

Fourteenth Annual
UNC Pembroke
Undergraduate Research and Creativity Symposium



Program with Abstracts

Pembroke Undergraduate Research and
Creativity (PURC) Center



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Dear Students and Colleagues:

The UNC Pembroke Undergraduate Research and Creativity center staff and our PURC Advisory Council members were eagerly looking forward to hosting the 14th Annual PURC Symposium this past April 7th. Unfortunately, the need to assure the safety and health of our students, staff, faculty, and the public, in the face of the Covid-19 pandemic meant that event could not move forward as planned. With heavy hearts, the PURC Council made a decision to move the Symposium to a virtual space.

We wanted to allow students and their faculty mentors the time, freedom, and support that would allow as many students as possible to share their important research and creativity projects with the public. With that in mind, the deadlines were extended and students were allowed to submit abstracts alone, abstracts with links to formatted posters, and or abstracts with accompanying videos.

We have gathered all submitted materials and present it for your enjoyment and edification here in this online program.

With the assistance of our committed faculty mentors, the dedication of our PURC Advisory Council, the support of the Office of Academic Affairs, the Provost, and the Chancellor, we look forward to next year and a renewal of our more standard symposium event.

For now, we **CONGRATULATE ALL OF OUR STUDENT SCHOLARS** on their successes and their determination.

A handwritten signature in cursive script, appearing to read "Rebecca Bullard-Dillard".

Rebecca Bullard-Dillard, Ph.D.
PURC Director
Professor of Chemistry

PURC provides four types of opportunities for undergraduates interested in pursuing mentored research.

- Student Travel Funds (STF) assist with travel for research, presentation of extracurricular projects or exhibits, meetings, and performances.
- Student Scholarship Support (S3) funds short-term extracurricular research, creative projects, entrepreneurial, and scholarly endeavors.
- Semester Undergraduate Research Fellowships (SURF) fund extracurricular research, creative, entrepreneurial, and scholarly endeavors during the academic year.
- For students, especially those developing in the early portion of their career here at UNCP, the Dr. Charles Humphrey Undergraduate Conference Travel Award exists to fund travel to regional conferences.

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NOTE: Abstracts titles in [Blue](#) font are hotlinks to poster or other media file URLs.

Undergraduate Research Mentor Award



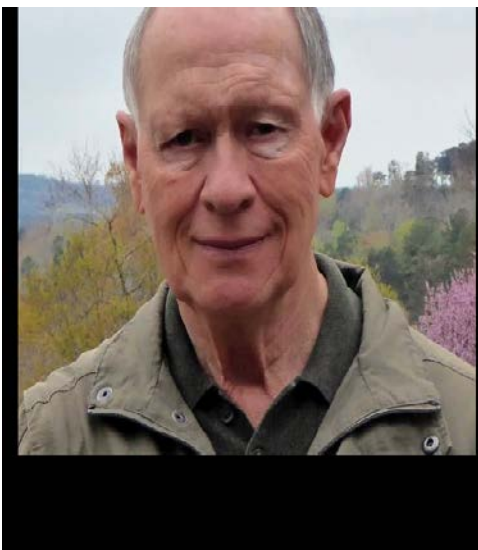
Dr. John Roe
2020 Award Winner

The Pembroke Undergraduate Research and Creativity Center Council is pleased to announce that Dr. John Roe (Biology) has been named the winner of this year's Undergraduate Research Mentor Award. This recognition rewards individuals who make significant contributions to forwarding undergraduate research, creative scholarship, and entrepreneurial scholarship. It highlights 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.

Dr. Roe is a herpetologist whose research focuses on the ecology of box turtles. During his time at UNCP Dr. Roe has mentored 31 undergraduate student researchers of whom nine have gone on to study in graduate programs . Among his numerous peer-reviewed publications, he has published five with student co-authors. To quote one of his former students: "The relationships he cultivates with his students reverberate in their personal and professional lives..." Please join us in congratulating Dr. Roe as we recognize his commitment to engaging and motivating his students.

Travel Award Benefactor:



Dr. Charles Humphrey

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. This year the Dr. Charles Humphrey Undergraduate Conference Travel Award has helped over three dozen students attend conferences with a faculty mentor.

Academic Year 2019-20 Conference attendance made possible thanks to the Dr. Charles Humphrey Undergraduate Conference Travel Award

Hannah Middleton and Regan Lowry, with faculty mentors **Drs. Laura Staal and Claudia Nickolson**, Critical Issue in Education Conference, Seattle, WA. February 15-19. Presentation: *Abandoning the Artificial and Inauthentic in Teacher Education and Attending to "What Really Matters"*.

Olivia Sadler, with faculty mentor **Dr. Scott Hicks**, POD Network Conference, Pittsburgh, PA. November 14-17. *Environmental Attitudes & Knowledge of Collegiate Students & Faculty at the University of North Carolina at Pembroke*

ABSTRACTS

1 - Survivorship in Eastern Box Turtles (*Terrapene carolina carolina*)

Zachery Bayles, *Biology*

Mentor: John Roe

Although Eastern Box turtles are not an endangered species, their populations have been on the decline in recent years. This study aimed to identify variables that could have the greatest impact on survivorship of Eastern Box turtle populations at Lumber River State Park (LRSP) and Weymouth Woods State Park (WEWO). Park managers at WEWO have been utilizing prescribed burns since 1974, whereas LRSP has only been burned once since 2001. We hypothesized that the fire management practices at WEWO would lead to higher turtle mortality. We also expected females to have lower survival than males owing to long-distance nesting migrations, and juveniles to have the lowest survival due to their smaller body size and softer shells. We studied turtles between 2012 and 2018 using the capture-mark-capture method. Encounter and apparent survival probabilities were then estimated and compared using Cormack-Jolly-Seber live-recapture models in the program MARK. As hypothesized, there was a trend for adult males to have higher survival than females, and for juveniles to have the lowest. At LRSP however, model comparisons did not support these overall trends. However, contrary to our hypothesis, LRSP estimates had a significantly lower survival probability than at WEWO. The LRSP estimates also contained a higher degree of uncertainty with a standard error nearly double the standard error for WEWO estimates. The decrease in low survival at LRSP may be due to catastrophic flooding caused by hurricanes Matthew and Florence, as well as a prescribed fire that got out of control in 2017. The differences in survival probability between the two locations may warrant further investigation.

2 - The effects of an urban area on water quality and benthic macroinvertebrate diversity in the Lumbee River

Aalayza Blackshear, *Biology*

Mentor: Amber Rock

Pollution caused by urban runoff can decrease water quality in nearby rivers, which can negatively impact aquatic organisms such as benthic macroinvertebrates. Benthic macroinvertebrates are an important source of food to fish in the Lumbee River, a blackwater river with high levels of tannin leached from decaying wetland plants. This project examined the effects of an urban area (Lumberton, NC) on water quality and benthic macroinvertebrate diversity in the Lumbee River. Three sites were each sampled 5 times between June 2019 and February 2020. These sites were located upstream of Lumberton, downstream of Lumberton, and in Fair Bluff. Water quality indicator data, including dissolved oxygen, temperature, pH, turbidity, and nutrient concentrations, were

recorded at each site. Benthic macroinvertebrates were also collected from each site at each visit. Overall, water quality indicators show no significant effect of the urban area on the Lumbee River. Preliminary data suggest that the majority of the benthic macroinvertebrates found are known to have a high pollution tolerance, which would indicate a highly impacted river. However, some research has suggested that high numbers of these invertebrates may be normal in blackwater rivers such as the Lumbee, therefore more research is needed to better understand the benthic macroinvertebrate community in the Lumbee River.

