

**Thirteenth 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 cordially welcomes you to the Thirteenth Annual PURC Symposium, a campuswide celebration of undergraduate research scholarship, creativity, and scholarly entrepreneurship. This year the symposium features **83 presentations, by 130 undergraduates and 40 mentors from across the university community**. The work you see here today represents faculty-mentored work funded by PURC this academic year and students who have taken coursework beyond class and developed their ideas with a faculty member further. Some of these presenters are trying out undergraduate research for the first time; some are making their second, third, or fourth appearance. For some of these presenters this is a culminating experience; for others it is the next step to a larger venue. Want to know how UNCP and PURC prepare our undergraduates for success? Just look around and listen today.

PURC provides a trio 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. Summer 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.

Contributions from Duke Energy help make this program possible. Duke Energy's commitment to higher education helps PURC continue offering this extraordinary opportunity to our undergraduates.

Many thanks go to all the students and faculty mentors whose works are represented here today. I would also like to acknowledge the PURC Advisory Council for all the hard work they do throughout the year, the Office of Academic Affairs, Provost Ward, and Chancellor Cummings.

It is our desire that the PURC Symposium serve as a launching pad for student participation in research and formal presentation venues. So, please plan to take your works to local, regional, and international meetings.

Best,

A handwritten signature in black ink, appearing to read "RKA", written in a cursive style.

Dr. Ryan K. Anderson  
PURC Director  
Professor of History

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\*Cover Photo: *BLQ*  
Photography by Dr. John Roe  
Lumber River State Park, June 2015

**UNC-Pembroke 13th Undergraduate and Research Creativity Symposium**  
**Schedule of Events**  
**April 10, 2019**  
**UC Annex**

**9am: Opening Remarks**

**Dr. Ryan K. Anderson**, PURCC Director/History

**Dr. Bob Poage**, RISE Co-Director/Biology

**9:20-10:05am: Oral Presentations, Part 1: Sciences**

**“Improving the economy of medical diagnosis: Faster and cheaper lab tests for blood work and urinalysis”**

**Xin Dong**, *Chemistry and Physics*

**“Antimicrobial Effects of St. John the Worker Native American Herbal Tea”**

**Cheyenne Lee**, *Biology*

**“Testing natural extracts to treat early indicators of dementia in a rat model**

**Kaitlin Smith**, *Biology*

**10:15am: 1<sup>st</sup> Creative Performance (Acto Latino)**

**“La fábula de la nevera, el cuchillo y el mechero”**

**Acto Latino**

**10:45-11:45 a.m. 2<sup>nd</sup> Oral Presentation Group, Part 2: Humanities and Social Sciences**

**“Activism in Hip Hop”**

**Tiara May**, *History*

**“Mapping the Underground Railroad: Documenting Cora's Journey to Freedom”**

**Aaliyah Weatherington**, *Geology and Geography*

**“Racism, Racial Profiling, and Prejudice through Hip-Hop”**

**Hakeem Abdur-Rahim**, *History*

**“Mothers on The Mind”**

**Sydney Blake**, *English, Theatre & Foreign Languages*

**Noon: Lunch**

**12:30pm: Keynote Speaker**

**“Strengthening your networks of support and mentorship through undergraduate research”**

**Dr. Ryan Emanuel**, Center for Geospatial Analytics, Department of Forestry and Environmental Resources, North Carolina State University

**1:15pm: 2<sup>nd</sup> Creative Performance**

*“Ego Flos Campi”*

**Pembroke Singers**

**1:30-3:00pm: Poster Session**

**3:00-3:30pm: Oral Presentations, Part 3: Group Travel supported by the Dr. Charles Humphrey Undergraduate Conference Travel Award**

**“NCANS-Attending a Professional Conference”**

**“Literacy Disrupted-but not Defeated: The Impact of Hurricane Florence on a University/School Literacy Service Learning Partnership in Robeson County, NC”**

