

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



April 20, 2022

Program with Abstracts

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

April 10, 2022

Dear Students and Colleagues,

Welcome to the sixteenth annual UNC Pembroke Undergraduate Research and Creativity Center Symposium. Today you will see the academic accomplishments of some of our best and brightest students, displayed in various formats, from across the academic spectrum. This year's symposium includes 55 presentations representing 64 students, 27 mentors across 8 academic departments.

My own experience in undergraduate resources draws from technical and artistic roots. As a first-generation undergraduate computer science and fine art student, I worked with professors on undergraduate research projects in both disciplines. These projects accelerated my academic growth and further increased my drive to succeed in my coursework and subsequent careers. I have mentored dozens of PURC grants, and I know the same is true for my own students and every student presenting here. I have seen students start businesses, find jobs and enter graduate programs as a result of their undergraduate research projects.

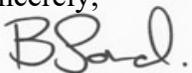
In the 2014 PURC Symposium introductory letter, PURC Director Dr. Tim Ritter wrote that “No matter what the discipline, the opportunity for an undergraduate student to work with a professional in their chosen field will have a significant impact on the student.” The impact he describes is that of practice as opposed to study. In actively practicing the discipline, the student gains an entirely different understanding of it, particularly if the student has ownership of the project. As such, I have no doubt that undergraduate research and shared scholarship prepare students for the professional workplace.

At PURC, it is our goal to support and facilitate these efforts in every discipline possible. Whether student or faculty mentor, please do not hesitate to bring your ideas to our attention! We will do our best to help you get your project off the ground, connect mentors and students, and find local, national, regional and international opportunities in your field.

The Symposium is a culmination of the efforts of many dedicated people. First, to the faculty mentors who have worked so hard to guide our students: Thank you! Secondly, I would like to recognize the PURC Council for their work on the Symposium and their expertise in advising the center. Finally, thank you to all the hard-working staff across campus that work to make this event happen.

Please take the time to speak with students and faculty from outside your own discipline. We have a wonderful group of faculty and student mentors and it is rare that we are all in once space. In the thirteen years I have been involved with PURC, I have been consistently impressed by the quality of our mentored undergraduate research.

Sincerely,



Brandon Sanderson, MFA
Interim Director – Pembroke Undergraduate Research & Creativity Center

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Cover photo by Dr. Kaitlin Campbell, Biology

*“This picture of a bumble bee (*Bombus* sp.) on *Coreopsis* was taken in the summer of 2019 for a student research project studying pollinator floral preferences through pollinator observations in the UNCP campus Garden and Apiary. The project was led by Abigail Canela (Geo-Environmental Studies & Chemistry) and assisted by Cody Eubanks (Biology), Macaela Locklear (Biology), Mary Thorn (Biology), & Amanda Holmes (Environmental Science) under the mentorship of Dr. Kaitlin Campbell (Biology).”*

16th Annual
Pembroke Undergraduate Research and Creativity Symposium

Wednesday April 20th, 2022
Mary Livermore Library Commons Area

Schedule of Events

- 9:45-10:00 Registration**
- 10:00-10:15 Greetings**
Dr. Richard Gay, Dean, College of Arts & Sciences
Brandon Sanderson, Interim Director, PURC
- 10:15-10:30 Keynote Speaker – Dr. Matthew Schneider, Sociology and Criminal Justice**
- 10:30-11:45 Poster/Exhibit Session**
- Ongoing Musical Performance:**
Phillip Brown and Brandon Womack with faculty member Joseph Van Hassel (monitor)
Work Details: “Consonant Music” for Percussion Trio by Jack Veas.
- 11:45-12:15 Deli Lunch Service**
- 12:15-1:20 Oral Presentations**
- 12:15-12:30 “*Faraday Rotation in Air and the Dispersion of its Verdet Constant*”
Terry Chavez, Chemistry and Physics
Mentor: **Dr. William Brandon**
- 12:35-12:50 “*Integrin Inhibitor Attenuates Synaptotoxic Pathogenic Cascade Following Paraoxon Exposure in Hippocampal Explants*”
Jared Tuton, Biology
Mentor: **Dr. Ben Bahr**
- 12:55-1:20 “*The Utilization of T-shaped Mazes to Examine the Effect of Rabbit Tobacco on Memory in Caenorhabditis elegans*”
Ashton Tillett, Biology
Mentor: **Dr. Courtney Alexander**
- 1:20-2:20 Awards Presentation, Reception, and Closing Remarks**
- 1:20-1:30 Dr. Timothy M. Ritter and Marie A. Amero Endowed Research Scholarship – Haleigh Grace
- 1:30-1:40 Dr. Charles Humphrey Undergraduate Conference Travel Award – Jazmine Borden
- 1:40-1:50 Undergraduate Research Mentor Award – Dr. Maria Santisteban, Biology
- 1:50-2:00 Undergraduate Research Mentor Award – Dr. Jamie Mize, History
- 2:00-2:10 Livermore Library & Undergraduate Research – Mr. Robert Arndt, MLIS
- 2:10-2:15 Closing Remarks

Keynote Speaker 2022



Dr. Matthew Jerome Schneider is an Assistant Professor of Sociology at the University of North Carolina at Pembroke. He earned his Ph.D. and M.A. in Sociology from the University of Illinois at Urbana-Champaign. He earned his B.S. in Sociology and History from Illinois College, a small liberal arts college in West-Central Illinois. Matt's research attempts to understand race, race relations, volunteering, civic engagement, and/or environmental politics in both American and international contexts. Recently, he has written about volunteer tourism in Honduras, American public opinion of hydraulic fracturing, navigating college as a first generation college graduate, and the need for more inclusive civic institutions in the United States. Currently, he is working on a book project that explores how homeless service volunteers in St. Louis, Missouri both undermine and reproduce problems related to homelessness.

On campus, he frequently collaborates with the Office of Student Inclusion and Diversity to create co-curricular learning opportunities for UNCP students. Perhaps most importantly, he encourages his students to involve themselves in community service, activism, and politics, and teaches courses on social inequalities, race and racism, environmental sociology, and urban and community sociology. And of course, he is a strong proponent of undergraduate creative and research projects.

Posters

1 - Finding relationships between multiple Hypericum species home to North Carolina

Benjamin Bell, *Science Education*

Mentor: **Lisa Kelly**

Abstract:

The Hypericum species has multiple beneficial traits to the body and is a staple in Lumbee herbal culture. The study created in lab will aid to finding the relationship between the 9 Hypericum species found in North Carolina. This will include looking for closer relationships, such as sister taxa. Using MEGA software, we were able to computerize data and visually see the difference and relationship between the Hypericum species. In addition to the MEGA Software, a PCR reaction was ran on the Hypericum species. First extracting the DNA of my species, *H. Hypericoides*, using biomashers and the Qiagen DNeasy plant mini kit. then, using the Rbcl primer and a PCR reaction we replicated the DNA strands. The DNA found should show visible characteristics in form of base pairs and groups. A complete analysis is planned, to further explain relationships between the species. To improve relationship analysis, multiple scientific methods should be used to create cladograms. The Hypericum species with improved research could lead to improvements of body through natural alternatives.

2 - Sprites, Elves, and Pixies: Transient Luminous Events in the Upper Atmosphere

Erica Blakely, *Geology & Geography*

Mentor: **Dennis Edgell**

Abstract:

High altitude test pilots observed mysterious flashing lights in the atmosphere high above thunderstorms. Pilots were reluctant to report these short-lived flashes, as they did not want to be accused of imagining them, and risk being grounded. As a result of a 1989 photographic discovery, different forms of atmospheric electrical charges have been investigated and determined to exist, if only for a fraction of a second. These lights are given the fanciful names of Sprites, Elves, and Blue Jets. Pixies, Gnomes and Trolls are also whimsical terms for another category of upper atmosphere electric phenomena. Transient Luminous Events (TLEs) appear in the atmosphere for only a few milliseconds, 40 times faster than an eye blink, or even a single pixel flash on a television screen. TLEs have been associated with thunderstorms stimulating the upward electric charges above the weather. Sprites (Stratospheric Perturbations Resulting from Intense Thunderstorm Electrification) appear as flickering red lights above cumulonimbus clouds. Elves (Emissions of Light and Very Low-Frequency Perturbations from Electromagnetic Pulse Sources) are bright lights culminating from lightning within thunderstorms. Blue Jets are streaking lightning emissions between positive and negative charges above thunderstorms.

Atmospheric scientists are finding out that this upper-atmospheric electricity has potential effects on weather systems, satellites, orbital space flights and communication. The primary emphasis of this presentation is to review current research on these poorly understood upper-air electrical phenomena.

3 - Judgment Free Zone: How Self-Compassionate People Perceive Judgment in Others

Jazmine Borden, *Psychology*

Mentor: **Ashley Allen**

Abstract:

By definition, self-compassionate (SC) people treat themselves compassionately; however, this may result from a belief that others are also judging oneself more compassionately. We hypothesized that high SC participants would judge themselves less and perceive less judgment from their partner after experiencing failure than low SC participants and that this effect would be moderated by the partner's expressed SC. Using Amazon's Mturk, 170 participants (M= 38.76, SD= 10.64, men 63%) were ostensibly paired with a partner who had already completed the study's trivia questions. Participants answered 10 timed trivia questions, received fabricated negative feedback, and were told their partner received the scores. Participants wrote about their thoughts and were shown what their fake partner wrote after answering the trivia questions (3 conditions: self-compassionate, self-critical, or no response). Finally, participants completed measures of self and partner judgment and the SC Scale. The primary hypothesis was supported in that high SC participants judged themselves less and thought their partner judged them less. The partner's expressed SC did not impact these perceptions.

