how much carbon dioxide is released into the atmosphere. Freshwater ecosystems can play a significant role in the carbon cycle and can be either a net source or net sink of carbon relative to the atmosphere. In addition, previous research suggests that smaller ponds may be important contributors to the global carbon cycle relative to their size. Southeastern North Carolina is known for its wetlands, unique blackwater ecosystems, and its vulnerability to hurricanes. The anticipated weather changes due to climate change may lead to major flood- and/or drought-induced shifts in carbon cycling. Therefore, it is important to better understand ecosystem metabolism and carbon cycling within our local ecosystems. A comparison of carbon cycling between a retention pond (data collected in 2021) and a naturally occurring wetland pond (2025) will provide more information regarding the impacts of small ponds on carbon cycling. We collected dissolved oxygen and temperature readings at 15-minute intervals via a deployed PME miniDOT Logger. We then obtained weather data from the weather station closest to each pond. We used two packages in R to align the data and calculate ecosystem metabolism. 2021 data indicated that the retention pond fluctuates between a net source and a net sink of carbon to the atmosphere, and our study will determine whether a wetland pond follows similar trends.

### **59 - Building my Sociological Toolkit; Preparing for the 2025 SSS Conference**

**Trey Watson**, *Sociology & Criminal Justice*

Mentors: **Melanie Escue, Corey Pomykacz**

*Abstract:* I will attend the Southern Sociological Society (SSS) Conference in Charlotte, North Carolina from April 9th to April 12th. This poster highlights my experience attending a smaller state level sociological conference, the North Carolina Sociological Association (NCSA), conference on February 28, 2025. Moreover, I engaged in several steps to prepare for the SSS conference including participation in a conference practice session, researching professional conference wear, and reviewing the conference program to plan the sessions I will attend. With a variety of sessions to choose from, like paper sessions and roundtables, I am particularly interested in engaging with research on student success and mentorship in higher education. Lastly, I look forward to creating lasting professional and peer connections that will help open doors to graduate school in professional counseling and move towards my career goals of serving students in higher education.

### **60 - The Relationship Between Ultrasonographic Pixel Intensity and Prepubertal Testicular Cytology in Beef Bulls**

**Marijo Wilkes and Adriana Rodriguez**, *Biology*

Mentor: **Nicolas Pereira**

*Abstract:* Bulls play a crucial role in herd fertility, with a single sire breeding around 50 females.

According to the USDA, over 90% of beef calves in the U.S. come from natural mating. A bull's daily sperm production depends on the Sertoli cell (SC) population established before puberty. Bulls with more SCs exhibit larger scrotal circumference, increased testicular weight, and higher sperm production. Since each SC supports a limited number of germ cells, testis size and sperm output correlate directly with SC count at puberty. Current selection methods cannot accurately predict a bull's sperm

production. The Breeding Soundness Examination assesses breeding potential but fails to identify sub-fertile bulls. Ultrasonography, which evaluates tissue density and echotexture, has shown a correlation between increased pixel intensity and testicular cell proliferation from birth to 8 weeks, stabilizing by 20 weeks. Testicular echogenicity has been linked to daily sperm production. However, limited research exists on the relationship between testicular echogenicity and cytology in young bulls. This study aims to validate ultrasonography as a tool for predicting sperm production in prepubertal beef bulls. Ultrasound images, body weight, scrotal circumference, and testicular volume will be recorded for four weeks in bulls aged 8-20 weeks. After castration, an analysis of SC and germ cell populations will be conducted. Pixel intensity, testicular measurements, and cell counts will be analyzed.