**3:30: UR Mentor Award**

**Dr. Bob Poage, Biology/RISE**

**3:45: Closing Remarks**

**Dr. Ryan K. Anderson, PURCC Director/History**

## PURC Symposium 2019:

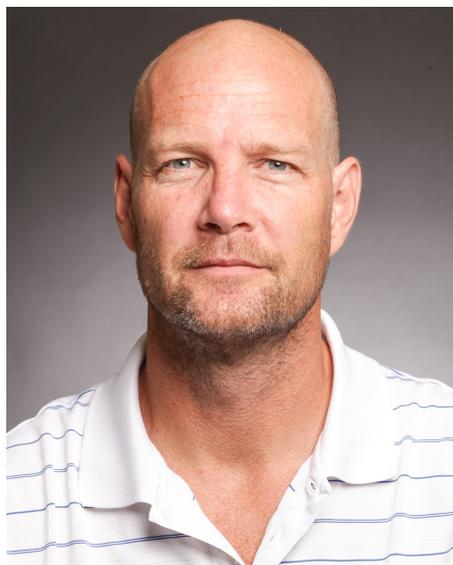
Guest Speaker:

### Dr. Ryan Emanuel

Talk Title: *Strengthening your networks of support and mentorship through undergraduate research*

Dr. Ryan E. Emanuel is an associate professor and University Faculty Scholar in the Department of Forestry and Environmental Resources at North Carolina State University. His research group focuses on environmental processes in natural and human-altered ecosystems. Group members combine fieldwork, remote sensing, and computer modeling to study the impacts of land-use and climate change on streamflow, evaporation, photosynthesis, and other processes. Emanuel is an enrolled member of the Lumbee Tribe and also studies policy issues surrounding environmental justice and indigenous rights, using data-driven analysis to advise tribal governments and American Indian organizations on decisions related to environment and culture.

Emanuel has written or co-authored nearly 40 peer reviewed research articles on topics that range from hydrology and climate science to environmental history and public affairs. He serves on the environmental justice committee of the North Carolina Commission of Indian Affairs and is actively involved in the American Indian Science and Engineering Society. Emanuel holds a B.S. in Geology from Duke University and an M.S. and Ph.D. in Environmental Sciences from the University of Virginia.



Undergraduate Research Faculty Mentor Award:

### Dr. Bob Poage

*2019 Award Winner*

The Pembroke Undergraduate Research and Creativity Center Council is pleased to announce that Dr. Bob Poage (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. Please join us in congratulating Dr. Poage for all of his success integrating research, scholarship, and undergraduate teaching.

# Oral Presentations

## Part 1: Sciences

### - Improving the economy of medical diagnosis: Faster and cheaper lab tests for blood work and urinalysis

**Xin Dong**, *Chemistry & Physics*

Mentor: **Paul Flowers**

The concentration of uric acid in a patient's blood or urine is commonly measured in medical labs to assist physicians in making health assessments and diagnosing a variety of diseases. Standard lab tests for uric acid require the use of relatively expensive enzyme reagents and long analysis times (about 20 min or more per sample). As part of our research group's primary focus on designing faster and less costly lab tests, we have developed an alternative approach to measuring uric acid that is based on monitoring changes in light absorption by samples undergoing electrolysis, a technique known as spectroelectrochemistry (SEC). Results of our research show the SEC assay is comparable to the standard lab test with regard to accuracy and sensitivity, but is more than three-times faster, requiring just 6 min analysis time per sample. Compared to the enzyme-based lab test, the SEC assay requires fewer and far less costly reagents, and samples needn't be incubated prior to analysis. In this presentation, our experimental approach to the development of this new tool for clinical analysis will be outlined. This material is based upon work supported by the National Science Foundation under Grant Number 1506817.

### - Antimicrobial Effects of St. John the Worker Native American Herbal Tea

**Cheyenne Lee**, *Biology*

Mentor: **Conner Sandefur**

Patients with obesity and type II diabetes are characterized by an altered gut microbiome. This experiment was designed to test *Hypericum hypericoides* or St. John the Worker, a traditional medicine of the Lumbee Native American tribe of North Carolina, for antimicrobial properties on thirteen different bodily bacteria. Experiments from Spring 2018 suggested that plant-paste made from *Hypericum hypericoides* had antibiotic properties. For further experiments, the bacteria were streaked over three Mueller-Hinton agar plates, and each plate was divided into four sections with three different antibiotics and one disc of water per plate. The third plate per bacteria had two different antibiotics, one water disc, and 75% plant-paste to test plant antibiotic properties against seven standard antibiotics. Experiments on Mueller-Hinton agar plates instead of bacteria specific growth media illustrated inhibition on three of five bacteria. Since both experiments yielded antibiotic inhibition to some degree, we also performed the same tests done on the Mueller-Hinton agar plates on Tryptic Soy Agar and Luria Broth Agar plates to compare the antibiotic standard inhibition zones to the inhibition results seen from the plant-pastes in Spring 2018. The results suggest growth inhibition of five of the thirteen studied species: *Corynebacterium xerosis*, *Micrococcus luteus*, *Bacillus subtilis*, *Staphylococcus aureus*, and

*Neisseria sicca*. Our experimental data suggest a possible avenue of therapy by using traditional medicines to target altered microbiomes in obesity and type II diabetes.