4 - The Writing Center: Investigating Ways to Increase Engagement and Usability

Shannon Braswell, *English, Theatre & Foreign Languages*

Mentor: **Elizabeth Gagne, Elise Dixon**

Abstract:

As a Writing Center it is imperative that multiple voices are heard to gauge and increase student involvement and engagement. The projected goals for the University Writing Center revolves around asking students what they need, hosting events that bring students in, and interviewing other university writing centers to see how they meet the needs of their students. This research will allow the center to learn what can be done to create an inviting and interesting environment that students are eager to be a part of. Lori Salem writes in "Decisions: Who Chooses to Use the Writing Center?" that writing centers are where college students have the opportunity to choose the type of writing instruction they will receive (p.150). Students are the sole reason why writing centers exist and asking them directly what they want and need will allow centers to be a better tool for said students. It is understandable that students may be reluctant to visit the writing center out

of fear of being told that they are “wrong”, especially when they are sometimes sent to centers as a punishment. Harry Denny, from "Understanding the Needs and Expectations of Working-Class Students in Writing Centers", expands upon this by stating that “Writing centers should be a godsend for students”(p.69). It is the job of the center to find out all of the information that they can in order to create a space that is helpful and approachable rather than intimidating. The best way for the center to achieve this is by communication with students and other writing centers. Ultimately, this should target new areas for further research to help evolve and improve the writing center.

5 - Correlations Between Major Precipitation Events and Groundwater

Grayson Cecil, *Geology & Geography*

Mentor: **Madan Maharjan**

Abstract:

The coastal plains are subject to major storm events throughout the year, most prominently during the Atlantic hurricane season from June-November. In this poster I will correlate the effects of major precipitation events and changes in groundwater levels within Robeson County. I collected data for this project from the RCGM (Robeson County Groundwater Monitoring) project wells, The Department of Environmental Quality, and the United States Geological Survey’s water gauges. During Hurricane Florence in 2018, there was an immediate 1:1 correlation between precipitation and rising groundwater levels in the Black Creek aquifer. This was unexpected because typically hurricanes and storms would have some lag time and less direct impacts on confined aquifers like the Black Creek Aquifer. I will be comparing the trends in groundwater levels and precipitation seen during hurricane Florence and three other hurricanes: Matthew, Hermine, and Dorian. Understanding and quantifying the connection between the magnitude of precipitation events to the changes in the water levels of confined aquifers is important because groundwater is a primary source of water for the region, so understanding it allows for making informed decisions regarding water management and public health policies.

6 - DNA Testing Herbal Supplements for Their Listed Ingredients

Abigail Chatham, *Biology*

Mentor: **Lisa Kelly**

Abstract:

The purpose of this study is to determine if a Ginger Root and Garlic & Parsley supplement contain what their bottles claim, by amplifying the ITS2 gene. The FDA does not regularly test herbals for their listed ingredients, due to a 1994 Act preventing this. Testing supplements is a way to see if they contain what the manufacturers say. The Qiagen DNeasy Plant Kit was used for this study. It allowed for the extraction, amplification and purification of the species-identifying ITS2 gene. This purified gene was sent to GeneWiz

for Sanger Sequencing. After this, the sequence was run through the BLAST database for identification. The sequence for the Garlic & Parsley supplement yielded no results. The Ginger Root supplement had a 97% match to *Echinacea angustifolia* or “Purple Cone Flower”. Two conclusions for the Garlic and Parsley supplement were drawn; the DNA of the Garlic & Parsley in this supplement was either destroyed in the manufacturing process, or the supplement contained neither of these ingredients at all. The main conclusion for the Ginger Root result was contamination in some step of the study due to inexperience of students. A Purple Cone Flower supplement was also tested, so much of the equipment was used for both. The second conclusion was replacement of ingredients in the manufacturing process. This study could be taken a step further, by imitating a study done by Steven Newmaster, in which he tested supplements from 12 different manufacturers for their listed ingredients. Continuing this research could make government officials review the 1994 Act, and require all herbals to be regulated by the FDA for quality, safety and effectiveness.

7 - Advanced Laboratory Instruction: Lock-in Amplifier Demonstration

Terry Chavez, *Chemistry & Physics*

Shaun Schrubbe, *Chemistry & Physics*

Mentor: **William Brandon, Quinton Rice**

Abstract:

Occasionally a scientist is faced with the dilemma of measuring very low voltage signals of the order of a microvolt, or even nanovolts. Naively, one might assume such signals can be amplified using a traditional chain of operational amplifiers. However, the result of doing so might amount to a waste of time. Why? – NOISE. When the signal of interest is amplified, so is the accompanying noise. Essentially one will not be able to distinguish the signal of interest from the background noise. In this type of situation, one solution is to employ a measurement technique referred to as phase sensitive detection (PSD) with a lock-in amplifier (LIA). Here is a brief outline of the theory, as well as a very straight-forward exercise involving several instruments found in a typical electronics laboratory, in addition to an optical chopper and a lock-in amplifier, to elucidate the power of phase sensitive detection.

8 - Positive modulation of lysosomal protein clearance machinery to counter the negative synaptic influences that lead to dementia-related cognitive decline

Sidney Clayman, *Biology*

Mentor: **Ben Bahr**

Abstract:

As we age, and more so with early dementia, altered mechanisms of proteostasis cause the buildup of proteins on the synapse which can lead to the disruption of synaptic integrity and eventual loss of synapses. The UNCP Alzheimer's disease research lab found that with positive modulation of an enzyme component of the autophagy-lysosomal pathway led to

improved synaptic and cognitive measures in rodent models of Alzheimer's disease, α -synucleinopathy, and mild cognitive impairment. The project aims to investigate the effects of positive modulation of the autophagy-lysosomal protein clearance pathway and promote synaptic resilience. The hypothesis being tested is that restoring and boosting proteostasis will preserve the synaptic integrity and avoid age-related cognitive impairment. First, the mature rat hippocampal explants were treated with Z-Phe-Ala-diazomethylketone (PADK), an enhancer of the active form of the lysosomal hydrolase cathepsin B (CatB), then we assessed CatB and synaptic markers as compared to control explants. The brain explants were harvested and separated by electrophoresis. Accordingly, applying the positive lysosomal protease enhancer resulted in an increase of active form of CatB, increased production of cleavage product of the CatB substrate DAB-2, and associated with enhancing synaptic markers in the brain explants. Next, a group of cultured brain slices were insulted with the lysosomal inhibitor chloroquine, which mimics age-related protein accumulation stress, with or without PADK. Findings indicate that positive modulation of a lysosomal protease provides a potential avenue to avoid age-related synaptic integrity and associated cognitive decline.

9 - Optimization of Biological Control Agent *Bacillus thuringiensis* Growth Using 2L and 5L Fermenters Under Various Environmental Conditions

Aida Cortez, *Chemistry & Physics*

Grant Gabzdyl, *Biology*

Isabella Ortega, *Biology*

Mya Love-Whitley, *Biology*

Mentor: **Devang Upadhyay, Sivanadane Mandjiny, Leonard Holmes**

Abstract:

Evidence has proven that utilizing insecticides can pose a potential risk to humans and other life forms as well as unpleasant side effects to the environment. *Bacillus thuringiensis*, a distinctive bacterium naturally found in soils and plant leaves, has been accepted as a safe biopesticide to reduce these side effects. It is a gram-positive soil-dwelling bacterium that shows significant toxic effects against larvae. The goal of this project was to determine the best parameters for the specific growth rate of *Bacillus thuringiensis*. This was accomplished by using a 2-liter and 5-liter bioreactor to promote the growth of *Bacillus thuringiensis* (Bt). Three different growth parameters were examined in this project which were the temperature (Celsius), agitation (RPM), and airflow (VVM). Each week consisted of alternating between the growth parameters to determine the leading value of each. The temperature being the first parameter to be examined, the temperatures of 30, 34, 38, and 42 degrees Celsius were used. Agitation being the second, the values of 100, 150, 200, and 250 RPM were used. Lastly, airflow was the final parameter to be examined, and the values of 0.5, 1, 1.5, and 2 VVM were used. After conducting the experiments using variations in temperature, agitation, and airflow, we found that BT is grown most successful at 38 degrees Celsius, 200 RPM, and 1 VVM.

10 - Extraction and Isolation of Bioactive Compounds from Rabbit Tobacco and Nematode Longevity

Samantha Cranford, *Chemistry & Physics*

James Locklear, *Chemistry & Physics*

Mentor: **Cornelia Tirla, Courtney Alexander**

Abstract:

Rabbit Tobacco (*Pseudognaphalium obtusifolium*) was known by the Lumbee native tribes in North America to benefit health. Previous work in our laboratory showed that aqueous extracts from this plant increase the longevity of nematocytes; however, no information is available in the literature about the active compounds present in the rabbit tobacco or their activity level. This work describes the extraction of biologically active compounds from the plant using diemethanlinechloride and hexane, followed by the isolation, purification, and identification of the compounds. Further, these compounds were tested on nematocytes to understand their biological activity better.