3 - Genotype-Phenotype Correlations in Parkinson's Disease: Retrospective Analysis of the NIH-PD Cohort

Joshua Cade, *Biology*

Mentor: Derek Narendra

Parkinson's disease (PD) is a neurodegenerative disorder caused by loss of dopaminergic neurons in the Substantia Nigra. Signs include tremor, slowness of movement, stiffness, and imbalance, and often also include non-motor features, such as cognitive decline, decreased sense of smell, and autonomic symptoms. The cause of PD is multifactorial with environment and genetic contributors in most cases (referred to as idiopathic PD); however, it can also be caused by mutations in single genes, some of which have been identified. Specific monogenic causes of PD (e.g., due to mutations in Parkin) often involve an earlier age of onset accompanied by other phenotypic differences such as preserved sense of smell when compared to idiopathic PD. This research project will compare phenotypic features of genetic PD subtypes, including Parkin, GBA, and LRRK2, with that of idiopathic PD. Patient records will be reviewed for standard assessments, such as the UPSIT (The University of Pennsylvania Smell Identification Test), the MOCA (Montreal Cognitive Assessment), and orthostatic vital signs that assess sense of smell, cognitive ability, and autonomic dysfunction, respectively. These findings will be used to establish genotype-phenotype correlations for genetic PD subtypes.

4 - Overuse and Misuse of Antibiotics, their Implications on the Development of Antibiotic Resistant Bacteria and the Current Antibiotic Stewardship Practices to Alleviate the Issue

Brianna Catalano, *Biology*

Mentor: **Marilu Santos**

Antimicrobial resistance and multi-drug resistant bacteria have become a worldwide problem. Research has found that misuse and overuse of antibiotics is the leading cause of antimicrobial resistance. The current misuse and overuse of antibiotics in hospital settings and the implications on the development of antibiotic-resistant bacteria are discussed throughout this paper. Risks of infection and development of antibiotic-resistant bacteria, the human gut microbiota, as well as mobile antibiotic-resistant genes are explored. This paper will also review current antibiotic stewardship practices, as well as suggest ways to decrease the antimicrobial-resistance problem.

5 - Updated Methods for Isolating RNA from Cell Free Saliva

Tyler Cox, *Biology*

Mentors: **Crystal Walline and Ashley Allen**

Saliva is a watery liquid containing electrolytes and organic molecules, secreted by salivary glands, to lubricate the mouth and aid in mastication and swallowing. Secreted proteins with immune, endocrine, or other biological functions can be quantified from saliva. Further, the protein template, or coding RNA (mRNA), and regulatory, non-coding RNA (ncRNA) can be detected in saliva using high-throughput RNA sequencing (RNA-seq). Despite the advantage of non-invasive sampling, saliva is an underutilized source of biomarkers for disease diagnosis and monitoring. A significant drawback is that RNA is highly unstable and subject to rapid degradation from nucleases. Therefore, the goal of our research is to develop and validate methods for isolating high-quality RNA transcripts from saliva for RNA-seq. In the future, reliable methods for quantifying RNA transcripts may have diagnostic or therapeutic potential.

[6 - Potential of Biochar, as a Substitute for Perlite in Soilless Media, for the Growth and Production of Southern Highbush Blueberry](#)

Samantha Cranford, *Biology*

Mentors: **Bryan Sales, Maria Pereira**

Blueberry is a long-lived perennial crop that prefers a soil with a high amount of organic matter and a pH between 4.5-5.5. Container production using soilless substrates are a relatively new approach with increasing interest in recent years. Commercial soilless medias often contain perlite and peat moss, both of which are finite resources, and not considered sustainable. Biochar, a charcoal produced from C bearing compounds, has proven to be a sustainable alternative to both perlite and peat moss in the production of wheat, lettuce, onion, and radishes. A 12-week greenhouse experiment will be performed to evaluate the use of biochar, as a substitute for peat moss and perlite in soilless media. However, the high pH (8.0-10.0) of biochar could pose a potential risk for blueberry growth.

7 - Taking a Closer Look at the Disturbed Human Gut Microbiome: A Study of the Interplay between *E. faecalis* and variant *E. coli* Mutants.

Tyra Critchley, *Biology*
Mentor: **Rachel Bleich**

This research project aims to identify the interplay between various *E. coli* strains (isolated from mice) and *E. faecalis* both of which play crucial roles in the human gut microbiome. *E. faecalis* is able to drive inflammation in the gut microbiome (Lengfelder, et al. 2019). The mice isolated *E. coli* that I am working with is being compared to the results of clinical strains of *E. coli* as the project goes on. We know due to Dr. Bleich's sequencing work that more *E. coli* in the mouse model gut microbiome leads to more *E. faecalis* (Keogh, Damien, et al. 2016), but the question is: if there is more *E. faecalis* present will it lead to more *E. Coli*? We also know from other studies as well as Dr. Bleich's sequencing data, that L-Ornithine production from *E. faecalis* can act as signaling molecule to increase expression of siderophores (molecules that scavenge and acquire metal) in *E. Coli*. We also know the morphologies can change based on genetic and environmental cues, we observed mixed cultures, and chelated metal agar grown bacteria. Overall, this work is intended to help understand and aid in the treatment of Inflammatory Bowel Diseases in the human gut microbiome such as Crohn's Disease and Ulcerative Colitis. Both of which cause chronic or returning inflammation in the lining of the GI tract and may result in scarring, obstructions, ulcers, fistulas, malnutrition, blood clots and increased risk of colon cancer. It has been found that *E. faecalis* can trigger IBD and is a very prominent microbe found in those with IBD (Zhou, Youlian, et. al. 2016).

8 - SET2 mutation: A potential suppressor for the *htz1*^Δ*rpb2-2* dominant synthetic lethal phenotype

Jessica Dean, *Biology*
Erica Baynard, *Biology*
Mentor: **Maria Santisteban**

H2A.Z is a highly conserved histone variant among eukaryotes and in *Saccharomyces cerevisiae* is encoded by the HTZ1 gene. Earlier research showed that a deletion of HTZ1 in *S. cerevisiae* did not relieve the requirement for the SNF/SWI nucleosome remodeling complex during transcription; suggesting a role for H2A.Z in transcription. We have since focused our efforts on understanding the mechanism of H2A.Z in transcription regulation. Central to our investigations has been a double mutant between an *htz1* null and a mutation in the gene encoding the second largest subunit of RNA pol II, RPB2-2. The *htz1*^Δ*rpb2-2* double mutant has a dominant synthetic lethal phenotype, meaning that either mutation is viable individually but lethal when combined *htz1*^Δ*rpb2-2* double mutants are dead even in the presence of wild-type RPB2. One possible interpretation is that in the absence of Htz1, the template-bound mutant Rpb2-2 blocks the ability of wild-type polymerase to transcribe. This blockage could occur at almost any step in the transcription process after polymerase recruitment. Interestingly, other researchers have described that in a similar way, *rpb2-10*, an arrest prone polymerase mutant in vitro,

became dominant in the absence of DST1, the gene encoding the SII elongation factor (Lennon et al. 1998). This parallelism made us hypothesized that Htz1 could have a more specific role in transcription elongation. A yeast genome library screening revealed SET2 as a potential suppressor of the *htz1* Δ *trpb2-2* dominant synthetic lethal phenotype and is consistent the hypothesis of a role for Htz1 in transcription elongation as Set2 mediated methylation is involved in suppressing histone exchange.