**61 - T1D the Silent Genetic Time Bomb and the Importance of Finding the Clues Before Explosion**  
**Jessie Williams, Biology** Mentor: **Silvia Smith**

*Abstract:* This critical literature review analyzes the genetic risk factors for Type 1 diabetes (T1D), its prevalence, and the environmental factors that compound the likelihood of developing the disease. Since genes are the target of evolutionary forces like natural selection, evolutionary theory could be used to explain the increase of T1D cases. While T1D cases and the associated high-risk haplotypes are increasing in more developed countries, this is most likely linked to increased access to and affordability of modern medicine. This leads to increased life expectancy and a reduction of the effects of natural selection even for people who develop TD1 in childhood, who would otherwise have a limited life expectancy. Other factors could also contribute to the increase in TD1, including diet and exercising habits, which can potentially impact the development and management for T1D. As new genetic variants associated with TD1 are discovered, opportunities for genetic testing and possibly gene therapy will allow people to make informed decisions and hopefully improve quality of life of those affected.

**62 - Navigating Academic Conferences as an Undergraduate Student: Forming Connections at NCSA**  
**Ronnie Williams, Sociology & Criminal Justice** Mentor: **Melanie Escue**

*Abstract:* I attended the North Carolina Sociological Association annual conference on February 28, 2025, in Raleigh, North Carolina. It was transformative, immersive, and academically nurturing. This conference allowed me to ask questions and learn more about my own research "Addressing the Decline of Men in Higher Education" as well as exploring many other topics within the field of sociology. I was able to cultivate new peer relationships, develop professional connections, and discuss topics I was interested in further. This was a unique experience allowing me to connect with a wide range of scholars well versed in their fields, showing me the possibilities for my own future in graduate school.

## EXHIBITS

### **Exploration and Experimentation in Studio Practice**

**Ty Bellamy, Art**

Mentor: **Brandon Sanderson**

*Abstract:* As a mixed media artist, I alternate between digital work and several printmaking techniques, including screen printing and relief printmaking. My artwork consists of my interests and hobbies, thoughts and emotions, or personal experiences. I am inspired by the knowledge and experience I gain daily. What influences me is the desire to understand an artist's thoughts/intent behind their works. Music also drives my creative process. I typically start with my tablet if I do a piece in layers to screen print. If I'm just sketching, I will draw on paper, then transfer it digitally to fine-tune it. Depending on what I'm creating, my process will implement the texture and style I want to portray with my piece. Messages within my art evolve as I do. I hope my work brings a reaction to anyone who sees it, good or bad. I want the viewer to question it, remember it, hate it, love it – to respond naturally.

### **Alternative Photography Processing through Cyanotype**

**Sondra Carlson, Art**

Mentor: **Brandon Sanderson**

*Abstract:* This project explores an alternative photography process. As a photographer, I am interested in finding non-toxic methods to develop my photos. Through printmaking and cyanotype, I can produce images safely at home. Cyanotype is created using a light-sensitive solution of Iron salts and water. This solution is painted onto a substrate, covered with objects or digital negatives, and then exposed to ultraviolet light. My process begins with a Photoshop-enhanced photo. Next, hand-drawn and/or digital drawings are added. Then, a digital negative is printed onto transparent film. After exposing the negative on the substrate, the work is rinsed with water to reveal the tones. The final image is blue, but other colors can be achieved with stains, like coffee, tea, or other tannin-rich substances. I will share my completed artworks and the techniques in which they are made, from start to finish. A representation of a Jacquard cyanotype kit will be included in the presentation. Cyanotype is a process that has been used since 1842 after being discovered by John Herschel.

### **The Clouds will Float Away**

**Mikaylah Chisholm, Art**

Mentor: **Brandon Sanderson**

*Abstract:* This piece of art is an exploration of how I see myself. This work was inspired by observation of and reflection on clouds. This animation was recreated to better illustrate my emotional state.