11 - Identification and isolation of genomic DNA from pollen and the intestines of the Western Honeybee

Melissa Creech-Sutton, *Chemistry & Physics*

Mentor: **Crystal Wallline**

Abstract:

Solitary bees do not gather or operate within a colony, but despite making up about 90% of the total bee population, they are often underrepresented in scientific studies. The purpose of this research is to identify the species of pollen present in beehives and the microbes present in the bee intestines. To accomplish this, genomic DNA (gDNA) was isolated from pollen and bee intestines from the Western honeybee, *Apis mellifera*. Bees that were emerging from the honeycomb cell were captured and dissected. The digestive tract, consisting of the midgut and hindgut, was removed from the abdomen using dissecting scissors and forceps, and intestinal samples were stored at -80 C until further use. Additionally, pollen from individual honeycomb cells was gathered using a blunt probe and stored at -80 C. Pollen or samples were homogenized using the Vortex Genie TurboMix attachment and gDNA was extracted from the samples using the Quick-DNA Fungal/Bacterial Miniprep Kit (Zymo Research). Purified DNA was then analyzed. Future directions include Tagmentation and DNA sequencing. The the DNA quality control checks will be implemented throughout this process to ensure that the gDNA is free from any contamination or degradation. Sequencing will be performed using the Miniseq Sequencing System (Illumina) to identify pollen gathered by native bees and the species of bacteria present within the gut microbiota. Previous studies in carpenter bees suggest there is a close relationship between pollen species and gut bacteria. Our studies will investigate if this relationship holds true for other native bee species, including the Western honeybee.

12 - Foraging ecology in an omnivorous terrestrial turtle using stable isotope analysis

Kathryn Davis, *Biology*

Mentor: **John Roe**

Abstract:

The eastern box turtle, *Terrapene carolina carolina*, is known to be omnivorous, feeding on invertebrates, fruits, and mushrooms. However, little is known about dietary preferences among individuals and across demographics like age and sex, as well as what food items are most important to building tissues. This study seeks to examine *T. carolina carolina*'s foraging ecology using stable isotope analysis of tissues and observations of foraging during a long-term radiotracking survey. We collected claw samples from turtles at two sites, Weymouth Woods Sandhills Nature Preserve and Lumber River State Park. We sent the samples to the New Mexico Center for Stable Isotopes. We will analyze the isotope data with the programs isoSource and isoError. Our preliminary data shows a trend toward mushrooms in the diet of the Eastern box turtle, and our stable isotope data will allow us to confirm or deny that trend.

13 - The resurveying of plant diversity within the Lumbee tribe Cultural Center

Kendarius Jonquay Dixon, *Biology*

Mentor: **Lisa Kelly**

Abstract:

The plant diversity of the Lumbee Tribe Cultural center gives acknowledgement to the importance of North Carolina native species and their relationship to the Lumbee Tribe that evokes cultural belonging 1). The Lumbee Tribe Cultural Center (Biodiversity Website) created by students enrolled in Conservation biology at The University of North Carolina At Pembroke(2019,2020,2021); as a service to the Lumbee tribe, education, and medicine 2). The (Plantdiversity) is divided between Herbaous plants and Woody plants; a primary way to separate the huge division 3.) The listed species were photographed from the nature trail located near the Lumbee Tribe Cultural Center, then transferred onto the website; along with the (iNaturalist) website for further observation and awareness on the environment. The (iNaturalist) site is premature, but yet has over (200 species) and (190 identifiers) 4). To conclude, my researchproject contributes to the summary of plant diversity of the Lumbee Tribe Cultural Center (Biodiversity Website). I will be updating the current observations of the site for recognition ofthe resources of the area (lumbee tribe) and as tribute to the creators of the site before me (predecessors). As a result, the outcome of my contribution will help the local community and newcomers be conscious of the uniqueness and inherent knowledge of cultural sharing

14 - *Myrica cerifera*, a medicinal plant of the Lumbee tribe, has antibacterial and nematocidal properties

Ashley Edwards, *Biology*

Mentor: **Courtney Alexander**

Abstract:

Currently threatening the world of medicine is a growing number of antibiotic resistant diseases like methicillin-resistant *Staphylococcus aureus* (MRSA). In addition to antibiotic resistant bacteria, nematodes have gained resistance to many of the world's leading nematicides, rendering infections in both people and plants more difficult to treat. Subsequently, these parasitic organisms can continue damaging crops and humans unchecked. To help in this battle against antibiotic and nematicidal resistance, the development of novel antibiotics and nematicides is vital. Previous research suggests that phytochemicals are a potential solution that will help not only inhibit bacterial growth, but also reduce nematode survival. We hypothesized *Myrica cerifera*, a plant often used by the Lumbee tribe to combat illness, possesses antibacterial and nematicidal properties. To answer our hypothesis, we began by collecting plant specimens to extract material for biological assays. The extract was evaluated for antibacterial properties with an agar diffusion assay and then, nematicidal properties using *Caenorhabditis elegans*. *M. cerifera* extract was added onto an agar lawn at various doses and the nematodes' lifespans were scored. The findings of this study show that extracts of this plant, more commonly referred to as 'wax myrtle,' do significantly decrease the lifespan of *C. elegans* and increase the zone of inhibition for *Staphylococcus epidermidis* and *Staphylococcus aureus*. The compounds in wax myrtle could potentially be used to treat bacterial and nematode infections.

15 - Investigating microplastic pollution in the water column and sediments of the Lumbee River

Carlee Epting, *Biology*

Mentor: **Amber Rock**

Abstract:

Microplastics, debris that are less than five millimeters in length, have been known to persist in marine and freshwater environments for decades. Microplastic debris can cause harm to native and local wildlife when ingested due to their small size and bioaccumulation potential. More focus has been placed on the harmful effects of microplastics in marine ecosystems, however it is also important to better understand their effects in freshwater ecosystems. This research aims to evaluate microplastic pollution in the Lumbee River, an ecologically and economically important river in southeastern North Carolina. Water column and sediment samples were collected at three different sites near Pembroke, NC over the period of a year. These samples were filtered and examined under a microscope. Additional water quality measurements such as pH, turbidity, and water temperature were also collected. Data collected thus far suggest that fibers are the most abundant type of

microplastic in the Lumbee River. Future work on the Lumbee River should sample additional locations to determine the full extent of microplastic pollution in this ecosystem.

16 - Recreating carcinogenic missense mutations through CRISPR, altering *Saccharomyces cerevisiae* CDC42

Leah Frazier, *Biology*

Mentor: **Brittany Miller**

Abstract:

Establishing asymmetric polarity is an important process for cells, as it relates to the critical elements in the life cycle of cells. Targeted exocytosis is used by polarized eukaryotic cells, like epithelial cells and neurons to direct vesicle trafficking to particular sites on the plasma membrane and regulate their development. To mimic missense mutations in human cancer cells, I am utilizing CRISPR to deliver mutations into *Saccharomyces cerevisiae* CDC42. Currently, I do not know whether or not these mutations in human *cdc42* affect its activity or contribute to the pathology of cancer. Cdc42 is a member of the Rho family of small GTPases and controls cell cycle progression, motility, and polarity. Many proteins involved in polarity are maintained between yeast and humans, including the RhoGTPase CDC42. *Saccharomyces cerevisiae* has equivalent methods to drive development to the bud tip, making it an ideal model for cell polarity research. Tethering factors are activated by CDC42, which regulates polarized cell development and arranges cytoskeletal components to produce asymmetric polarity. Cancer can be caused by mutations in CDC42 since a lack of cell polarity can lead to tumorigenesis. I hypothesize that by reproducing similar mutations in the yeast CDC42 homolog, we will disturb the polarity in yeast, allowing us to better comprehend how CDC42 functions and if the missense mutations in these CDC42 cancer samples contribute to the disease.

17 - The Use of Needle Aspiration and Specific Sertoli Cell Markers to determine the size of the cell population in Prepubertal Beef Bulls

Kalani Gaddy, *Biology*

Mentor: **Nicolas Negrin-Pereira**

Abstract:

Sertoli cells (SC) are found in the testis of mammals and are responsible for nurturing germ cells and defining the potential daily sperm capacity in bulls. Daily Sperm Capacity is determined by the size of the SC population. Sertoli cell replications occurs rapidly between 4-25 weeks of age in the prepubertal bull. Once puberty is achieved, Sertoli cells halt replication and the ceiling of sperm production in the bull is determined. Different techniques for testicular tissue sampling are utilized and compared: fine needle aspiration (22g needle), semi-automatic biopsy needle (20g needle) and conventional histology

sections in combination with immunohistochemistry using specific cell markers to identify SC. The following stain comparison is made hematoxylin and eosin, and GATA 4 and Wilms Tumor I antibodies. The use of specific SC markers allows us to locate accurately the cells within the tissue. The objective of the present experiment is to compare different testicular sampling and staining techniques to determine the size of the SC population established in the testis before puberty in young bulls assessing the potential daily sperm production of the individual as an adult bull.