9 - Examination of Pollinator Gardens in Regard to Combating Decline of Local Bee Populations

Cody Eubanks, *Biology*

Mentor: **Kaitlin Campbell**

Pollinating organisms such as bees comprise an essential ecosystem service inimitable to humanity and mark substantial contributions to our national economy. However, current bee populations continuously face anthropogenic threats such as industrial agricultural practices, habitat fragmentation, and introduction of invasive species and disease, and we are currently witnessing declining pollinator populations. Methods employed to combat population declines among bee species include managing pollinator habitats. To test the role of habitat enhancement on bee communities, two pollinator gardens were established. Over two summers, we sampled these gardens and the adjacent lawn using colored bowl traps for four periods. We also netted bees at these sites twice during each period and noted what flower the bee was visiting. The abundance of bees, flowers, and flower diversity were compared. We hypothesized that habitats with pollinator gardens provide more resources and more diverse floral types which attracts more specialist species, increasing diversity. A total of 939 bees, comprising more than 43 species, were collected across the two sampling locations. Average bee abundance was lower in the lawn areas than the gardens. Floral abundance was higher in the garden at the UNCP site, but lower in the RCC site, however, flower species diversity was higher in the garden at both sites. Pollinator gardens promote bee abundance, by providing abundant and diverse floral resources suggesting it as an effective method for bee and insect conservation.

10 - Testing effects of a biochar blend on container-grown Albion strawberries under greenhouse conditions.

Melanie Handley, *Biology*
Mentor: **Maria Pereira**

Biochar as a soil amendment seems, in a majority of studies, to affect the physical and chemical properties of container substrates. These properties include bulk density, total porosity, container capacity, nutrient availability, pH, electrical conductivity and cation exchange capacity. Biochar has also been shown to affect soil microbiota. Several studies have also conveyed the ability of biochar to trigger defense-related genes in plants, which aid the plants in disease suppression. Because of the potential benefits of biochar in agriculture and nurseries, this study was aimed at analyzing any effects of a biochar blend on the growth and flowering of container-grown strawberries. This study was divided into two separate experiments, both using everbearing bare root Albion strawberries (*Fragaria x ananassa* "Albion"). The first experiment tested the effects of varying percentages of a biochar blend on container-grown Albion strawberries in greenhouse conditions. The second experiment also tested the effects of the biochar blend on container-grown Albion strawberry plants, but in field conditions. Results so far seem to indicate on average that higher percentages of biochar in both greenhouse and field conditions result in smaller plants and less flowers. The flowering and size of the control plants were higher and more consistent on average as well. This could be because of excess moisture, an overload of nutrients, and/or pathogens from the biochar blend.

11 - Comparison of Native Bee and Honeybee Floral Preferences for Pollinator Conservation

Brandon Herron, *Biology*
Mentor: **Kaitlin Campbell**

Many flowering plants rely upon bees for pollination. The Honeybee was introduced for crop pollination, but native bees are important for native plant communities. Our study tested if large social bees (honeybees and bumblebees) and solitary bees differ in their floral preferences. We hypothesized: 1) honeybees coevolved with European species, therefore, their floral preference will be for European flowers, 2) bee size corresponds to flower size due to weight constraints, competition-based resource partitioning, and resource quantity, and 3) the most abundant flower species attracts more pollinators. Bees were collected in four periods over two years: May-July, 2018 and 2019. A total of 459 female bees (33 species) from 52 flower species were collected. White clover and Sunflower had the most bee species (22 and 14 species respectively) and supported the greatest bee abundance. Honeybees and bumblebees were found on only 10 flower varieties, and preferred white clover, glossy privet, and squash, which are all good nectar producers. Native status of plants did not affect visitation by native bee or honeybees nor did the flower size relate to bee size. The most important factor affecting bee richness and abundance is the abundance of floral resources. Recommendations for helping

pollinators often include planting diverse flower gardens, and understanding what flowers cater to which bees is an important first step for pollinator conservation.

12 - Nesting Habits of Native Bees

Macaela Locklear, *Biology*

Mentor: **Rita Hagevik**

Native bees are key pollinators of many native plants and crops. In general, bees are important for environmental stability, as around 75% of non-agriculture plants rely on pollination. UNCP's native bee house project hopes to not only provide housing for some of the native bee species that make our garden their home, but to also understand if we are meeting the nesting needs of existing bee diversity. Hundreds of native bee species nest in hollow reeds and tubes, and they may have preferences for different sizes and materials. We set out over 1000 nest tubes in 4 bee houses and harvested the cocoons for overwintering. There were approximately 100 cocoons (10 species) in 2018 and 477 cocoons (12 species) in 2019. Data from 2018 show that leafcutter bees and various wasp species are the most common residents. Cocoons from 2019 showed that medium paper-based tubes hosted the largest number of species and highest abundance of cocoons compared to other sizes of paper, bamboo, or reed tubes. The data collected in these yearly cocoons censuses can help us further improve the bee houses to make them more habitable for the bees. The improvements made in the future will continue to encourage the diversity of native bee species in our area so that the native environment and plants can continue to thrive.

13 - Native Plant Extracts Improve Stress Resistance in Nematodes

Hannah Mariani, *Biology*

Mentor: **Courtney Carroll**

Caenorhabditis elegans (*C. elegans*) is a key organism in the study of eukaryotic cell functions and interactions, host-parasite interaction, and evolution. This is due to the small size, rapid cycle of life, transparency, and well-annotated genome. *C. elegans* are a species that self-fertilize. Grown on plates that hold a lawn with bacteria, *C. elegans* consume the bacteria and use their stock of fat. Hunger in *C. elegans* contributes to the modification of small RNA containing metabolic genes. To explore nutrition genes, we exposed the worms to extreme heat conditions and allowed them to recover in various tea extracts. Upon doing this, we recorded the worm's life rate, paying close attention to their motility. The purpose of this research is to examine the effects of tea extract and heat shock on *C. elegans* motility and lifespan. If we expose the worms to heat shock, then adding a favorable tea extract will slow the rate of death.

14 - Exploring plant food preferences of invasive fire ants (*Solenopsis invicta*) in wetlands

Shamon Mercier, *Biology*
Mentor: **Lisa Kelly**

In this study, we extracted DNA from invasive fire ants to analyze their most abundant plant food. These fire ants are from a Carolina bay, which is a nature preserve, and there is concern that these ants are affecting food webs and rare species of animals in this ecosystem. I am generating the nucleotide sequences by way of Sanger sequencing. The sequences will be submitted to a database online to look for matches (BLAST searches) to plant species. We amplified the ITS2 gene using the Uniplant F (Forward) and R (Reverse) primers. We are using these primers because they are able to amplify tiny fragments of DNA. The data presented in this study will advance our understanding of the diets of invasive fire ants in wetlands.