### **Exploring the Aesthetic Possibilities of Cyanotype and Solarfast Inks in Typography Poetry**

**Prints: Utilizing Blank Space and Font**

**Ray Eddy, Art**

Mentors: **Brandon Sanderson, Michael Berntsen**

*Abstract:* This project is a continuation of the research from a Spring 2024 SURF grant. I aim to conduct a comprehensive comparison between cyanotype and Solarfast inks, with a focus on exploring the visual elements of utilizing blank space and font in typography prints. By investigating the processes involved in creating these prints, as well as experimenting with various paper sizes, I will gain insights into the effectiveness of different inks and explore the potential of visual tools for emphasis and meaning in poetry through font choices

### **I Have Two Hands and Must Create**

**Veronica Rapp, Art**

Mentor: **Brandon Sanderson**

*Abstract:* This presentation will display what, at this point in time, is my most intricate piece in printmaking. It serves as a testament to the creative ambition and passion I bring to my craft. The use of text in relief carving is challenging; as such adding 73 words overlapping an image is a test of skill and determination.

**Daniel, Bel and the Dragon in Large Scale Relief Printmaking**

**Cameron Lowery, Art**

Mentor: **Brandon Sanderson**

*Abstract:* This set of woodcuts are a relief woodcut piece that I did over the summer of 2024 for the URFS scholarship. This piece in particular illustrates a Biblical story, specifically the apocrypha. The apocrypha is specifically known for the books that aren't in most of the more popular Bibles today, like the KJV or ESV and many other Bibles. It is very similar to the Ethiopian Bible and they have all the original books. It contains stories about giants, dragons, aliens and other "mythical" beings. This URFS tells the story of Bel and the Dragon, which is found in the book of Daniel in chapter 14 verse 27.

**Bare Nature**

**Cameron Lowery, Art**

Mentor: **Joseph Begnaud**

*Abstract:* In this piece I seek to showcase ethereal art and femininity. I sought to make the paint go on the canvas as smooth as possible so it can feel ethereal. I am learning more about anatomy and being feminine, so I wanted to show that in this piece. I believe that paintings of nude women in natural settings are some of the most beautiful and most feminine paintings. As my work develops, I want to improve my knowledge of anatomy and further develop my use of color theory and shadows.

**Arthurian Copperplate Etching after Durer and Holbein**

**Tyler Skolozynski, Art**

Mentor: **Brandon Sanderson**

*Abstract:* This project will be showing my research of different artists such as Dürer and Holbien and the technique of etching. I have a 4x6 copper plate that I will be showing along side prints. The image is of King Arthur receiving Excalibur. I have sketches as well that will show the process of creating the print.

**Wolf Sheep Woodblock after Posada**

**Tyler Skolozynski, Art**

Mentor: **Brandon Sanderson**

*Abstract:* I will be showing the process of wood block prints. I will have sketches and notes of my process, along with a wood block I used and prints on paper. The image is a stylized wolf wearing sheep's clothing. The style is inspired by Mexican printmaker Posada.

## PERFORMANCES

### **"Lover Mine" a contrafact on the song "Take the "A" Train"**

**Jonathan Andrews, Music**

Mentor: **Aaron Vandermeer**

*Abstract:* Jazz musicians have a unique claim to the compositional tool known as the contrafact. Jazz composers, more than their counterparts in other genres, shape new compositions based on pre-existing ones. They also use a different structure to do this than traditional music does. Contrafacts are related to the harmonic framework of a previous composition rather than the melodic structure. Classical music and other genres, even pop, usually works with the theme or the melody as the main reference point. The melody is the part of the song that is most easily recognized. The contrafact works however on the underlying harmonic structure. This came about as really great instrumentalists would sit for hours playing the same parts over and over in the 1920's and 1930's dance bands. They were being paid to play these parts, and as long as they wanted to get paid, they would endure the monotony of their tasks. But in their time off they began to create their own compositions not based on the melody, but the harmonic structures that they all knew so well from all those hours of playing in the dance halls. Since they had above average instrumental skills, these new compositions were often challenging and hard to play. This excited the jazz musicians, and they would get together to try to outdo each other. What emerged in the 1940's was a compositional tool that included both exciting new melodies to play as well as connections which would honor the past. In this way Jazz always remembers and always innovates.