18 - Military Explosive Blast Shockwaves Induce Early Astrocytic and Synaptic Alterations

Minh Huy Giang, *Chemistry & Physics*

Mentor: **Ben Bahr**

Abstract:

Explosive shockwaves are linked to injuries commonly associated with military service and an increased risk for the onset of dementia. Moreover, neurological complications following a blast injury, including depression, anxiety, and memory problems, often persist even when brain damage is undetectable. Recently, detonations of military explosive cyclotrimethylene trinitramine (RDX) were used to show a reduction of synaptic markers in hippocampal explants, which is known to be downregulated in cognitive disorders without causing overt neuronal loss. Here, inspired by the concept of the “tripartite synapse”, this study investigates the effects of shockwaves on astrocytic cells in blast-exposed brain explants. The hypothesis is that in addition to pre- and post-synaptic elements exhibiting compromise after blast exposures, astrocytes within the dense neuropil also experience blast-induced alterations. Mature rat hippocampal slice cultures that were exposed to RDX-induced blast shockwaves and glial fibrillary acidic protein (GFAP) alongside pre- and post-synaptic proteins were assessed by immunoblot and immunofluorescence. Interestingly, the blast-induced synaptopathology also does not cause an overt increase in astrocyte marker GFAP. However, results from morphological analyses of blast-exposed vs. control brain explants found that the distinct synaptopathology caused by RDX blasts is also associated with enlarged astrocytic cell bodies and their lengthened primary branches, the latter being signs of early astrocytic modifications. These results indicate that blast-induced shockwaves cause distinct synaptic and cellular alterations early before detectable neuropathology.

19 - Effects of Hurricanes in Groundwater levels

Cody Gless, *Geology & Geography*

Mentor: **Madan Maharjan**

Abstract:

For my poster I will be going over the 3 largest hurricanes in the past decade in North Carolina and how they affected groundwater levels in Black Creek Swamp aquifer. This is important because, ground water is one of the primary resources that we use to supply households with fresh water. I collected the data for the wells in our county own by the state and plotted the data for a week before, the week of, and 2 weeks after the hurricane took place. I will provide insight into the hurricanes Dorian, Florence, and Hermine.

20 - Factors Affecting Diversity and Abundance of Butterflies in Pollinator Gardens

Imani Gordon, *Biology*

Mentor: **Kaitlin Campbell**

Abstract:

Amplified interest has been shown in pollinator plantings in response to growing pollinator decline driven by widespread pesticide use, habitat loss, parasites, and climate change. Butterflies serve a significant role as pollinators, affecting ecosystem regulation and crop production. Our study sought to investigate four major questions: Which butterflies are using the pollinator garden at UNCP, how long are butterflies living and persisting in the habitat, do butterflies show a preference for certain flowers, and how do a variety of weather conditions affect the diversity and abundance of butterflies? In 2019, butterflies were sampled weekly for 10 weeks in the UNCP garden. In 2021, butterflies were sampled twice daily, five days a week for a duration of nine weeks from June to August. Then, butterflies were sampled daily, five days a week for a duration of nine weeks. Identification, marking status, condition, and flower visited, if any, were recorded. Results demonstrate a significant relationship between butterfly abundance and temperature and UV index as the most important indicators for butterfly abundance and richness. Temperature alone also demonstrated significance as a predictor for butterfly abundance. In 2021, a total of 696 butterflies were captured, 169 were recaptured later with the longest recapture being 12 days. Butterflies displayed a preference for butterfly bush and zinnia over other flower varieties. Conservation for native pollinators is imperative for ecosystem balance and human food supply.

21 - Combining Electrolysis and Light Absorption: A New Tool for Chemical Analysis of Very Small Samples

Haleigh Grace, *Chemistry & Physics*

Mentor: **Paul Flowers**

Abstract:

Technologies for identifying and quantifying specific chemical substances are essential to the advancement of nearly every area of science. With applications ranging from the diagnosis and treatment of human disease to the search for life on other planets, these technologies are continually being expanded and refined through research in the field of analytical chemistry at institutions across the globe. For many applications, the ability to analyze very small (“microscale”) amounts of sample is desirable, for example, when the sample is scarce, expensive, or hazardous. We have developed a simple device for the chemical analysis of microscale samples that relies on how the sample’s light absorption properties change when it is electrolyzed, a technique known as spectroelectrochemistry. The device is fabricated from relatively inexpensive epoxy, wires, steel tubing and polymer plates, and it features a narrow channel in which liquid samples are subjected to spectroelectrochemical measurements. To date, we have successfully analyzed sample volumes as low as approximately 300 nL, roughly the size of a flea or a grain of sand. The quality of results obtained using our device compares nicely to typical results for conventional analysis of much larger samples. This material is based upon work supported by the National Science Foundation under Grant Number 1506817. Additional support provided by funds from the Dr. Timothy M. Ritter and Marie A. Amero Endowed Research Scholarship, administered by the Pembroke Undergraduate Research and Creativity Center, is gratefully acknowledged.

22 - From Hurican to Whirlwind Woman: Indigenous Interpretations of Severe Weather in The Americas and Caribbean

Jacqueline Harlow, *Sociology & Criminal Justice*

Mentor: **Dennis Edgell**

Abstract:

Weather has always occurred, and since people have existed on this great blue planet, we have tried to understand how it works, where it comes from, and why it happens. Indigenous peoples of the Americas and Caribbean interpreted weather within the context of their cultural narratives and intertwined explanations of weather events with their understanding of the rest of the natural, and supernatural, universe. To native peoples, winds were divine feminine spirits and hurricanes were powerful gods of both destruction and rebirth. In this presentation, indigenous interpretations of weather events are investigated and the influence of weather on the oral histories, practices and customs of the Native Peoples of North America, South America, and the Caribbean are examined. By incorporating their holistic view of weather as it relates to the natural ebb and flow of

nature within a cyclical rather than linear framework, our general appreciation for the power of natural forces is broadened.

23 - Mutating *Saccharomyces cerevisiae* CDC42 with CRISPR to emulate cancerous missense mutations in humans

Emily Harrison, *Biology*

Mentor: **Brittany Miller**

Abstract:

Asymmetric polarity is an important process, as it pertains to integral milestones in the cellular life cycle, such as cell division. Budding yeast (*Saccharomyces cerevisiae*) directs growth to the bud tip, which serves as an ideal model to study cell polarity. Many proteins involved in polarity, including the RhoGTPase CDC42, are conserved between yeast and humans. CDC42 is a master regulator of polarized cell growth, activating tethering factors and arranging cytoskeletal components to achieve asymmetric polarity. Mutations in CDC42 result in cancer, as losing polarity can result in the development of tumors. By recreating these mutations in the yeast CDC42 homolog that is 80% identical to human CDC42, we hypothesize we will disrupt polarity in yeast and can use this to understand the functional disruption of CDC42 and whether the missense mutations in these CDC42 cancer samples contribute the disease. Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) serve as an 'immune system' for bacteria to protect against viruses. CAS9 is an endonuclease enzyme that cleaves DNA; using CAS9 and a single guide RNA, researchers can edit the genomes of cells. In our research, we use CRISPR to introduce mutations into *Saccharomyces cerevisiae* CDC42 to recreate missense mutations in human cancer cells. The specific mutations we selected have connections with cancers, such as colorectal, lung, and uterine cancer. We have introduced several missense mutations in CDC42 and are assessing their effect on polarity in yeast by observing cell morphology, growth rate, and temperature sensitivity. These observations will give us insight as to how these mutations affect human cells.

24 - Homeopathic potential of medicinal plants in fighting microbial overgrowth found in canine otitis.

L. Renee Hoot, *Biology*

Mentor: **Joseph White, Timothy Anderson**

Abstract:

Canine otitis, more commonly known as a canine ear infection, is a frequent issue in veterinary medicine. The condition is typically caused by bacterial or fungal imbalances within the microbiome present in the ears. Although antimicrobial treatments for these overgrowths are available, a veterinary visit is required, treatment is expensive, and antibiotic resistance is a potential concern. For these reasons, owners may choose an at-home natural remedy using easily sourced ingredients before visiting their local veterinary office. This project was designed to

build on the current research available to determine whether there are viable at-home treatment options for canine otitis, using supplies and methods easily accessible and reproducible for the average pet owner. Several common plants with known medicinal uses were compiled and used to create crude extracts and infused oils using household supplies. These extracts were then applied to pure cultures of *Staphylococcus pseudintermedius* and *Malassezia pachydermatis* (two of the most common microorganisms to cause infection) using the Kirby Bauer disk diffusion method to determine if the extract has inhibitory properties and allow for comparison between different extract preparation techniques. It was anticipated that the crude extracts would have a more significant inhibitory effect than the infused oils but that both would suppress bacterial growth to some degree.

25 - **Phylogentic analysis of 9 Hypericum species in North Carolina**

Ethan Hunt, *Biology*

Mentor: **Lisa Kelly**

Abstract:

Analyzing *Hypericum* species is important in understanding the different types of relationships and characters between them. A planned analysis will determine hypothetical relationships between the nine *Hypericum* species in North Carolina. We will also determine which species are related and appear to be sister taxa. The DNA of five species *Hypericum* were amplified, which was the *rbcl* gene using PCR. Also, a MEGA software was used to make cladogram for five species. For the five *Hypericum* species that we amplified a cladogram was made and it was determined *H. hypericodes* and *H. nudiflorum* are sister taxa. Compared to the other species, they had a higher percentage reliability for their relationship. The cladogram for all the nine *Hypericum* species should show some species that share the same characters and relationships, while the other species will not show any comparison and may have outgroups. To investigate even more on the *Hypericum* species, analyzing the relationships using other molecular characters will help. Also try different statistical methods for analyzing the cladogram. This analysis will connect the relationships with shared common ancestor between North Carolina *Hypericum* species and determine the different groups of taxa.