15 - Effects of agricultural pollution on water quality and benthic macroinvertebrate diversity in the Lumbee River

Matthew Moore, *Biology*
Mentor: **Amber Rock**

The goal of this project was to examine how agricultural runoff affects the water quality and diversity of benthic macroinvertebrates in the Lumbee River. Physical and chemical factors such as pH, dissolved oxygen, turbidity, and nutrient concentrations can be used to determine overall water quality. Measuring the diversity of benthic macroinvertebrates in a river also provides an indication of water quality, as some species are more tolerant to pollution and decreased water quality than others. Fertilizer usage associated with agriculture can lead to runoff of nitrogen and phosphorus into rivers, and excess nutrients can decrease water quality. We sampled three sites along the Lumbee River, one upstream reference site and two sites located in areas with heavy row-crop agriculture land use (Ag. 1 and Ag. 2). Each site was sampled five times between June 2019 and February 2020. We predicted that the sites Ag.1 and Ag.2 would have higher concentrations of phosphorus and nitrogen and would show decreased benthic macroinvertebrate diversity. Preliminary data indicate an increase in diversity of benthic macroinvertebrates at sites Ag.1 and Ag. 2, and a decrease at the upstream site. We also found no significant differences in water quality variables across sites. Together, these data suggest that the Lumbee River is not strongly impacted by agricultural runoff.

16 - Continuous Biodiesel Production II: Purification Via Silica Gel Columns

Yaqot Nasser, *Biology*

Savannah Chappell, *Chemistry and Physics*

Lauren Bostick, *Biology*

Maya Grimes, *Biology*

Mentor: **Sivandane Mandjiny and Steven Singletary**

Many different processes have been investigated to produce biodiesel from various triglyceride feedstocks. Both batch reactions and continuous flow processes have been developed in an effort to lower the production costs of biodiesel to make it competitive with diesel fuel derived from crude oil. All production methods currently produce a mixture of biodiesel, catalyst and unreacted oil feed stock that must be purified before the fuel can be distributed for use. We report the results of a project designed to develop a continuous production cycle for biodiesel. This work focuses on the purification of the mixture as it exits the trans-esterification process. Current methods rely on a density-driven process in large settling tanks. While effective, this step in the biodiesel production process adds significant time as the mixture separate and tanks are emptied and cleaned before a new batch can be processed. Purification in this work is accomplished by forcing the mixture through a silica-gel column via a pressure differential. Column height and diameter, flow rates and pressure differentials are varied in order to achieve a continuous purification as the mixture exits the trans-esterification process.

17 - Linking Water Quality, Nutrient Concentrations, and Microbial Diversity in the Lumber River

Johnathan Oxendine, *Biology*

Mentor: **Conner Sandefur**

Water quality is a byproduct of biodiversity. The Lumber River is a blackwater river in southeastern North Carolina that is at risk for poor water quality due in part to agricultural runoff and big rain events such as Hurricanes Matthew and Florence. To assess Lumber River water quality, water samples were collected from six locations along the river's path through North Carolina. Each water sample was filtered to collect cells and DNA was extracted from these cells. Next-generation sequencing libraries on these DNA samples are under preparation. Once sequencing libraries are sequenced and the data are analyzed, we hope to achieve a better understanding of the diversity of microorganisms in the Lumber River, which will, in turn, provide necessary information about the water quality of the Lumber River.

18 - Light preference for night active insects

Jazlyn Pointer, *Biology*

Mentor: **Erika Young**

While fluorescent bulbs are commonly used for illumination, many insects are attracted to the light emitted. Numerous experiments have shown that nocturnal insects are most attracted to lights that emit large amounts of ultraviolet radiation, such as fluorescent lightbulbs. Insects are also attracted to black lights and are often used by entomologists as light traps. While both lights are known attractants, it has not been fully explored if they both attract the same type or quantity of insects. For this comparison, two white sheets were hung in an area with minimal light pollution. Each sheet had either a black light or fluorescent light angled toward the sheet for one hour. Insects were then collected by hand, aspirator, or net. Sampling took place once every month for the fall and spring. The insects were preserved and identified to species. Preliminary results show that Hemipterans, mainly cicadas and stink bugs, were more attracted to the black light while dipterans were more attracted to the fluorescent light.

19 - Effect of Environmental Factors on Growth Kinetics of Biocontrol Agent *Bacillus thuringiensis* Bacterium using 2L and 5L A+ Sartorius Stedim Biostat®A+ Fermentation Systems

Casey Richardson, *Biology*

Riko Ramos, *Biology*

James Butler, *Biology*

Mentors: **Devang Upadhyay and Leonard Holmes**

Bacillus thuringiensis (Bt) is a soil-dwelling, Gram-positive bacterium that is used as a biological pesticide and used to genetically engineer plants due to the toxic proteins it produces. *B. thuringiensis* was studied in batch cultures to determine the specific growth rates and doubling times. The purpose of this experiment was to research the growth kinetics of *Bacillus thuringiensis* in a 2L bioreactor and a 5L bioreactor containing growth media at different environmental conditions. Fermentation parameters were controlled by utilizing a Sartorius Stedim Biostat®A+ bioreactor system for bacterial growth. The environmental conditions included temperature, agitation, and aeration. The specific growth rates of *B. thuringiensis* were determined. The optimal conditions for the 2L bioreactor were 50 RPM, 30°C, 1.5 VVM, and with the highest specific growth rate 0.2974 h⁻¹ and the lowest doubling time 1.0122 hr. For the 5L bioreactor, the optimal conditions were 150 RPM, 27°C, 1.5 VVM, and with the highest specific growth rate 1.1557 h⁻¹ and the lowest doubling time 0.2605 hr.

20 - Habitat Enhancement: Butterfly Diversity and Floral Use

Mary Thorn, *Biology*

Mentor: **Kaitlin Campbell**

Along with bees, butterflies play a vital role in pollination, a key step in plant reproduction and fruit production. Concerns about pollinator declines have increased interest in enhancing habitats through pollinator plantings. For this study, we asked: What are the possible effects of habitat enhancement, do butterflies show a preference for certain flowers, and how long do butterflies live? We hypothesized that having a wide variety of flowers that bloom throughout the season attracts and provides resources for butterfly visitors encouraging them to remain in the enhanced habitat. For 10 weeks, butterflies were netted, marked, and released once per week for an hour in both the UNCP garden and lawn. After 10 weeks, butterflies continued to be caught and released three times a week for thirty minutes at a time, only in the garden. Data was recorded for the variety of flower being visited by butterflies and weather conditions such as humidity, temperature, wind, UV index and cloud cover. Results show that while weather conditions have no significant effect on the diversity of butterflies, the effect of pollinator plantings (habitat enhancement) has a great influence on the abundance and species richness of butterflies at UNCP. Butterflies also show preference to zinnia, purple coneflower, and gold and bronze coreopsis. Promoting butterfly diversity is important because they are important pollinators and beautiful additions to a garden. People interested in promoting butterfly diversity should plant brightly colored flowers that bloom continuously and produce a lot of nectar, such as zinnia, purple coneflower and gold and bronze coreopsis.