**- Testing natural extracts to treat early indicators of dementia in a rat model**

**Kaitlan Smith**, *Biology*

Mentor: **Ben Bahr**

Alzheimer's disease (AD) is the most common age-related neurodegenerative disorder. It is often characterized by multi-proteinopathy and massive synaptic deterioration. Unfortunately, no effective treatments are currently available to slow the synaptic loss that is strongly linked to cognitive decline. It is well thought that one of the causes of AD pathology is due to inefficient protein clearance leading to protein accumulation pathology and synaptic decline. A major protein clearance mechanism entails the lysosomal pathway and compounds that enhance the pathway represent a promising therapeutic avenue for AD. Natural plant extracts have previously been shown to positively modulate protein clearance and improve synaptic markers by enhancing lysosomal- autophagy. When different plant extracts were tested against aging- type protein accumulation the extracts were shown to provide cognitive protection. To further this work, we have made use of an additional rat model, the Fisher rat model of mild cognitive impairment (MCI). Using this model memory was accessed by measuring exploration across two days in a passive avoidance paradigm. Interestingly, those MCI rats that received natural plant extracts exhibited improved memory in the test as compared to those that received inactive control compounds ( $p < 0.0001$ ). Further work found that plant-based natural products differentially modulate the lysosomal pathway in a manner that positively influences synaptic integrity. Enhancing the autophagy-lysosomal pathway protected central synapses in a model of age-related deficiency of protein clearance, suggesting that certain natural products can benefit cognitive health.

**Part 2: Humanities and Social Sciences**

**- Activism in Hip Hop**

**Tiara May**, *History*

Mentor: **David Walton**

This project explores activism within Hip-Hop, with a keen eye towards its effectiveness and action beyond words. I argue, that although the 'voice' of dissent, resistance and strength has always been present in the black musical tradition, it was not until the Hip Hop era, the 1980s - 1990s, that popular black musical voices have put public action and capital behind their words. Hip Hop has emerged as the soundtrack of black life that gives breath to our darkest realities and our brightest hopes as a platform to exude strength, to

analyze and inform the masses of the obstacles they face as a people, and above all, to improve those conditions.

### **- Mapping the Underground Railroad: Documenting Cora's Journey to Freedom**

**Aaliyah Weatherington**, *Geology & Geography*

Mentor: **Michele Fazio**

This project will produce two maps of spaces portrayed in Colson Whitehead's *The Underground Railroad* (2016), a story about a runaway slave, Cora, who travels across the U.S. in search of freedom. One map will portray Cora's journey along with other characters' journeys. The other map will portray Ajarry's journey, Cora's grandmother, as she experienced the Atlantic Slave Trade. Furthermore, these maps will also be included in a GIS story map, a program which allows you to create maps and add text, images, and other multimedia content to enhance historical and cultural contexts. The resulting story map will trace Cora's journey state by state, portraying crucial insights on the physical journey she undergoes while also examining the political and legal significance of these actual spaces from the 1860's to the present (how slavery, industrialization, and social change shaped the nation's progress). Whitehead's novel is a fictional narrative that includes real-life events during the Atlantic Slave Trade, slavery, and the Underground Railroad. The story map explores Whitehead's use of these real-life events and places to expand an understanding of how race and class function in the novel. By using cartography in this project, my research ties together the fields of geography and literature and how the latter intersects with history, ethnic studies, criminal justice, and critical race theory. This digital humanities project will be a resource for readers of this novel and to those interested in the study of literature and geography.

### **- Racism, Racial Profiling, and Prejudice through Hip-Hop**

**Hakeem Abdur-Rahim**, *History*

Mentor: **David Walton**

Hip-hop has been the source of high-quality of funk, bass, and rhythm. Though, The idea of hip-hop has been diminished through many outside sources. Hip-hop is viewed to be violent, drugged-endused, and hypersexual. In class, we watched the Evolution of Hip-hop in class and I was really interested in the episode of gang violence and the influence it had on hip-hop. The issue with gang violence is that mainly people of color were being profiled. There are selective hip-hop artist and groups that have made these issues of the black community the platform of their own music; for example we have Ice- T, N.W.A, and many more in the hip-hop community. I would also like to explain the major events that came before this era of hip-hop to bring the climatic details on why the characteristics have been connected to hip-hop. In order to further describe these specific characterzations of hip-hop; I would hope to breakdown the issue of gang violence, police prutality and profiling and develop a reason on why hip-hop has these characteristics.