26 - **Warm Bodies: An Ode to my Skin, an Ode to Leaving**

Dana Hunt-Locklear, *Art*

Mentor: **Brandon Sanderson**

Abstract:

My senior thesis blossomed from my original concepts I began to work with when I first joined UNCP. Originally, I enjoyed introspective thought and putting my traumas into my work, using art as an escape and a sort of therapy. The problem arose when I was not growing as a person, an artist, nor did my work really have any structure. Moving forward with *Warm Bodies*, I began to ponder: When I feel something, where do I feel it? When I felt

certain emotions or feelings, where exactly in my body did I feel it? By identifying where I felt something in my body when experiencing emotions such as sadness, anger, or hurt, I began to sketch different appendages and organs as well as abstract, and often-time monochromatic color schemes or organic shapes to accompany my detailed and medically accurate drawings. *Warm Bodies* serves almost as a farewell to my undergraduate art career, as well as an in-depth analysis of me, my emotions, trauma, and how I've handled them throughout my past 4 years at UNCP.

27 - Impacts of Control and Stress on U.S. Army Veterans: The Role of Tobacco and Alcohol as Coping Mechanisms

Hannah Irving, *Sociology & Criminal Justice*

Mentor: **Brooke Kelly**

Abstract:

The U.S. Army has long been a total institution exercising extensive control of its members. It is this control and the related stress that researchers investigate through the course of this study. Stressors associated with military service, e.g. deployments and separation from friends and family, have long been noted to influence substance use. Attempting to identify if there are unidentified stressors relating to military service, researchers focus on how strict behavior and grooming requirements, chain of command issues, and social pressure may drive substance use while an individual is serving. It also may identify whether or not tobacco and/or alcohol use decreases after participants retire from military service. Participants for this research study are U.S. Army veterans who have retired within the past five years. All participants had enlisted in the U.S. Army and completed at least basic training and advanced individual training, and were sent to a permanent duty station. During this study, researchers asked a mixture of quantitative and qualitative questions to understand if these substances were used to cope with the stresses of military life and, if so, what may cause change in substance use habits after retirement. While data collection for this study is still on-going, researchers have found tobacco use decreases substantially post-retirement, but alcohol use remains around the same level whether the participant was serving or retired. Researchers have also found common themes related to stress from toxic leadership and the contractual aspect of serving in the military.

28 - Recycling Plastic Materials by solvent-targeted recovery and precipitation.

James Locklear, *Chemistry & Physics*

Brianna Martin, *Chemistry & Physics*

Mentor: **Cornelia Tirla**

Abstract:

Because plastic materials are very common in the in everyday life, efforts to deconstruct and recover the initial pure resin became a high priority. The following project described

efforts to identify solvents to be used on a strategy called solvent-targeted recovery and precipitation (STRAP). In order to be successful, the purity and the composition of the recovered material should be similar with the pure resin. Analytical tests like ATR- FTIR spectroscopy and head gas chromatography, will show if the precipitation process allowed the recovery of pure resins, without traces of toxic solvents. During this project 4 bio-renewable solvents that can be used in this strategy were identified: 1-butanol, ethyl acetate, biodiesel, and Cyrene. These solvents were used on several pure plastic materials: Polycarbonate, Acrylic, Polyvinyl Chloride (PVC) and High-Density Polyethylene (HDPE).

29 - Impacts of Predator Communities on Eastern Box Turtle Populations

Kaytlyn Maringer, *Biology*

Mentor: **John Roe**

Abstract:

Eastern Box Turtles are seeing a decline in their population. To better manage this species and understand why their populations are declining, it's important to know what predators are in the turtles' habitat and their abundance to determine the turtles' depredation risk. To understand the impact of predators on turtle populations, we sampled turtles and predator communities at the Lumber River State Park (LRSP) and Weymouth Woods Nature Preserve (WEWO). WEWO receives frequent prescribed burns, while LRSP has only had two burns. Concurrent research shows that turtles from WEWO had a 5% higher mortality compared to LRSP. The goal of this project was to determine the richness and abundance of predators in LRSP and WEWO. We wanted to assess whether predator communities vary by habitat type. We compared turtle injury rates at the two sites to help determine predation risk. To determine predator richness and abundance, we deployed camera traps at 36 randomly chosen stations at each site for three weeks. We examined images for animal activity and identified species. Average abundance of predators per station at LRSP was 3.2 ± 0.7 (\pm SE) and at WEWO the average was 3.9 ± 0.9 . The average richness of predators at LRSP was 1.3 ± 0.2 and at WEWO the average was 1.2 ± 0.1 . The two sites were not significantly different in abundance or richness. Habitat type didn't make a significant difference in abundance or richness. LRSP had an injury rate of 27% and WEWO had a rate of 24%, which were not significantly different. From these results we can conclude that predators are likely not the cause for different mortality rates, and that other factors such as fire management are responsible.

31 - Evaluation of Kinetic Parameters for Lactate Dehydrogenase Enzyme using a Lambert (W) Function

Jameson McDonald, *Chemistry & Physics*

Chinemerem Blossom Edoh, *Biology*

Jullianna Chapman, *Chemistry & Physics*

Crystal Flinchum, *Chemistry & Physics*

Mentor: **Siva Mandjiny**

Abstract:

The biochemistry field of enzyme kinetics is adopting a new method of analysis for enzymatic kinetic parameter data. Over more than a century, biochemists have calculated enzymatic parameters V_m and K_m using the long-established, hyperbolic Michaelis-Menten equation: $v = \frac{d[S]/dt = -V_{max} [S]}{K_m + [S]}$ Where v is the reaction velocity, V_{max} is the maximum velocity reached once the enzyme is saturated, K_m is the concentration of the substrate once it has reached half its maximum velocity, and $[S]$ being the concentration of the substrate. When identifying the numerical values of V_m and K_m the Lineweaver-Burk plot is used to calculate and approximate their values. Employing the Lambert (W) function, V_m and K_m enzymatic parameters can be calculated using data collected using only the substrate concentration. This new model presents an explicit solution to securing an accurate approximation of V_m and K_m values without reformatting data using a linearization method, like the Lineweaver-Burk plot. This method allows biochemists to have accurate, viable results using a straightforward approach, securing a time advantage over the traditional method.

32 - Japanese Traditional Instrumentation and Music

Seth Mulholland, *Geology & Geography*

Mentor: **Dennis Edgell**

Abstract:

I will present ten Japanese traditional instruments that were developed during Japan's feudal period of history. I will cover the classifications of each instrument that developed from 600 A.D to 1865 A.D. One class of instruments that I will cover is the string instruments of Japan where I will discuss the versatility of each instrument and each instrument is like a Western instrument in style. I will also discuss the genre of each instrument is played in and how it fits into the traditional style of Japanese music. The influence of other Asian countries will be also discussed with the development of some of the instruments as well. I will also have an interactive presentation where I will share music video samples of the traditional instruments performed and recorded by traditional instrumentalists.

33 - “To Polish or not to Polish”-Simplifying Cutting edge micro analysis

Sara Ormsby, *Chemistry & Physics*

Mentor: **Steven Singletary**

Abstract:

In this project, the primary aspect that is hoped to be achieved is unlocking the potential of soil evidence in a forensic investigation by simplifying the sample preparation of soil examination. The sample preparation right now involves extensive mounting, polishing, and surface preparation, which leads to more money spent and time-intensive work done. In this project, I will prepare the collected samples for microprobe analysis in the traditional method (extensive polishing) and by mounting the select grains on double-sided carbon tape. These sample mounts will be utilizing the electron microprobe and wavelength dispersive spectroscopy (WDS) to measure the elemental composition of soil samples on the microscale. The primary goal of this project is to determine if the same quality for data can be acquired from both sets of samples, the double side carbon (cheaper way) and the polish (expensive and time-intensive way). The micro-scale compositional data from both sets of samples will be compared using the standard statistical and geochemical techniques to determine correlation. If the data comes back successful it will make the analysis of crime scene soils accessible to a wider audience of labs that may not be equipped with the expertise to prepare samples for electron microprobe analysis. This could also lay out a path for microanalysis by other means such as EDS, which can also recover similar data as WDS but with some ambiguity and being more common instruments in crime labs with only having to be on an SEM.

34 - The Atmosphere in Art History

Abigail Parnell, *Art*

Mentor: **Dennis Edgell**

Abstract:

Paintings throughout history has often been accompanied by skies filled with many different types of clouds and weather conditions. Various types of both clouds and weather can be seen ranging from landscapes to the backgrounds of portraits. However, the weather conditions and clouds types within artworks are typically overlooked and are usually thought of as an aesthetic choice rather than a contextual choice. This research looks at these depictions of clouds and the weather that accompanies them from both a geographic and artistic perspective. The research conducted will explore how geographic and meteorological factors represented within art pieces can give context to the environment from which time period the artworks originated and tell us about past climate conditions. Additionally, the research presented will help to better understand how different types of clouds and weather were viewed, and how these weather conditions shaped and influenced the cultures from which these pieces came. The aim of this research

is to help broaden the perspectives art can be viewed by and how these different approaches can enhance the meaning of a piece of art beyond aesthetics.