21 - Organic Cucumber Variety Trial for Resistance to Common Pests

Joshua Villa, *Biology*

Mentor: **Kaitlin Campbell**

Using pesticides on crops can harm the environment and non-target organisms, but growers must balance this with controlling destructive pests. Organic growers have limited options for pesticides, but they can use resistant or less attractive varieties instead. The hypotheses were that pest resistant varieties produce the highest marketable crop, that tilled ground reduces pest damage due to less protective debris for pests, and that soil moisture may impact pest levels. We conducted a fully replicated variety trial to determine which of 6 cucumber varieties had highest yield and were most resistant to common cucumber pests when grown under organic conditions, till or no-till, and two soil types. The pests of interest were the striped and spotted cucumber beetles and squash bug. The number of pests and squash bug egg patches on the plants were counted and damaged leaves were quantified. Cucumber production was measured as quantity, grade, and weight. Results showed that Marketmore76 and Calypso had the highest pest resistance, but not the highest yield. Tillage did not have an effect on pest damage or marketable crop yield. Soil type had an effect on pest damage with Rainy Sandy Loam soil having lower damage. The data indicate that low levels of damage may encourage some production, but further research is needed at higher levels. The data and method can help seed producers and farmers determine which crop varieties to use to get the best market yield while having low pest damage.

[22 - Distinct Astrocytic Changes during Synaptopathogenic Events Mediated by Organophosphate Toxicity in Hippocampal explants](#)

Caitlyn Young, *Biology*
Mentor: **Karen Farizatto**

This research focuses on detecting astrocytic alterations to study brain damage after an excitotoxic insult. Astrocytes are the most abundant glial cells in the brain, and strongly contribute to the neutralization of toxins, such as organophosphates (OP). OP are anticholinesterase toxins that include dangerous nerve agents that produce cholinergic crises leading to seizures, memory deficits, and eventually death. OP-induced neurological damage comprises complex pathophysiological signaling mechanisms involving neuron and glial cells. Informative *in vitro* studies investigated the effects of OP and metabolites but do not address cell-type specific effects, such as in astrocytic cells. Pxn-treated tissue elicited a two-fold increase in the density of GFAP-positive cells while synaptic decline occurred in hippocampal dendritic zones. Note, the Pxn effect on synaptic markers was found to be synapse-specific, no changes occurred in the density of neurons assessed by Nissl stain. To further examine Pxn-mediated astrocytic changes, our model showed that the signs of reactive astrocytes also comprises a greater number of branch points, and this event is not due to astrocyte or any other cell-type proliferation. These findings suggest that astrocytes responded to acute Pxn exposure by presenting increased density of GFAP-positive cells, disruption of astrocytic phenotype, and adopted reactive profiling, characteristics of astrocytosis. Studying astrocyte profile during an anticholinesterase model is important to better understand different responses that are linked during synaptic perturbation, allowing to also study how to properly intervene in order to promote synaptic repair.

23 - Cyclical and Volatile: A Look at the U.S Federal Funds Rate

Juanita Borges, *Business*
Mentor: **Lydia Gan**

The federal funds rate is a significant policy factor implemented by the Federal Reserve to stabilize our economy. This paper analyzes the implementation of the U.S. federal funds rate through open market operations and exactly how its volatility during bank reserve requirements is managed. In my research of peer-reviewed articles, I found that this rate is implemented based on the money supply and reaches volatility when reserve requirements are lower than appropriate. The average American is influenced by the federal funds rate whenever they borrow money from the bank such as receiving a mortgage loan. I find that the federal funds rate is an intricate piece of monetary policy in that it impacts inflation to regulate the money held by the public which in-turn affects the reserve-to-deposit ratio banks face.

24 - Economic performance in Latin America in the 2000s: recession, recovery, and resilience?

Ryan Brown, *Business*
Mentor: **Lydia Gan**

The Latin American economic performance from 1980 to 2014 experienced multiple periods of growth, recession, and stability. Throughout the 80s and 90s, the Latin American economy went through a period of debt crisis. By the early 2000s, the economy experienced rapid expansion that continued to grow until 2008. The Latin American economy later experienced a decline in GDP during the Global Financial Crisis. Latin America is affected by other countries' crises on the same scale as the larger countries, causing their slow and unstable growth periods. Latin America's reliance on exports to raise GDP may cause issues in the long run growth of the economy and could present other issues. About 60% of Latin America's exports are raw materials. The number of high-tech exports that were coming from Latin America were negatively affected by the 2009 financial crisis. Surprisingly the income gaps of Latin America in 2014 was the same as the income gap in 1990. Although Latin America was able to make their economy more stable, they were not able to lower the income gap, which could cause issues in the future. During the last two decades, Latin America's top exporters were able to successfully increase their fiscal revenues. Although Latin America has come a long way since the 1980s, they still have a lot of work to do if they want to grow their economy.

25 - Spectrophotometric Analysis of Total Flavonoid and Phenolic Content in Commercially Available Hawthorn Capsules

Nysja Campbell-Small, *Chemistry & Physics*
Mentor: **Meredith Storms**

Hawthorn falls under the genus *Crataegus*, which contains over 100 different species. While each species of the *Crataegus* genus can have different major health benefits, hawthorn is most known for regulating blood pressure and helping with minor heart issues. Research has found that hawthorn may be beneficial in treating heart failure; however, there is not enough data to use it as a main treatment in chronic heart failure. Various brands of hawthorn are on the market with some of the supplements made from *Crataegus Pinnatifida* Bunge fruit extract while others are derived from *Crataegus Laevigata* leaves and flowers. In some studies, the health benefits are noted to be more beneficial when the extract is removed from the leaves and flowers. Thus, the purpose of this research is to compare the total flavonoid and phenolic content of hawthorn extracts from the two species, *Pinnatifida* Bunge and *Laevigata*, since they are both commercially available in the U.S. with the claim that they "may support heart health".

26 - Pollen Concentration of Honey Collected in North Carolina

Abigail Canela, *Chemistry & Physics*

Chynna Eubanks, *Chemistry & Physics*

Mentor: **Martin Farley**

The geographical and botanical origin can be determined of any honey whose pollen was not completely removed during harvesting and extraction. However, previous melissopalynology studies have reported on pollen from honey from beekeepers without detailing the location of the hives or comparing results between hives closely located to each other. Honey extracted from the hives located in the UNCP Apiary from 2017 and 2018 were analyzed, which all experienced the same environmental conditions. Differences in pollen concentration were determined among the UNCP hives, in addition to honey from Columbus County and pollen slides from the Research Triangle. The honey samples from the UNCP Apiary were processed by standard technique; 10 g of honey was diluted by ethanol and centrifuged, and the remaining material was then acetolyzed. Slides were then prepared from collected pollen grains. Each sample has data for pollen concentration per 10 g of honey. Repeated analyses of pollen concentrations were conducted, allowing us to record variance among the prepared slides. The analyses for UNCP 2017 honey yielded a pollen abundance between 12,100 - 16,400 per 10 g of honey, Columbus County: 7,000 - 10,700, Research Triangle: 56,900 - 644,400, and UNCP 2018: 2,800 - 54,600 per 10 g of honey. The variance for each honey increases with the mean, suggesting that the pollen concentration does not have a statistically normal distribution. This has consequences on the analysis of variance. Varying pollen concentrations in each honey indicate that honey gathered in rural southeastern NC will exhibit lower concentrations compared to honey gathered in urban areas such as the Research Triangle.