**- Mothers on The Mind**

**Sydney Blake**, *English, Theatre & Foreign Languages*

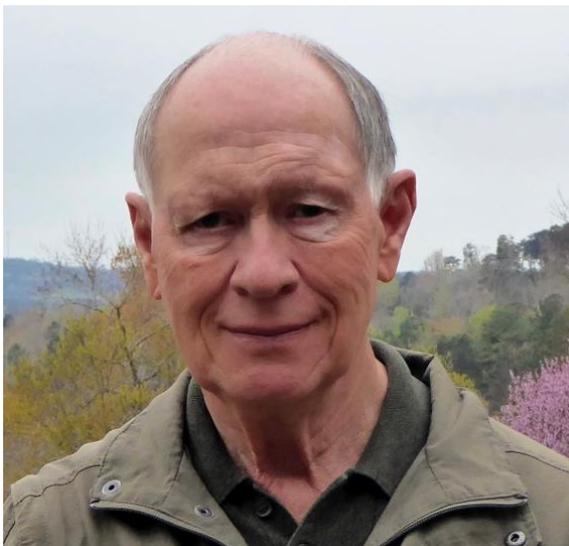
Mentor: **Peter Grimes**

Mothers on the Mind is a short story collection that consists of four short stories written over the course of a semester. The stories each explore a different aspect of motherhood: the struggles of being a mother, losing a child, deciding to become a mother or not, and the thrill that comes from a child's dependency on their mother. I will discuss the creative process used when writing these stories and how they have become what they are. I will also read a sample of the collection that showcases the process and how the theme of motherhood is exemplified.

**Part 3: Group Travel supported by the Dr. Charles Humphrey Undergraduate Conference Travel Award**

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.

**Conference attendance made possible thanks to the Dr. Charles Humphrey Undergraduate Conference Travel Award**

**- NCANS-Attending a Professional Conference**

**Joshua Delgado**, *Nursing*

**Astha Adhikari**, *Nursing*

**Crystal Edwards**, *Nursing*

**Olivia Scott**, *Nursing*

**Lauren Smith**, *Nursing*

Mentor: **Kathy McAllister**

With the help of PURC grants a group of Nursing students had the opportunity to attend a professional conference (North Carolina Association of Nursing Students). At the conference they attended lectures which covered a variety of topics to help them in their professional endeavors and academically.

**- Literacy Disrupted-but not Defeated: The Impact of Hurricane Florence on a University/School Literacy Service Learning Partnership in Robeson County, NC**

**Michaela Reynolds**, *Elementary Education*

**Araceli Cruz**, *Elementary Education*

**Briana Bradley-Chaves**, *Elementary Education*

**Samantha Carson**, *Elementary Education*

**Codi Pait**, *Elementary Education*

Mentor: **Laura Staal**

This presentation highlights the efforts of a literacy professor involved in a successful 7-year literacy service learning partnership—its beginnings—its growth—and its challenges through a recent disruption of more than 20 missed instructional days in Robeson County, NC. Together, with five undergraduate students, identified strategies and literacy best practices will be explored for all students every day and in every classroom—regardless of grade or content. Although literacy was disrupted, it was not defeated.

## CURE Development Grant Presentations

Grant Provided by the UNC System

These poster presentations were created in Course-based Undergraduate Research Experiences (CURE). Through a grant provided by the UNC General Administration, the Pembroke Undergraduate Research & Creativity Center invited UNCP faculty to apply for funding to ingrain undergraduate research projects into the courses they teach. In STEM disciplines, a CURE project might begin as part of a faculty member's own research program, offering research experience beyond lab assistantships to a broader array of students. In arts, humanities, social sciences, and business programs, CUREs might leverage individual students' interests in the instructor's area of expertise. Either way, CUREs cultivate skills that support the development of higher-order research

### **CRJ 2000 - Introduction to Criminal Justice**

Dr. Renee Lamphere

In Spring 2019, Dr. Lamphere's CRJ 2000 (Introduction to Criminal Justice) course was designated as a Course-based Undergraduate Research Experience (CURE) course. The purpose of the CURE was to introduce first-year students to scholarly, peer reviewed research by having them conduct library research on controversial issues in the criminal justice field. In addition to the poster presentation, the students are also submitted a detailed annotated bibliography where they outline the literature they reviewed for their poster.