### **Sonata for Eb Alto Saxophone and Piano by Lawson Lunde (1959-2019)**

**Colt Blackmon, Music**

Mentor: **Lindsey Jacob**

*Abstract:* In 1959, American composer Lawson Lunde (1935-2019) published Sonata for Eb Alto Saxophone and Piano. The first movement of the Lunde Sonata is in sonata form, which is divided into three sections: exposition, development, and recapitulation. The exposition can be divided into an "A" and a "B" section. The "A" section starts with a strong and powerful saxophone fanfare that then quickly introduces one of the main themes of the movement and also contains many runs or fast phrases. The "B" contrasts with the "A," having more lyrical and flowing melodies. The development adds tension to the movement as it cycles through different keys and new musical ideas. The recapitulation brings the movement back to its original key and starts with the original main theme from the exposition before concluding with a powerful fanfare similar to the first few measures at the beginning of the movement.

### **A Walk in the Park**

**Jaylen Jones, Music**

Mentor: **Aaron Vandermeer**

*Abstract:* This piece is calming and easy going, which is where it gets its name. It was written based on an earlier concept of a waltz with two chords and a simple back and forth rhythm. Eventually after a couple of months I took another look at it and decided to expand it into an entire piece. The idea was to take a simple melody, and slowly complicate it over time, which is what led to the piece it is now.



## ORAL PRESENTATIONS

### **Optimization of Polymerase Chain Reaction (PCR) Using Gradient PCR**

**Maricela Andrade**, *Biology*

Mentor: **Crystal Walline**

*Abstract:* Polymerase chain reaction (PCR) is a quick and practicable technique used to amplify copies of specific segments of DNA from a DNA sample. However, when conducting PCR, it is common to encounter complications such as smeared bands, primer dimers, nonspecific amplification, or no amplification. Optimizing PCR temperature settings can increase specificity and efficiency, preventing drawbacks and inconclusive results. Gradient PCR is a technique that allows for simultaneous testing of a range of annealing, denaturation, or extension temperatures to identify the optimal temperature to achieve the desired amplification. Using a  $T_m$  calculator, we estimated the appropriate annealing temperatures for the primer sequences. Typical inputs using  $T_m$  calculators involve identifying the specific polymerase, primer concentration (nM), and primer sequences. After determining the ideal annealing temperatures for each primer, a range of temperatures was selected to identify the best annealing temperature for a primer set. We used gradient PCR to achieve optimized results for the amplification of multiple domains of the 16s rRNA gene. To conclude, gradient PCR is an efficient and effective way to optimize PCR to specifically amplify a target gene.

### **Beyond the Typical Weather Forecast: Harnessing Probabilistic Graphics for Effective Emergency Management**

**Gretchen Gillenwater**, *Geology & Geography*

Mentors: **Daphne LaDue**, **Alex Marmo**

*Abstract:* Severe weather is challenging to predict but even more so to prepare for. County Emergency Managers (EMs) and other local officials are tasked with the dilemma regularly of being fiscally prudent yet always prepared. Tabletop exercises were conducted in northern California to better understand whether two experimental graphics could better support the difficult decisions being made. First, background interviews were conducted with EMs in two counties before the exercises to better understand local concerns and their decision-making process. All interactions with participants were recorded and transcribed by a professional transcription company. Special attention was given during the analysis regarding the two probabilistic graphics: a box-and-whisker graph and a stacked bar graph. They contained similar information but displayed it in different ways. Because the tabletop exercises had many participants, an anonymous online survey about the two graphics helped ensure everyone could provide their input. Surveys and tabletop discussions were analyzed to better understand how EMs and other local officials use weather forecasts. In particular, how understandable the probabilistic graphics were and whether they would be used prior to a potential flooding event. The results show that both graphs are helpful in the decision-making process. Still, timing and adequate forecasters' input would need to be provided to EMs and other local officials to optimize their usability.