27 - Reference Data for the Verdet Constant of BK7

Tristan Dwyer, *Chemistry & Physics*

E. Garcia-Guzman, *Chemistry & Physics*

Mentor: **William Brandon**

The Verdet constant of BK7 glass was experimentally determined in the visible to near infrared wavelength range corresponding to 400nm to 1000nm. In addition to our data, obtained utilizing phase sensitive detection and an ac magnetic field, we have also analyzed and compared all other known data for BK7. This exhaustive data mining work is intended to provide researchers and physics lab instructors interested in developing apparatus to measure Faraday rotation an accurate reference table for BK7 glass. For example, one could calibrate an unknown magnetic field strength utilizing these tables before proceeding to other samples of interest.

28 – An Analysis of Aluminum Cantilever

James W. Graham, *Chemistry and Physics*

Mentor: **William Brandon**

A cantilever is a thin beam that is fixed at one end. The end that is not fixed is free to oscillate. This analysis involved a single aluminum cantilever. A PASCO 750 interface and a motion sensor II were used to record the motion of the cantilever. The data was analyzed to find the frequency and modes of oscillation of the beam. A stopwatch can be used for lower frequencies. The frequency of oscillation is inversely proportional to the square of the cantilever's length and independent of amplitude. This relation led to a dynamic calculation of flexural rigidity. We extended the analysis to include a static calculation for the flexural rigidity using Young's modulus and the second moment of area along with other means of ensuring an intensive self-consistent analysis.

29 - Fabrication of a Microscale Electrochemical Cell from Conventional Disk Electrodes

Jared Hamlin, *Chemistry & Physics*

Breann Sigler, *Chemistry & Physics*

Mentor: **Paul Flowers**

Devices capable of chemically analyzing very small amounts of sample can enable advances in many areas of science, industry, medicine, and forensics. Our research pursues the development of such devices in which the chemical analysis is performed using electrochemical measurement techniques, either alone or in concert with spectrometric measurements ("spectroelectrochemistry"). We report here the design, fabrication and characterization of a device that has proven capable of making reliable electrochemical measurements on sample volumes as low as one microliter, approximately the size of a typical grain of sand. The device is assembled from commercially available electrodes, including a platinum disk working electrode and a glassy carbon auxiliary electrode modified to incorporate a silver chloride/silver reference electrode. An ion-exchange polymer coated onto the surface of the combination auxiliary / reference electrode serves as a salt bridge to allow the electrolysis of small aqueous samples in simultaneous contact with the platinum working electrode. Electrochemical measurements on a model chemical system, aqueous ferricyanide, show the device is effective in analyzing samples as small as one microliter, and likely capable of accommodating even smaller sample volumes. Future adaptation of the device to permit spectroelectrochemical measurements is also described.

30 - Total Flavonoid in Chinese Maybush

Zixian Jiao, *Chemistry & Physics*

Mentor: **Meredith Storms**

Maybush is commonly used in Chinese herbal medicine. As it turns out, in the United States, we refer to maybush as hawthorn. In fact, hawthorn is ranked fourth in the world in terms of its usefulness, according to the Food and Drug Administration of the United States, the German Agency for Medicinal Herbs and the European Commission for Food Safety and Medicine [1]. Hawthorn is well known in phytotherapy for the treatment of many cardiovascular diseases by helping to regulate blood pressure. Additionally, hawthorn is reported to have a soothing effect on the nervous system, and is also used as a mild diuretic. The benefit of hawthorn (known as maybush in China) is suspected to be due to the presence of different bioactive compounds, such as epicatechin, hyperoside, 1utin, and chlorogenic acid. Therefore, the purpose of this research is to study the total flavonoid content in dried maybush fruit using various methods of cold and hot maceration procedures.

1. Chouman, F and Hussam, S. Extraction, Separation and Determination Total Content of Flavonoids in Dried and Fresh Hawthorn Leaves and Flowers; *Journal of Chemical and Pharmaceutical Sciences*; December 2018.

31- Rapid Determination of Caffeine in Beverages using Mass Spectrometry and an Atmospheric Solids Analysis Probe

Kathryn Ryan, *Chemistry & Physics*

Mentor: **Paul Flowers**

Caffeine is a common ingredient in multiple beverages and is either naturally present or intentionally added as a stimulant. The concentration of caffeine must be known and then regulated for consumer safety. The preferred method for quantifying caffeine in beverages uses high performance liquid chromatography (HPLC) to both separate and quantify the beverage ingredients. Atmospheric solids analysis probe mass spectrometry (ASAP -MS) is an analysis tool used primarily for identifying the components of liquid and solid mixtures. It requires little or no sample preparation and can make multiple rapid measurements. Our research goal is to develop an ASAP-MS procedure that is a simple and fast alternative method to both identify and quantify caffeine in beverages. ASAP -MS in positive ion mode (ASAP (+)- MS) was optimized for detection of caffeine (CAF) in different beverage samples with acetaminophen (ACE) added as an internal standard to permit precise quantification. Optimization experiments determined that use of an ion source gas at 300 Å°C and selected ion monitoring at 195 amu (CAF) and 110 amu (ACE) resulted in the highest quality signals. Standards and spiked beverage samples were directly analyzed with minimal sample extraction techniques. In this work, we present the results of experimental studies that suggest ASAP (+)- MS may be a suitable method for rapid quantification of caffeine in beverages.

This work was performed in partial fulfillment of requirements for graduation from the Esther G. Maynor Honors College.

32 - Normal Mode Frequencies of a Double Mass/Spring and Double Physical Pendulum

Tristan Sammons, *Chemistry & Physics*
Mentor: **Thomas Dooling**

The normal mode oscillations of a double spring and double pendulum system were studied. The double spring system consisted of a coupled mass spring system. The double pendulum system consisted of two physical pendulums couple to a wireless rotary motion sensor. Normal mode theory was applied to both systems to predict the coupled frequencies of small oscillation. Due to the coupling, the normal mode frequencies are different than the individual free frequencies due to the exchange of energy between the two systems. Data was collected with a PASCO 850 interface and analyzed using CAPSTONE. Experimental results are compared to theory.

[33 - The Preparation and NMR Analysis of \[Co\(tren\)\(acac\)\]Cl₂](#)

KC Tennant, *Chemistry & Physics*
Mentor: **Mark McClure**

The synthesis of [Co(tren)(acac)]Cl₂ was carried out and followed by 1-D and 2-D NMR analysis. The purpose of this study was to determine the effects of incorporating oxygen donor ligands into the open coordination sites of cobalt complexes containing tris(2-aminomethyl)amine (tren). Both the ¹H and ¹³C spectra of the crystals were obtained in order to ensure the compound contained the methyl groups. Furthermore, the HETCOR program was used to confirm the coordination between the methyl group peaks displayed in the ¹H and ¹³C spectra.