#### **1 - War on Drugs**

Presented by: **Jamison Deese**

#### **2 - War on terror**

Presented by: **Sterlyn Dominguez**

#### **3 - The regulation of firearms to promote gun safety in the United States**

Presented by: **Travis Mervin, Alec Pack, Jimmy Chavis, and Andrew Matthews**

#### **4 - The Psychological Effects of Solitary Confinement in the Criminal Justice System**

Presented by: **Lillian Marino, Mary Ingram, Vinson Logan, and Maxim Wallace**

#### **5 - Bullying as a Crime**

Presented by: **Dashawn Patterson, Carson Ransom, and Ikenna Nwachukwu**

#### **6 - Holding parents accountable for delinquency**

Presented by: **Shania Lambert and Jasmine Whitfield**

## Investigating the transport of medicinal plants during Indian Removal using a CURE

Drs. Conner Sandefur and Maria Periera

Genetic diversity studies can provide information about the migration of species from one area of the world to another over time. These migrations can be natural, wind-based seed dispersal, for example, or forced, as occurred in the migration of some southeastern American Indian tribes after the signing of the Indian Removal Act of 1830. Here, we hypothesize that due to the medical importance of *Morella cerifera* to many southeastern American Indian communities, seeds of this plant were transported by individuals during Indian Removal from ancestral homelands (in the now Tennessee/Mississippi region) and then planted in Indian Territory (now Oklahoma). Genetic diversity studies often require analysis of large numbers of samples to gain the data necessary to generate computational models of species migration. Course-based undergraduate experiences (CUREs) can generate data in a semi-high-throughput manner while providing students with authentic research experiences as part of their normal course work. Here, we present the work of several student teams from our Principles of Genetics Laboratory, all who are working on ascertaining the genetic diversity of *M. cerifera*. Successful completion of this project will result in a better understanding of the genetic diversity of *M. cerifera* and perhaps gain access to a lost piece of cultural information: the movement of the traditional medicine *M. cerifera* by American Indian peoples during Indian Removal.

**7 - DNA: The Pathway to Determining Genetic Difference in The Wax Myrtle**  
Presented by: **Kyle Farris and Caleb McMillan**

**8 - DNA Extraction of *M. cerifera***  
Presented by: **Makayla Hales and Madison Murphy-Canto**

**9 - Linking the Biochemical Synthesis of Nrf2 to Microsatellites from *M. cerifera***  
Presented by: **Malinda Jolly and Josh Cade**

**10 - Genetic Delineation of *Myrica cerifera***  
Presented by: **Dylan Locklear and Ariana Tsalamandris**

**11 - *M. cerifera* Diversity and Its Relation to the Migration of the Chickasaw People**

Presented by: **Hannah Malcolm and Joshua Villa**

**12 - Analysis of *Myrica cerifera* DNA**  
Presented by: **Casey Richardson and Leanna Jacobs**

**13 - Genetic Characterization of Wax Myrtle (*Myrica cerifera*) in Relation to the Forced Removal of Native Americans**  
Presented by: **Kayla Travis and Madeline West**

**14 - The Movement of *M. cerifera* (Wax Myrtle)**  
Presented by: **Wanya Ward and Anna Heinz**

## Posters

### **1 - The Effect of Increasing Carbohydrate Concentrations on the Expressed Intracellular and Extracellular Proteins Utilized by the *Photorhabdus luminescens* Bacterium**

**Joshua Cade**, *Biology*

Mentor: **Danny Upadhyay**

*Photorhabdus luminescens* is a Gram-negative, pigment-producing enteric bacterium, bioluminescent, and pathogenic to insects. This bacterium has the capability to undergo phase variation. *P. luminescens* is symbiotically associated with the soil-dwelling nematode, *Heterorhabditis bacteriophora*, while also playing a crucial role in the reproduction cycle of this nematode. The phase I variant of *P. luminescens* produces light energy in the form of bioluminescence, the red anthroquinone-derived pigment, which is a symbiotic trait that infective juveniles of *H. bacteriophora* exploit to attract insect hosts.