### **Impacts of Digital Nomads on Economies**

**Hein Htet**, *Business*

Mentor: **Lydia Gan**

*Abstract:* Who are digital nomads? They are people who work not only from home but from all over the world. They are remote workers who enjoy traveling worldwide while working remotely away from their home country through the Internet. This lifestyle can be particularly appealing to the young working population in the U.S. struggling through the rise of the cost of living and inflation. A digital nomad takes advantage of the lower cost of living in countries where the average salary of the local population is US\$1,000-2000 per year for instance. Digital nomadism is a growing and exciting concept for those with this work lifestyle to travel to new countries and experience new cultures. The influx of

digital nomads favors host countries' economies by creating jobs in industries such as hospitality, recreation, and communication. Host governments welcome digital nomads because they generate revenues, and locals appreciate them because of new employment opportunities. However, there are also challenging concerns arising from this growing trend. Those issues include escalating housing prices in both host and home economies and increasing consumptions in host countries. Therefore, appropriate interest rates and taxation measures are recommended to prevent any future issues. Overall, digital nomads signal a new way of working lifestyle and culture to change the dynamic of global and local economies.

**Water Quality Trends in the Lumber River: Urban, Industrial, and Agricultural Pollutants**  
**Lillian Matthews, Biology** Mentor: **Amber Rock**

*Abstract:* The Lumber River is a culturally, ecologically, and economically vital blackwater system in Southeastern North Carolina, supporting diverse plant and animal life. However, decades of pollution from manufacturing and agriculture threaten its water quality. This study compiles water quality data from several research projects and a service-learning project into an ArcGIS map, correlating sampling sites with land use. These projects investigated biological, physical, and chemical metrics of water quality, including fecal coliform bacteria, benthic macroinvertebrate community composition, antibiotics, nitrogen and phosphorus concentrations, and standard physical variables such as dissolved oxygen, pH, and turbidity. However, the data suggest marginal impacts of runoff from urban areas and agricultural facilities, including increased conductivity and nutrients. The strongest impacts have been associated with industrial runoff, with increased heavy metals and decreased macroinvertebrate biodiversity downstream of historical and current industrial sites. Based on these findings, it is apparent that future research in this watershed should include a more rigorous evaluation of water quality. A more systematic approach could better capture the full complexity and dynamic nature of pollution impacts in this region.

**Two Invading Ant Species Affect Biodiversity in Longleaf Pine Ecosystems**  
**Erika Rivera, Biology** Mentors: **Kaitlin Campbell, Lisa Kelly**

*Abstract:* Longleaf pine savannas are unique and diverse ecosystems, and 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. Our research goal was to identify changes in ant nest density, species richness, and abundance over time in three longleaf pine savannas. RIFA nest surveys were conducted along belt transects in 2014/2015, 2017, 2022, and 2023. Pitfall traps were used to measure the abundance and richness of ants along transects in 2017, 2022, and 2023. New sampling methods were added in 2023 to monitor ANA. Our 2017 pitfall data showed that RIFA was the most abundant ant species in two savannas. In 2022 and 2023 our data revealed that 1) the ANA was now the most abundant ant species across savannas, 2) RIFA abundance and nest densities decreased, 3) there was a sharp decrease in native ant abundance, 4) soil texture impacted ANA and RIFA nest abundance, 5) and total ant abundance increased by 65% overall in 2022, but this was due to large increases in the ANA population. The ANA may be outcompeting other ants including RIFA, suggesting it may severely impact the ant community. 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 ants to mitigate their environmental effects.

## **Undergraduate Research and Creativity Mentoring Award**

### **Dr. Silvia E. Smith**



Dr. Silvia E. Smith is an Italian natural scientist interested in using evolutionary theory to test hypotheses regarding the natural history and causality of human diseases. Her doctoral work at the University of Utah focused on the coevolutionary relationships among humans and the causative pathogens of tuberculosis and leprosy (genus *Mycobacterium*), accounting for the previously uncharacterized role of genetic recombination in this genus. She continued the work on human infectious diseases as a postdoctoral fellow at the University of Idaho where she studied the mechanisms of plasmid-mediated acquisition of drug-resistance in multidrug-resistant human pathogens (genus *Acinetobacter*), as part of a project funded by the USA Department of Defense. During her second postdoctoral fellowship and subsequent role as a Research Scientist at the University of Utah School of Medicine, Dr. Smith studied genetic predisposition to age-related macular degeneration and lung fibrosis. Currently, she is the Principal Investigator on two patient-reported outcome studies to characterize dyspnea, fatigue, pain, and sleep disturbance in people with dysautonomia. Dr. Smith is a RISE and COMPASS mentor and supervises research for several honor's students.