34 - Continuous biodiesel production I: Trans-esterification via sonication

Blanca Trejo-Munoz, *Chemistry & Physics*

Danaisha Moore, *Chemistry & Physics*

Minerva Martinez, *Biology*

Mentors: **Sivanadane Mandjiny** and **Steven Singletary**

Bio-derived fuels such as ethanol and biodiesel, hold the potential to significantly impact modern society's struggle to provide reliable energy to the world's population and mitigate emission that have a negative effect on climate systems. Biofuels are carbon-neutral and can be easily distributed using current infrastructure and substituted into existing vehicles, engines, generators, etc. A major obstacle to widespread adoption of biofuels has been cost; biofuel production is expensive due to the batch nature of processing. A simple, continuous and inexpensive production method for biofuel production could make them cheaper than fossil fuels and accelerate their adoption. We report the results of a project designed to develop a continuous production cycle of biodiesel from various oil feedstocks. Primary trans-esterification occurs via sonification as the oil feedstock and Potassium Methoxide mixture is pumped along a coiled tube. Flow speed, tube diameter and tubing length were varied in order to achieve 100% conversion of triglycerides to methyl-ester groups.

35 - Development of a Simple Device for Microscale Spectroelectrochemistry

Nicholas Willard, *Chemistry & Physics*

Mentor: **Paul Flowers**

Technologies that enable the chemical analysis of very small (microscale) samples are increasingly important to many areas of science and medicine. Ongoing research in our lab is directed towards the development of novel devices capable of analyzing sample volumes of one microliter or less. These kinds of devices could be useful for a number of scenarios in which the amount of sample is limited, for example, forensic analyses of trace evidence, or clinical analyses of fetal body fluids. We have recently developed a simple, easily fabricated device that enables simultaneous spectral and electrochemical measurements ("spectroelectrochemistry") on sample volumes much lesser than 1 μL . The device employs a silver chloride-coated silver wire reference electrode, a platinum wire mesh auxiliary electrode, and a 1 mm diameter platinum disk working electrode. These electrodes are attached to the surface of a standard microscope slide coated with a layer of ion-exchange polymer that functions as a salt bridge, permitting ionic current flow between the microscale aqueous samples and the reference and auxiliary electrodes. A standard optical microscope with a miniature spectrometer attached to its camera port is used to view and measure visible spectra of samples as they are electrolyzed. In this poster, we present results that demonstrate the effectiveness of our device in making electrochemical and spectroelectrochemical measurements on submicroliter volumes of a common test system, aqueous ferricyanide. Research reported in this poster was supported by the National Institute of General Medical Sciences of the National Institutes of Health under award number R25GM077634.

36 - Decoupled Modes in a Double Pendulum

James Williams, *Chemistry & Physics*

Mentor: **Thomas Dooling**

The purpose of the experiment was to study the decoupling process of a coupled physical pendulum system. The second (lower) pendulum rotates out of plane of the first (upper) pendulum. The pendulums were studied individually, collecting frequencies of oscillation, mass, center of mass, total length, center of mass length, and inertial moments. The out of plane angles of oscillation changed from 0 to 90 degrees. At 90 degrees, the upper pendulum acted as one long pendulum, while the lower pendulum oscillated at a separate standalone frequency. Experimental data is compared with theory.

37 - Elementary Teachers and Their Perspective on Learning and Teaching Science

Jessica Hopkins, *Education*

Mentor: **Irina Falls**

Studies have shown that early science learning opportunities shape an individual's understanding of how scientific knowledge is developed, how it is used, and ultimately places them among users and producers of scientific knowledge. However, elementary teachers have been more focused on teaching Mathematics and English, devoting only about 1% to 11% of classroom time to science activities and not effectively using science resources. This study is looking elementary teachers' ideas of learning science, teaching science and the nature of science. The questionnaire had open-ended questions and was completed by 20 total elementary teachers. While the responses are still in the process of being interpreted, we expect that teachers will have solid responses regarding how young children learn and why teaching science is important. On the other hand, we are predicting that the teachers will have difficulty in identifying the nature of science and how to teach it. In light of these results, the teachers may need support in creating assignments, indoor activities, and vocabulary that will give them the skills and confidence needed to be successful in learning and teaching science. The results are also important for teacher preparation programs who might need to include science teaching methodology in their curriculum.

[38 - Abandoning the Artificial and Inauthentic in Teacher Education and Attending to "What Really Matters"](#)

Hannah Middleton, *Education*

Reagan Lowry, *Elementary Education*

Mentors: **Laura Staal and Claudia Nickolson**

The objective/purpose of this presentation is to address one of the Critical Questions in Education Conference themes: "What understandings of teaching and learning, teaching methods, and educational ends should be kept in teacher education classes, and which should be abandoned"? Despite the efforts of teacher educators committed to critical pedagogy, teacher education programs are still guilty of promoting ideas and practices that are not steeped in relevance, authenticity, or solid research. Together with our participants, we will critically examine curriculum and instruction in teacher preparation courses that should be abandoned and explain why.

"To keep, or not to keep" in teacher education curriculum and instruction is critical and can have "positive or negative" consequences that can last a lifetime. We only have so much time in higher education to impart "What Really Matters". So, what REALLY matters? In our session we will examine the "ethic of care" (Nel Noddings, 1992) and the "pedagogy of hope" (Friere, 2014) as a foundation for meaningful, authentic and culturally responsive curriculum that will provide preservice teachers with a vision for effecting positive social change from within schools.

[39 - Acto Latino](#)

Joselyn Salmeron, *English, Theatre & Foreign Languages*

Maite Easterling, *English, Theatre & Foreign Languages*

Trent Adams, *English, Theatre & Foreign Languages*

Azael Perez, *English, Theatre & Foreign Languages*

Isis Telombila, *English, Theatre & Foreign Languages*

Mentor: **Ana Cecilia Lara**

Acto Latino is an organization that was started in San Bernardino, California, It's initial purpose was to bring awareness of the situation that was going on with the immigrants in that time. This wonderful organization has now come to UNCP, and we use these plays to talk about any social issues going on in the Latino community. We present our plays at different locations, but with the help of the PURC grant we will be able to travel to Madrid, Spain to present a play that touches the topic of war and suffering in Latin America.

[40 - An attempt to unveil aquifer response to glaciations using residential water well data from a partially glaciated county in Ohio](#)

James Campos, *Geology & Geography*

Mentor: **Madan Maharjan**

Groundwater flows through interconnected pore spaces. The occurrence and rate of groundwater movement depend upon the storativity and transmissivity of the aquifer.

External stresses such as tectonics, glaciation, and hydraulic fracturing can influence porosity and permeability of an aquifer, thus changing aquifer parameters such as hydraulic conductivity and storativity. We were interested in unveiling whether glacial loading and unloading were effective to alter characteristics of the sandstone aquifer lying within Holmes County, Ohio, which was partially glaciated. The scope of this research was to capture the variations in aquifer parameters due to cyclic loading and unloading by comparing hydraulic conductivity of the aquifer under glaciated and non-glaciated regions. Data were obtained from public water wells archived at the Division of Soil and Resources (ODNR) that consist information pertaining to well location, well construction details, well production test, and rudimentary lithologic description. More than 700 data points were collected and processed which were later analyzed in MS EXCEL. Cooper and Jacob (1946) method was used to estimate hydraulic conductivity of the aquifer assuming a reasonable storativity value for the aquifer. We anticipate distinctly different values of hydraulic conductivity for the aquifer in glaciated vs non-glaciated portion of the county. The finding of this study could provide better understanding of how glaciation had impacted aquifer parameters in the regions and improve assessment of groundwater sustainability for the region.