This study examines the effects of different carbohydrates at various concentrations on the growth of *P. luminescens* phase I variant and production of bacterial luminosity in liquid culture, while also examining the relative amounts of expressed extracellular and intracellular proteins. In this study, 2x Nutrient broth was used as a liquid growth media. The bioluminescence was measured with a Modulus™ single tube luminometer (Turner Biosystems) and reported in terms of relative luminosity units (RLU). Protein assays were performed using a spectrophotometer (Beckman™ DU640) set at a wavelength of 595nm, while utilizing Bradford dye. Bacterial growth density was also measured at 600 nm using a spectrophotometer (Beckman™ DU640). The carbohydrates that were utilized in this study were trehalose, cellobiose and D-sucrose, ranging from 1, 3, 5 and 7%.

### **2 - Utilizing habitat enhancements as a conservation management tool to promote pollinator populations**

**Abigail Canela**, *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 more threats generated by anthropogenic activity such as the use of industrial agricultural practices, habitat fragmentation, and introduction of invasive species and disease, and we are currently witnessing declining pollinator populations. Methods employed to promote biodiversity and combat population declines among pollinator species include managing pollinator habitats consisting of native plant species that support generalist and specialist bee species. To test the role of habitat enhancement on bee communities, two pollinator gardens were established. We sampled these gardens and the adjacent lawn using colored bowl traps for four periods. The abundance of bees, insects, 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 and increases abundance. There was a total of 272 bees and 9466 total insects across the two sampling locations. The bee abundance in the

gardens was 191, while the lawns had 81. Average bee and insect abundance per trap were lower in the lawn area than the garden. 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 and insect abundance, by providing abundant and diverse floral resources suggesting it as an effective method for bee and insect conservation.

### **3 - Personality Profiling in Eastern Box Turtles**

**Maria Chavez**, *Biology*

Mentor: **John Roe**

Eastern Box turtles face challenges every day in their environment from predators, finding resources and a mate, prescribed burning, and diseases. With these factors coming into play, personality traits could be an important factor in their day to day behaviors and overall fitness. We measured personality traits in two populations of Eastern Box Turtles using a simple field test and examined whether personality scores varied between sexes, body sizes, or population and then compared it to a second trial to validate accuracy of the personality scores. We also examined whether personality score was correlated with in field behavior and fitness measures including growth rates, timing of spring emergence, and home range size. Turtles were radio-tracked to identify sizes of home ranges, annual growth rates, and timing of spring emergence. We performed personality tests which told us how bold (risk-taking) or shy (risk-averse) an individual was by placing each individual in a dark mesh bag for one minute and monitored how long it took each turtle to come out of its shell (0 minutes to a limit of 10 minutes for our study). We have found that certain bolder individuals will travel farther and emerge earlier from winter dormancy, giving them more access to resources. Shy individuals may have more limited opportunities for resource acquisition but may experience other benefits such as lower energy expenditure and increased survival. A better understanding of how personality varies among individuals is clearer through this second trial and would ideally help biologists interpret behaviors and fitness of free-ranging animals.

### **4 - Quantity and anti-microbial properties of essential oils produced in medicinally valued plants exposed to varying photoperiods**

**Colton Crenshaw**, *Biology*

Mentor: **Joseph White**

Essential oils are secondary metabolites produced by plants. These oils are stimulated at different times in the plant's life cycle, with each plant stimulating different oils for different purposes. Some of the oils found within plants are medicinally valuable, being used to produce multiple medicines on the market today. These medicinal compounds are extracted and analyzed for possible uses, going on to be synthesized for mass production. Three plant species, *Mentha pepperita* (Peppermint), *Hypericum perforatum* (Saint John's

Wort), and *Tagetes patula* (Marigold) were used for the study. Plants were placed in one of 2 separate chambers, with one set for 12-hour intervals of light and dark periods, and another set for constant light (24-hour). The plants will be grown to mature seedlings, at which point they will be harvested. Once harvested, they will have their physical measurements recorded, such as root:shoot ratios. Finally, an organic extraction will be used to collect essential oils from the plants. Once extracted, the oils will be tested against pathogens associated with the human intestinal tract, testing the plant's capability of producing medicinally valuable oil. After testing against the pathogens, the oils will be compared to one another, showing which species produces a more anti-microbial essential oil. The findings will be used to show what photoperiod is best for the maximum, most effective, oil production, allowing insight into how to best massively produce the oil for medicinal use.