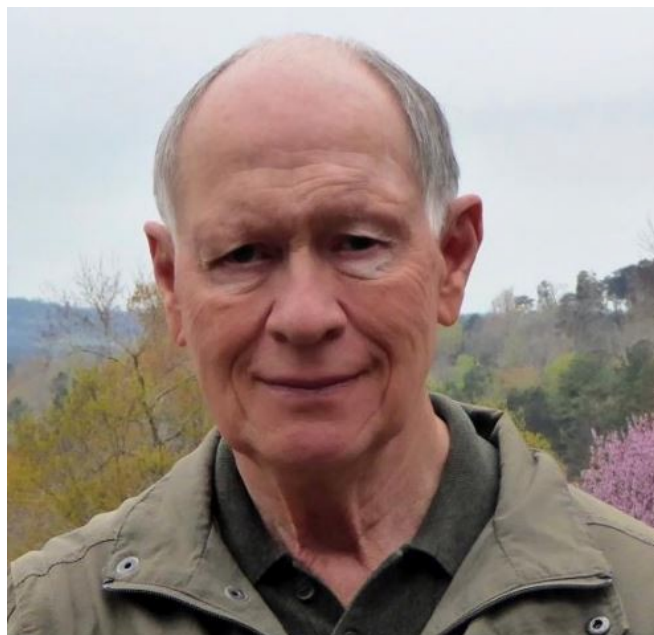
### **Dr. Courtney Alexander**



Dr. Courtney Alexander is an Assistant Professor in the Department of Biology. She earned her BA in Biochemistry from Hamilton College in 2011 and her PhD in Neuroscience from Weill Cornell Graduate School in 2017. She joined UNCP in 2019 after completing an IRACDA fellowship at the University of Texas San Antonio Health Science Center. She teaches a variety of courses in genetics and physiology, and she uses a course based undergraduate research experience (CURE) in her genetics labs. Dr. Alexander is a fierce advocate for undergraduate research, and she loves mentoring students in the lab. She takes a hands-on approach with her research students, working together to develop a research project that they are excited about. She strives to give them the tools to be a successful scientist, even if their project diverges from her previous work. She has two main branches of her research, both of which involve undergraduates. The first uses nematodes as a model organism to investigate the properties of indigenous plants, and the second branch is focused on pedagogical questions. Of note, three UNCP students were co-authors on a peer-reviewed publication, and eight students have been authors on posters for large, international conferences. Dr. Alexander has mentored fifteen students in the research lab at UNCP. Of the twelve students that have graduated, eight are either attending or planning on attending graduate school. Beyond the lab, Dr. Alexander is the Program Director for the U-RISE program at UNCP, which is an NIH-sponsored training grant that helps STEM students apply for graduate school by giving them a paid research experience and extensive training and mentorship. Her work with U-RISE allows her to reach students with more diverse research interests and mentor the next generation of scientists.

## **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.

## **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).

## **2025 Pembroke Undergraduate Research and Creativity Council**

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

**Dr. Maria Santisteban**, Professor of Biology

**Dr. Matthew Hassett**, Associate Professor of Sociology and Criminal Justice

**Dr. Renee Lamphere**, Professor of Criminal Justice

**Dr. Zachary Laminack**, Assistant Professor of English

**Dr. Alice K. Locklear**, Professor of Social Work

**Dr. Marcus Burger**, Assistant Professor of Accounting

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



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