[41 - UNC Pembroke Campus Map Update](#)

Amanda Gallavan, *Geology & Geography*
Mentor: **Jesse Rouse**

With the recent construction on N. Odom St. and Prospect Rd near UNCP and other alterations on-campus, updates to campus data were needed. The current mapping data has not been updated in years, leaving the campus map inaccurate. The campus' structures, roads, parking lots, and sidewalks were the focus of the project to update on-campus facilities map. Drone imagery was collected, processed with Agisoft, to capture the most up-to-date information of UNCP, and then the drone imagery was georeferenced, using ArcGIS Pro, to older digital geographic information from the USGS and previous campus data. This poster will cover the process of updating the campus map data and highlight the changes from previous data.

42- Campus Wells: Visualizing Data to Support Interpretation

Annika Hanson, *Geology & Geography*

Rebekah Harvey, *Geology & Geography*

Mentor: **Madan Maharjan**

The campus of the University of North Carolina at Pembroke has 11 wells that are being monitored. Data collection began in November 2016 as part of the larger Robeson County Groundwater Project, which collects data from wells across the county to record, model, and report water levels for the county. While many of the wells follow the same trends, there are periodic changes in water level at specific wells on campus. This poster will highlight and discuss the initial descriptions and interpretations of the monthly average observations to date focusing on visual methods for graphing individual wells and mapping the modeled water level across campus.

43 - Bringing children and families together

Jeanateer Merritt, *Interdisciplinary Studies*

Mentor: **Lisa Mitchell**

My presentation was how to get children and families to spend quality time together in a relaxed atmosphere and allow their children to be able to interact and engage with others.

44 - Securing Smart Homes with Blockchain

Chaa Loftin, *Mathematics & Computer Science*

Mentor: **Joong-Lyul Lee**

The current power grid system only allows for consumers to communicate with their energy provider on a one-way basis. The current power grid system lacks the technology to efficiently monitor energy fluctuations that can cause harmful blackouts. Based on this issue, we currently require a new grid system that has been coined as a "Smart Grid". The smart grid will be comprised of millions of parts that will give the old power grid a host of new capabilities. It will be capable of "smart sensing" energy fluctuations among transmission lines, give customers access to two-way communication between themselves and their energy provider, and it will also be capable of integrating various power sources. There may be several weak spots within a smart grid system's communication channels. Therefore, we have focused our research on data security in a smart grid system. Smart meters will be used to accurately measure a consumer's energy consumption in real-time. This data needs a mode of transmission that is both safe and efficient. We propose the secure smart meter platform for safety, efficiency, and transparency using Blockchain. Blockchain technology's primary purpose is to create a distributed ledger (essentially a list of data points) that is unchangeable. This ledger could be used to store data for each member of a privileged blockchain network. The network would have to be privileged because this would essentially segment the information on the network. Basically, each member's data would only be viewable by the member and the utility company and the information would be immutable.

[45 - A Design and Implementation of Intrusion Detection System for Smart Home IoT Devices](#)

Brianna Thompson, *Mathematics & Computer Science*
Mentor: **Joong-Lyul Lee**

Developing an Intrusion Detection System (IDS) for Smart Home Internet of Things (IoT) devices is becoming more imperative with each technological advance in society. The introduction of IoT devices that simplify and automate everyday lives begin to pose a plethora of security risks. IoT devices lack the security measures to defend against virtual attackers, making them the weakest link in a secure infrastructure. This project proposes designing and developing a three-layer Intrusion Detection System that detects using a machine learning algorithm when an attack is occurring to a device on a network and classifies the type of attack deployed.

46 - Women in Power: Fairness in High Powered Positions

Heather Boggess, *Psychology*
Mentor: **Shilpa Regan**

As women gain more access to high paying positions in the workforce, gender bias becomes a bigger issue in hiring decisions. Participants were asked to answer questions about a male and female candidate for a CEO position at a Fortune 500 company. These results suggest that others view powerful women as more controlling and less fair in their treatment of those they hold power over. Studies have shown that stereotypical media images of women in leadership positions have a negative impact on self-perceptions and leadership goals in the women who view them (Simon & Hoyt, 2012). This relationship between media images and perceptions of women in high-powered positions could explain the results of this study.

47 - How Many Sexual Partners is “Too Many”? Gendered Perceptions and Behavioral Outcomes Based on the Number of Previous Sexual Partners

Courtney Britt, *Psychology*

Mentor: **Tara Busch**

The current research examined the impacts of mate value (i.e., attractiveness, reproductive potential, etc.) and sexual history on evaluations of other's values, likeability, success, and intelligence, and ability to attract partners for various romantic and sexual relationships. Within a 2 (target sex; male, female, BS) x 2 (mate value; low, high, BS) x 3 (number of previous sexual partners; 0, 1, 12; BS) design, participants (n = 563) read a hypothetical scenario describing aspects of a target person including their sexual history and mate value, and then evaluated that target's values, likeability, success, and intelligence, along with their willingness to engage in various relationships with the target person. Preliminary analysis revealed that, regardless of mate value, evaluations of virgin men are lower than evaluations of virgin women ($d = .27$), and evaluations of men with 12 sexual partners were more favorable than evaluations of women with 12 sexual partners ($d = .20$). Number of sexual partners also significantly impacted willingness to engage in long-term relationships with target individuals. Implications of mate value and interaction effects will be discussed, along with differing willingness to engage in relationships with various targets.

48 - The Benefits of Self-Compassion Following Hurricane Florence

Tyler Cox, *Psychology*

Mentor: **Ashley Allen**

Following the devastating effects of Hurricane Florence, our research team surveyed 261 people in the counties hit the hardest: Robeson, Scotland, Bladen, and Columbus. In order to qualify for participation, participants had to still be experiencing effects of the hurricane, six months later. The participants completed a baseline survey assessing personality variables, coping self-efficacy, perceptions of support, depression, and post-traumatic stress. The participants then completed three month and six month follow up surveys. We hypothesized that self-compassionate participants would be less depressed and we anticipated that this effect would be mediated by various thought processes. Analyses were conducted on the baseline survey results. Self-compassionate participants reported significantly less depression and lower post-traumatic stress symptoms. Additionally, self-compassionate participants reported significantly higher coping self-efficacy as well as higher levels of providing support to others. Self-compassionate participants also believed that they had received more support and perceived more social support as well. To explain the relationship between self-compassion and depression, we conducted a serial mediation model. This model assessed whether positive cognitive restructuring and consequently coping self-efficacy explained the relationship between self-compassion and depression. The model was supported showing that self-compassionate people are less depressed perhaps in part because of their ability to restructure negative information, which makes them feel more capable of handling negative events.

Pembroke Undergraduate Research and Creativity Council 2020

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