## **5 - Investigating the Relationship of the SWR-1 Complex and RPB2-2 in Transcription Regulation of *Saccharomyces cerevisiae***

**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. In the past decade, our lab has uncovered a role for Htz1 in transcription elongation and focused its efforts on understanding the mechanism behind this 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. This double mutant exhibits synthetic lethality meaning that either mutation is viable individually, but lethal when combined. Our hypothesis is that in the absence of Htz1, the mutant RNA Polymerase stalls on the DNA template strand and blocks transcription elongation. One question we want to address is if the synthetic lethality is related to the mere absence of Htz1 or the inability to exchange Htz1-H2B dimers. This has led us to investigate the Swi2/Snf2-Related chromatin remodeling complex (SWR-C). Specifically we wanted to test if a deletion of the Swr1 ATPase gene (the catalytic subunit of SWR-C) is also synthetic lethal with rpb2-2. If this double mutation proves to be lethal, it would be consistent with the hypothesis that Htz1 and SWR-C act in the same pathway, i.e., Htz1 deposition, to regulate transcription elongation in the absence of a functional RNA pol. If we do not find that a swr1/rpb2-2 double mutant is synthetic lethal then it may be an indication that SWR1 function is not limited to Htz1 nucleosome exchange.

## 6 - DNA Extraction and Analysis of *Nicotiana tabacum* cv. Gold Dollar

**Justice Godwin**, *Biology*

Mentor: **Maria Pereria**

Tobacco has many uses both commercially and scientifically. *Nicotiana tabacum* cv. Gold Dollar was analyzed using DNA extraction and amplification of microsatellites to better understand the evolutionary relationships and genetic variability of the tobacco plant. It was found through DNA extraction and quantification on an agarose gel that the cultivar had prominent bands of large size DNA. The results indicated that *Nicotiana tabacum* cv. Gold Dollar likely contains genomic DNA. By targeting specific nucleotide segments of non-coding DNA, comparisons of the sizes of those segments were able to be made between the Gold Dollar cultivar of *Nicotiana tabacum* and five other cultivars grown in the southeastern United States. Using these results, the tobacco can be further evaluated with phenotypic traits and with other cultivars to better understand the evolutionary relationships and correlations between cultivars. In the future, *Nicotiana tabacum* cultivars can be compared for genotypic and phenotypic traits to understand if certain cultivars grow differently due to different non-coding segments of DNA. The tobacco plant can also be analyzed due to the area and environment that they are grown in to evaluate the relationships between those factors and the aforementioned traits.

## 7 - Steps in Testing Human-Based Migration of *Morella cerifera*: Obtaining DNA

**Melanie Handley**, *Biology*

Mentor: **Conner Sandefur**

This project centers on assessing the genetic variation of *Morella cerifera* (wax myrtle) distributed across the southeastern United States. *M. cerifera* was used for medicinal purposes by Chickasaw Nation members prior to Indian Removal. Due to the cultural and medical importance of this plant, we hypothesize that during Indian Removal, seeds from *M. cerifera* were transported from Chickasaw ancestral homelands (now the states of Tennessee and Mississippi) to Indian Territory (now the state of Oklahoma), where the seeds were planted. We propose to test this hypothesis by extracting DNA and using polymerase chain reaction (PCR) to compare microsatellite markers of plants harvested from the southeastern United States. Our first step was to extract DNA and we applied two basic methods with many modifications. The CTAB and phenol-chloroform methods were used on both desiccant-dried and frozen plant material. After DNA was extracted it was tested on a NanoDrop2000 UV-Vis spectrophotometer to ascertain DNA purity. We also used gel electrophoresis to test DNA quality. Recent gel electrophoresis results demonstrate that DNA was successfully extracted using phenol-chloroform extraction on dried plant leaves. Currently, we are using PCR to amplify microsatellite markers in the DNA. Our current plant samples were harvested from Fayetteville, North Carolina and Pembroke, North Carolina and we are working with the Chickasaw Cultural Center in Sulphur, OK to obtain plant material from that region. Once our project is completed, we

will have a better picture of the genetic diversity of *M. cerifera*, including the natural and human-based migrations of the plant.