35 - **Magneto-Optical Characterization of ZnSe Bandgap**

Shaun Schrubbe, *Chemistry & Physics*

Terry Chavez, *Chemistry & Physics*

Mentor: **William Brandon**

Abstract:

The Verdet constant of ZnSe was experimentally determined in the visible to infrared wavelength range corresponding to 480 -980 nm. In addition to the values obtained utilizing phase sensitive detection and an ac magnetic field, we have also analyzed and compared all other known data. This work is intended to characterize the dispersion of the Verdet constant and extract the energy bandgap from existing theories. The values tend to agree with newer theories assuming a quasiparticle⁹ and/or quantum dot (nanoparticle structure)¹⁰, which assume a smaller crystalline size and stronger energy confinement than the older the models.

36 - **Ecology of Juvenile Eastern Box Turtles (*Terrapene carolina carolina*)**

Mic Schulte, *Biology*

Mentor: **John Roe**

Abstract:

Eastern Box Turtles are a terrestrial species experiencing population declines throughout their native range in North America. Due to their slow rates of growth, small body size, limited mobility, and low annual fecundity, they are susceptible to human and environmental disturbances. They are also prone to higher rates of mortality during the early life stages. Adult Eastern Box Turtles have been well studied, yet little is known about the more cryptic juveniles. This research aims to further our understanding of the behavior, growth, and movements of juveniles from two populations in North Carolina. Using radiotelemetry, we documented the coordinate positions of 41 turtles at regular intervals during 2020 and 2021. We compared the movements of juveniles (n=12), adult females (n=14), and adult males (n=15) from April through October. We hypothesized that movement rates would be lower in juveniles compared to adults of either sex, and lower in smaller than larger individuals. Our hypothesis was not supported by the preliminary data which showed that juveniles, adult males, and adult females moved at an average of 9.56, 10.13, and 14.37 meters per day, respectively. Additionally, only 1.5% of the variation in movement rates was a result of body size. Our future aim is to compare various fitness-related endpoints between adults and juveniles and test how fitness and other behaviors vary with body size. By gaining more information about the vulnerable early life stages of this imperiled species, wildlife managers can establish practices that may help provide

juveniles with the resources they need to reach sexual maturity and promote population stability or even growth.

37 - Suitability of Biochar as a Root Substrate for Hydroponically Grown Lettuce

Eric Schwarz, *Biology*

Mentor: **Bryan Sales**

Abstract:

Our research will examine the efficiency of three substrates (biochar, rock wool, and perlite) when growing *Lactuca sativa* (lettuce) in a hydroponic system under three levels of fertilizer (low, medium, and high). The hydroponics systems we designed will allow us to evaluate the effect of each substrate on plant growth under increasing levels of fertilizer solution. Although various studies on hydroponic systems substrates were published, only a small number of research articles focused on different substrates and minimal research has been conducted with biochar as a substrate. A study was conducted that focused on the growth Gerberas Daisy on four different substrates (perlite, zeolite, sand and rockwool) and found that the perlite substrate had the highest yield and zeolite had the lowest yield. What makes our research different is the use of Biochar in an aquaponic system with the ability to change the nutrient levels of our solution. The experimental study will show the effect of three growing substrates on the yield of *Lactuca sativa* cultivated in an aquaponic system and will determine the optimum nutrient levels to cultivate *Lactuca sativa*.

38 - Phylogenetic study of rbcL nucleotide in Hypericum species native to North Carolina

Josh Skinner, *Biology*

Mentor: **Lisa Kelly**

Abstract:

Examination of relationships is essential to better understanding the lineages of *Hypericum* and the diversity of traits amongst the species. We used PCR testing to sample five species of *Hypericum* DNA and the other six species data were collected from a GenBank. We homed in on focusing on digital samples of *Hypericum* (rbcL) nucleotide sequences as the rbcL sequence was the key gene we used for our five species in the lab. We also used SERNEC as a reference to show the selected species are native to North Carolina. We are making a cladogram to better illustrate the molecular relationships between the selected *Hypericum* species. The cladogram or phylogenetic tree will show not only which species are sister taxa, but which species are more ancient or primitive. This study can be improved by adding *Hypericum* species native to nearby states that are not native to North Carolina due to the difference's environments between the blue ridge mountain areas near Virginia and Tennessee to more piedmont and coastal plains regions of South Carolina. Another way to improve this study would be to include *Hypericum* species native to Eurasia and see the range of phylogenetic differences. This study helps us better

understand the varying evolution tracts amongst different native *Hypericum* species of North Carolina.

39 - Investigating the Effects of Rabbit Tobacco on Parkinson's Disease in *C. elegans*

Jacqueline Swann, *Biology*

Mentor: **Courtney Alexander**

Abstract:

Parkinson's disease is a neurological disorder that causes a number of symptoms, including issues with locomotion, tremors, and reduced lifespan. Research is being done to discover different ways to either cure Parkinson's, or at least aid in the symptoms of it. One way this research is being conducted is through the nematode model, *Caenorhabditis elegans*. Better known as *C. elegans*, the worms are an easy, and cost effective, way to conduct research into different diseases, including Parkinson's, because they have a short lifespan and reproduce quickly, and they can be easily genetically manipulated. In this experiment, the Parkinson's model DDP1 *C. elegans* are used because they have a reduced lifespan, and an overexpression of the alpha-synuclein protein. I used medicinal plants used by the Lumbee tribe. The Lumbee tribe has an extensive history of plants they use for medicinal purposes which have not been thoroughly studied, so in pursuit of more ways to treat serious disorders, such as Parkinson's, in depth research is needed. We used a mild heat shock as a cellular stressor, and then followed it by feeding one group an extract of a Lumbee plant- *Pseudognaphalium obtusifolium* or rabbit tobacco. The other group was fed vehicle control. I scored the worms for lifespan, marking the number dead each day as a measurement of survival. This is an ongoing study that still has yet to be completed, so the results are still pending. The hope is for rabbit tobacco to provide a prolonged lifespan for the *C. elegans*.

40 - Decontamination Study on Honeydew Insects as Part of Inspecting Interspecies Relationships.

Bailey Teale, *Biology**

Mentor: **Lisa Kelly**

Abstract:

When investigating the plants that insects feed upon, we analyze the plant DNA found internally. The surface of specimens can be covered in DNA from surrounding plants. The specimens require surface decontamination to avoid contamination of the internal plant DNA. We are looking to standardize our practice as there are several ways to decontaminate insects. Commercial bleach is a common decontaminant but there are different approaches regarding concentration. First, we sorted and selected our specimens – honeydew insects from sites we are investigating. Next step was washing the insects in our three different bleach concentrations following the protocol we created. The insects were washed in SDS, and the insects and SDS washes were stored. We then extracted DNA

from the samples for analysis. We plan on amplifying our DNA extracts by way of PCR. Those extracts will then be purified, and the samples will be sent to a commercial lab for Sanger Sequencing. Once we have the results, we can compare the different bleach concentration treatments. From that we can draw a conclusion as far as what is the best concentration to use moving forward. To improve the study, we could have purposefully contaminated the insects prior to the decontamination process to get a better understanding of the efficacy. This study is important for its applications as part of researching the plants that insects feed upon and the relationships between insects and their host plants.

41 - **Synthesis and Isolation of β -cis-Dichlorobis(2-ampy)-cobalt(III)chloride**

Ailee Trombley, *Chemistry & Physics*

Mentor: **Mark McClure**,

Abstract:

The purpose of this experiment was to synthesize, isolate, and identify a sample of β -cis-Dichlorobis(2-ampy)-cobalt(III)chloride. The compound was synthesized and isolated by successive extraction and then identified by utilizing C-13 NMR. A pure sample of β -cis-Dichlorobis(2-ampy)-cobalt(III)chloride was produced, with an NMR showing a total of eight peaks within the aromatic region. Two-dimensional NMR was used to partially assign signals.

42 - **Hypericum Species in North Carolina**

Savannah Watkins, *Biology*

Mentor: **Lisa Kelly**

Abstract:

Studying the relationships between the Hypericum species in North Carolina shows how different each species is from just a simple change in gene expression. The Hypericum species has a broad range of species that we were able to research. In the lab, we studied five species that included Hypericum galioides, gentianoides, gymnanthum, hypericoides, and mutilum. Using PCR, we were able to amplify the rbcL gene of the five different species of Hypericum. With the software MEGA, we were able to conduct this study while also using BLAST for searches of the different Hypericum species. Then, using the NCBI's GenBank, we can locate the rbcL gene of the other four species of Hypericum. When looking at the results, between the Hypericum hypericoides and the H. nudiflorum it was an equal percentage of 83%. These two Hypericums were more than the other two (H. microdepalum and H. tetrapetalum) with a percentage of 79% reliability. The results provide a hypothesis that these species are closely related. To improve the study, we could do more experiments of other species to analyze their genes to determine the reliability of related species. Investigating these species provides more information of the relationship between the different Hypericum species in the native habitat of North Carolina.

Exhibits

- Processing Childhood Trauma Through Art Making, Paper Dolls

Melanie Banks-Scrudder, Art
Mentor: **Carla Rokes**

Abstract:

The series Paper Dolls is a group of four drawings of my memories. I have named each piece after streets I lived on in my childhood. Paper dolls are significant to me because creating and playing with them, in lieu of more expensive mainstream toys, was one of my favorite past times as a child. Throw away toys, like the paper dolls in my art series are a representation of the brevity of moments and the fragility of familial relationships in turmoil. I chose my concept to help heal from past traumas. I found that being forced to reach through the depths of my mind to recall my memories caused me to truthfully reflect on my despair. My pain gave me inspiration to create a visual diary of sorts. Looking inward made me become cognitively aware of my life circumstances and gave me profound comprehension of my experiences and personal truths. This series has helped to allow my pain to go through me untethered so that I may be fully immersed in my past. In quiet contemplation during my art making process, I realize that my parents did and do love me but they did not fully understand how to love appropriately. I feel that my creations are relevant to others and may help heal those with similar conditions and home environments. The viewer may examine my work with a greater understanding of their own tribulations. Life is fleeting. The realization of this should not allow us to focus on and live in constant pain of antiquated hurts, but should motivate us to move forward in hopes of more prosperous and joyful futures. It is my hope that my work initiates a healing process to others who have battled abuse and misfortune.

- Creative explorations into scientific botanical illustrations with printmaking

Laura Moser, Art
Mentor: **Brandon Sanderson, Adam Walls, and Beata Niedzialkowska**

Abstract:

Printmaking opened a portal to a new world of possibilities for my artwork and unique creative mind, experimentation and possibilities never end. My intention will be to create a series of works that marry art and science together through scientific botanical illustrations, while exploring the many mediums printmaking offers. The narrative of these works remain primary, these illustrations represents resilience, growth, culture, strength and perseverance to be an artist in this generation while also being an indigenous woman of science going through the cycles of life. Printmaking techniques used will be etching, plexiglass, woodcuts, linocut including screen printing. Throughout the process for this project i would like to enhance my creative technical skills within a variety of printmaking

mediums while researching new pathways into botanical Illustrations , plant and insect species, including new methods for printmaking.

- **Personification of Blobs**

Aly Horn, Art

Mentor: **Brandon Sanderson**

Abstract:

Something I have been very interested in are the simple ways that many people will personify non human creatures or even objects. A very common idea is when people attribute human emotions or actions to their pets, this is just a simple example. For the specific set of works, there are these blob creatures that can emote similar to humans and have relationships akin to what people have as well. With something so simple in appearance, I wanted to explore the limits at which people can relate so closely to these blob creatures. Another thing I wanted to achieve was creating something simple that is able to evoke some sense of enjoyment especially with how low its been with recent turmoil in politics and society generally.

- **Nature**

Shannondoah Lowery, Art

Mentor: **Brandon Sanderson**

Abstract:

Plants and animals shows how beautifully and sometimes deadly nature can be. The meaning behind my pieces is to show just that. The beauty and danger of nature. The process is drawing on woodblock, carving that woodblock, and then printing it. Sometimes it may take more than one woodblock.

- **The Cycle of Life**

Donique McLaurin, Art

Mentor: **Carla Rokes**

Abstract:

This is an assignment I had in Advanced drawing 1. This drawing combines contour line, selective value, and solid shapes in silhouette forms. My process includes mixed media layering techniques and combines Graphite, acrylic paint, ink wash, pen, prisma colors and markers. This drawing is about the death of my brother on May 1, of 2015 . I was 14 and this had a significant impact on me. The drawing contains three different clocks to represent the different times of his life: the time he was born, the time he lived, and the time he passed. The grim reaper is supposed to represent death letting time wait for no one. He was 16 when he passed away.

- **Transform**

Alcenia Purnell, Art

Mentor: **Carla Rokes**

Abstract:

This mixed media drawing was inspired by the artwork of Tomasz Mro, a portrait artist who works in digital and traditional mediums such as watercolor, gouache, graphite, and ink. This self-portrait includes my spirit animal, a dragonfly, which symbolizes my journey into and preparation for adulthood. My drawing combines modeled areas of value juxtaposed with monochromatic texture and includes graphite pencils, micron pen, white gel pen, acrylic paint, and gouache.

- **Exploring Screen Printing for Artistic Style and Narrative**

Leeanna Earp, Art

Mentor: **Brandon Sanderson**

Abstract:

As an undergraduate at UNC Pembroke, I have worked with many forms of art in the studio track. My main concentration is printmaking; however, I also enjoy drawing, sculpture, digital art, and painting. Through taking the highest-level courses in printmaking at UNC Pembroke, I have evolved as an artist and am always searching for what is next. Within these classes, I discovered my fascination for screen printing. This style of printmaking resonates with both my art style and creative process, and, as I entered my last academic year at UNC Pembroke, I found myself more and more interested in the practice of screen printing. My goal for this creative research opportunity was to set up a functional at-home studio for me to be able to continue creating artwork after graduation, expand my professional portfolio, and explore symbolic narratives of characters. My research focused on visual storytelling and character design through experimenting with printing and drawing techniques. In June 2021, I was able to purchase screen printing equipment and create 4 editions of 10 prints each. As an emerging artist and printmaker, I had very little accessibility to the appropriate supplies needed for such a medium, and this extracurricular opportunity helped me reach this level of accessibility.

- **Amazon Apocalypse**

Tina Wilson, Art

Mentor: **Brandon Sanderson**

Abstract:

This exploration of printmaking involves relief carving onto woodblock. The use of multiple carving and cutting tools create varying line weights and textures to create a range of

values within an environment. This combination of textures and lines exhibit movement, dimension and contrast when printed onto paper.

- **Exploring Aquatic Themes Through Intaligo**

Sabrina Doan, Art

Mentor: **Brandon Sanderson**

Abstract:

The expressiveness of aquatic creatures has always interested me due to the amount of personality each one can display non-verbally. Through several processes of etching, I've created a series of prints exploring these personalities. Supplemental techniques such as chine collé and collaging provided me with experimentation in colors and texture.

Furthermore, the addition of a narrative and the use of a character allowed me to explore several themes in depth.

Oral

- Faraday Rotation in Air and the Dispersion of its Verdet Constant

Terry Chavez, Chemistry & Physics

Mentor: **William Brandon**

Abstract:

On account of the weak circular birefringent response to axial magnetic fields, and hence low values of the Verdet constants, only a few research groups have successfully measured non-resonant Faraday Rotation, and its dispersion, in diamagnetic gases. In contrast to the laborious experiments employed by those researchers, we used a straightforward technique resulting in accurate measurements of the Faraday rotation in air. Our method combines brute force and finesse. The former by combining a nominal 15 ampere RMS current at 85 Hz to produce an AC magnetic field intensity of 240 gauss over a 60 cm length, the latter by utilizing an optical bridge and differential phase sensitive detection. The accuracy of the values we obtained for the Verdet constant of air, V_{air} , at a dozen wavelengths ranging from 405-800 nm are firmly supported by directly calculating the dispersion of Verdet constant in air as a weighted mixture, $V_{air} = (0.7809 V_{N2} + 0.2095 V_{O2})$, based on previous data.

- Integrin inhibitor attenuates synaptotoxic pathogenic cascade following paraoxon exposure in hippocampal explants.

Jared Tuton, Biology

Mentor: **Ben Bahr**

Abstract:

Acute exposure to an acetylcholinesterase inhibitor of the Organophosphate (OP) leads to a cholinergic crisis, resulting in associated excitotoxic injuries (e.g. seizure pathology), an increased risk in developing long-term neurological problems, and potentially death. Understanding the synaptotoxic profile of OPs is vital for public health and long-term treatment strategies. Distinct OP-mediated synaptopathology has been described (Farizatto et al. 2017 J Mol Neurosci 63:115; Farizatto et al. 2019 Sci Rep.9:6532), with the latter study identifying an involvement by integrin-type adhesion responses. Here, long-term hippocampal explants were exposed to the OP toxin paraoxon (Pxn) to decipher if the induced synaptic vulnerability is influenced by integrins, using the $\beta 1$ -integrin inhibitor (BIO 5192). Synaptic changes were assessed by immunoblot, immunohistochemistry, and correlational analyses. Pxn exposure caused a dramatic loss of pre- and postsynaptic staining among neuropilar dendrites, occurring in conjunction with abnormal induction of adhesion responses through the $\beta 1$ integrin. An increase in $\beta 1$ integrins was evident across the hippocampal dendritic fields. Interestingly, the distinctive adhesion response was mediated solely by the $\beta 1$ -type integrin family when assessed in parallel with neurexin and

NCAM. Additionally, the synaptic compromise observed in Pxn-exposed explants was not exhibited after the application of the β 1-integrin inhibitor, suggesting that blocking β 1 integrin signaling attenuates the unique synaptotoxicity mediated by Pxn. These findings postulate that integrins strongly influences synaptic integrity and maintenance during a cholinergic crisis.

- The Utilization of T-shaped Mazes to Examine the Effect of Rabbit Tobacco on Memory in *Caenorhabditis elegans*

Ashton Tillett, Biology

Mentor: **Courtney Alexander**

Abstract:

Memory is essential for the survival of humanity because it is how we accumulate knowledge, nurture intimate relationships, and articulate our personalities. Unfortunately, loss of memory is common in people who suffer from neurodegenerative diseases. Rabbit tobacco as a deterrent of memory loss in this experiment is ideal as it is a plant that is commonly found in North Carolina, and it has rich anti-inflammatory and antioxidative properties. *C. elegans* is an ideal model organism for this experiment because much genetic information is available in its simple nervous system. In addition, they display evidence of associative learning based on chemotactic behavior towards water-soluble chemoattractants such as Butanone. The purpose of the experiment was to test the hypotheses: the memory value for the worms starved in rabbit tobacco extract is higher than that of the worms starved in the absence of rabbit tobacco as demonstrated by their migration through T-shaped mazes. The worms were starve -conditioned, placed at one end of the maze and recorded as they migrated to either of the poles. This was done initially for naïve worms and then for starve-conditioned worms. The worms were left at the pole momentarily and then transferred to a new T-shaped maze free of food or external stimuli. This aimed to assess the accumulation of knowledge during the previous step. The memory indices of the worms starved in the absence and presence of rabbit tobacco were then compared.

Performance

- Consonant Music by Jack Veas

Phillip Brown, *Music*

Brandon Womack, *Music*

Mentor: **Joseph Van Hassel**

Abstract:

The piece we are performing has 3 sections. The first requires the other performers to first read a selected text along with the performance notes simultaneously. The next section has myself with the other performers reading from the text but taking out 9 consonants and replacing them with percussion instruments. B's are replaced with a bongo. C's with Castanets. F's with an Afuche. G's with an almglocken. H's with a shaker. L's with Sleigh Bells. M's with a snare drum played by a brush. S's with a hi hat. V's with a guiro. In the third section we're playing the instruments in the same way but without reading the text. The piece was performed at a percussion convention where the theme of the concert was "Music for Percussion and Voice."

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



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

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

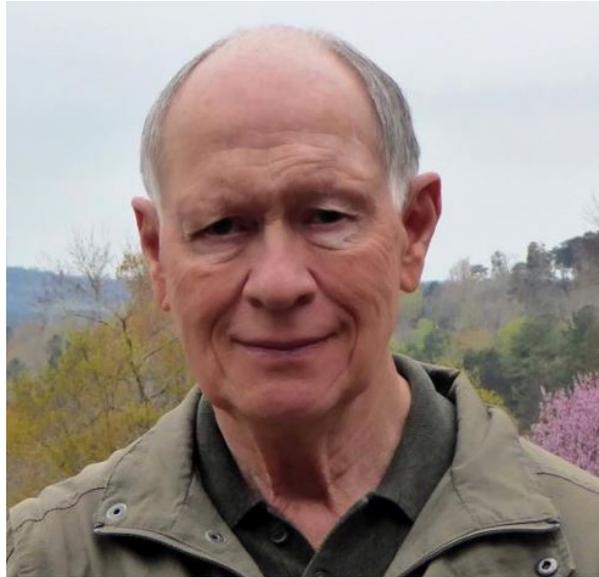
Dr. Ritter began his career at UNC Pembroke in 1996 after graduating from the State University of New York at Buffalo (SUNY Buffalo) with a Ph.D. in condensed matter physics. From 2002 – 2014 he led a multidisciplinary, multi-University microgravity research team known as the “Weightless Lumbees.” This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

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

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

Dr. Charles Humphrey Undergraduate Conference Travel Award

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



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

For the past two years due to COVID restrictions we were unable to award student travel. However, this year we are happy to report that the Dr. Charles Humphrey Undergraduate Conference Travel Award has helped one student attend a conference. This year Jazmine Borden received the award under the mentorship of Dr. Ashley Allen.

Of her travel award and experience, Jazmine Borden writes, "I would like to express my gratitude to Dr. Charles Humphrey for his travel award. This award allowed me to attend the 2022 Society of Personality and Social Psychology Annual Conference in San Francisco, CA. At the conference, I presented my poster *Judgment Free-Zone: How Self-Compassionate People perceive Judgment in Others*. This conference presentation was my first experience presenting my work in an academic setting. I will be attending graduate school for Forensic Psychology in the fall and having this experience of presenting at a national conference has made me more confident and competitive as a higher education applicant. This experience also helped me feel more equipped to handle similar experiences and challenges that await me after graduation.



PURC Council is proud to announce Undergraduate Research Mentor Awardee – Dr. Maria Santisteban

Dr. Santisteban is a Professor in the Biology Department at the University of North Carolina at Pembroke, an institution she joined as Assistant Professor in 2007. She teaches Microbiology, Cell Biology, Molecular Biology, and Genomics. Dr. Santisteban, a native of Spain, earned her B.S. in Biochemistry from the University of the Basque Country. She then went to the Université Joseph Fourier in France where she completed her DEA (Diplome d'Études Approfondies, the equivalent of a Masters) and her PhD in Cellular Biology. Under the supervision of Gérald Brugal she worked on the chromatin structure/function relationship using image cytometry methods. For her postdoctoral studies, Dr. Santisteban went to Dr. Mitchell Smith's laboratory in the Microbiology Department at the University of Virginia, working in the field of Yeast Molecular Genetics. She became an Assistant Professor of Research at the same institution and remained there till her appointment at UNC Pembroke. Dr. Santisteban continues to work with the yeast *Saccharomyces cerevisiae* as a model organism. Her research focuses on the role the histone H2A.Z variant in regulating gene expression, and she involves undergraduate students in her research.

Dr. Santisteban is the PI of the COMPASS (Creating Opportunities for Students in Science) program, an NSF funded Scholarships in STEM program, which seeks to improve the education of future STEM workers, and to generate knowledge about academic success, retention, graduation, and academic/career pathways of low-income students. The first phase of the program run from 2014 to 2019 and provided financial, academic, and career support, and very importantly created a community of scholars and faculty that continues today. The program is currently in its second cycle (2020-2025). Dr. Santisteban has served in various roles within the North Carolina Academy of Science since she joined in 2008. Notably, she was president of Academy in 2016-2017 and is currently chair of the Annual Meeting committee. She also serves as district director (region IV) of the NC Student Academy of Science (6th-12th grade) and organizes the district competitions. She has served as a reviewer in various NSF panels and judged several student competitions at regional and national conferences, including the Regeneron International Science and Engineering Fair (ISEF).

Dr. Santisteban promotes and participates in initiatives that aim to bring research in the undergraduate classroom. She, and a group of colleagues, founded “CRISPR in the classroom” project whose objective is to create a national network of biology educators at both two- and four-year institutions dedicated to the development and implementation of laboratory activities centered on CRISPR-Cas technology. She was a member of the GCAT (Genome Consortium for Active Teaching) and served in the years 2012-2014 as a member of the GCAT advisory board, whose mission was to recruit faculty from minority serving institutions for the synthetic biology NSF funded summer workshops. Since 2012, she also has been a member of the Genomics Education Partnership (GEP), a nationwide community of faculty from more than 100 colleges and universities dedicated to facilitating equity in undergraduate biology education by introducing bioinformatics in general and genomics in particular into the undergraduate curriculum, while providing students with a research experience. Dr. Santisteban is currently serving as Chair of the Curriculum Committee where she assists with identifying new GEP curriculum needs, maintaining current curriculum, and developing new items. She is also director of the GEP’s Carolinas Regional Node.

The Undergraduate Research Mentor award recognizes individuals who make significant contributions to forwarding undergraduate research, creative scholarship, and entrepreneurial scholarship. This award recognizes demonstrated excellence in supporting undergraduate researchers, encouraging mentoring relationships with undergraduate students, and conveying the campus' high regard for contributions made by the academic and research community at UNC-Pembroke, particularly if a mentor supports and influences students’ educational and career paths. Exemplary mentors can demonstrate continued success in helping students produce tangible results that may include peer-reviewed publications; student presentations, awards, or scholarships. Excellent undergraduate mentors support students through their availability, attentiveness, encouragement, and understanding. In many disciplines, this mentoring is done by faculty, staff, postdoctoral researchers, and graduate students. The award recipient is recognized annually at the PURC Symposium and the Faculty Awards Dinner.

PURC Council is proud to announce Undergraduate Research Mentor Awardee – Dr. Jamie Mize



Dr. Jamie Mize is an Assistant Professor of History and American Indian Studies where she teaches courses on American Indian history. She became program director for the Pembroke Mellon REACH Program in January of 2020, and since then, has worked with a number of students across a variety of majors. In addition to serving as program director, Dr. Mize has had the honor of mentoring two REACH Fellows as they worked on American Indian history projects.

As REACH’s director, Mize provides “programming that represents the weight our campus lends to contributions made by the academic and research community. The guest speakers Mize brings to campus are available to the whole UNCP community, but they also help REACH fellows develop as

thinkers, researchers, and writers because meeting intellectuals from underrepresented communities helps build a sense of possibility and belonging” praises Dr. Ryan K. Anderson.

2022 Pembroke Undergraduate Research and Creativity Council

Council Membership 2021-2022

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

Dr. Jaeyoon Kim, Professor of Music

Dr. Maria Santisteban, Professor of Biology

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

Dr. Renee Lamphere, Associate Professor of Criminal Justice

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

Dr. Xinyan Shi, Professor of Economics/Decision Sciences

Dr. Zachary Laminack, Assistant Professor of English

*Co-authors for (#40) Decontamination Study on Honeydew Insects as Part of Inspecting Interspecies Relationships, include: **Kinsley Adams**, *Biology*; and **Hunter Ivey**, *Biology*



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