## **8 - Comparison of Native Bee and Honeybee Floral Preferences for Pollinator Conservation**

**Brandon Herron**, *Biology*

**Cody Eubanks**, *Biology*

Mentor: **Kaitlin Campbell**

Flowering plants rely upon bees for reproduction through pollination. The European Honeybee was introduced to assist with pollination of crops, but native bees remain extremely important for pollination of native plant communities. Our study aimed to determine if large social bees (honeybees and bumblebees) and solitary bees differ in their floral preferences. We hypothesized: 1) honeybees and bumblebees would primarily visit nectar producing plants because nectar storing needs while solitary bees would use high pollen producing plants, 2) honeybees coevolved with European species, therefore, their floral preference will be for European flowers, 3) bee size corresponds to flower size due to weight constraints, competition-based resource partitioning, and resource quantity, 4) the most abundant flower species attracts more generalist pollinators. Bees were collected from flowers using nets at pollinator gardens at two sites for two hours per day over sixteen days throughout the summer. We collected a total of 482 bees (36 species) from 37 varieties of flowers. White clover and African Basil had the most bee species associated with them (10 and 9 species respectively). Honeybees and bumblebees were found on only 10 flower varieties, and preferred white clover, glossy privet, and squash, which are all good nectar producers. While preliminary, our findings suggest that small solitary bees use different resources from large social bees and that many flower species support bees. 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.

## **9 - Analyzing the Interactions of Plant Diversity/Structure and Ant Communities**

**Will Johnson**, *Biology*

Mentor: **Kaitlin Campbell**

Ants are crucial organisms in many environments because they affect both above-ground and below-ground systems. Ants are sensitive to disturbances and change in soil quality and composition and may also be impacted by plants structure and diversity. Plants represent the base of the food web and their diversity and composition influences organisms by changing the conditions of the environment and the resources available. Fire is frequently used to maintain pine forest ecosystems in North Carolina. Fire can directly impact plants and ants through mortality, but also indirectly by altering soil carbon. In this on-going study, we analyze how soil, plant structure, and fire affect ant biodiversity using

data collected in 2017 (fire) and compare it to data collected in 2018, a year after the fire. Ants were collected using pitfall and Winkler traps in locations with different soil conditions and plant structure. The 2017 data analysis demonstrated that ant biodiversity was lower in locations with wet soil but higher in places with more plant cover. In 2018, a total of 344 ants were collected comprising 18 species. We hypothesize that the added carbon from the fire in the soil will increase total plant height, diversity, and cover in the following year, increasing ant biodiversity.

### **10 - Individual-level foraging niche variation in the omnivorous Eastern Box Turtle, *Terrapene carolina***

**Jasmine Kelly**, *Biology*

Mentor: **John Roe**

Individual-level ecology is a concept that focuses on examining variation in resources use or behavior among individuals in a population or species. Studies that focus on the species or population as the units for comparison may overlook inter-individual specializations, preferences, or tolerances that are important for population dynamics, ecology, evolution, and conservation. We examined individual variation in the foraging niche within a population of omnivorous Eastern Box Turtles (*Terrapene carolina*) using stable isotope analysis. We compared carbon and nitrogen isotope ratios from turtle claw samples to that of various locally available food items including fruits, mushrooms, and invertebrate animals. Claw samples are known to accumulate material from dietary resources over medium temporal scales and thus potentially offer a useful bioindicator of foods the individual has consumed over the past several weeks or months. We hypothesize that the isotopic signatures of the turtle claws will indeed be variable and reveal individual-level food specializations or preferences within the population. If so, this finding could have implications for the conservation and management of this declining species across its broad geographic range.

### **11 - 3,4-Diaminopyridine as a Treatment for Lambert-Eaton Myasthenic Syndrome (LEMS)**

**Savannah Melvin**, *Biology*

Mentor: **Robert Poage**

Lambert-Eaton Myasthenic Syndrome (LEMS) is a debilitating autoimmune disease where the neuromuscular junction (NMJ) does not function normally. A patient with LEMS has damaged Voltage-Gated Calcium Channels (VGCCs), which in return does not allow their NMJ to release an adequate amount of acetylcholine that is required for muscle contraction. A novel treatment for LEMS is administering 3,4-Diaminopyridine (DAP), because the drug blocks presynaptic potassium channels and broadens presynaptic action potentials. Since presynaptic action potentials are broadened, more acetylcholine can be released and reduce muscle weakness associated with LEMS. To further LEMS research, we used a frog

model and focused on the gastrocnemius and the sciatic nerve. The frog muscle and nerve were soaked in different calcium concentrations to simulate the frog having LEMS. After we collected control data, we treated the frog with DAP and then collected data showing the effects DAP has on muscle contraction and nerve excitability. We predicted that muscle twitch (force) generated by nerve stimulation will increase with drug treatment but direct stimulation to the muscle will not generate a change.

## **12 - Exploring the impact of Hurricane Florence on microbial diversity in the Lumber River in Pembroke, North Carolina**

**Dontae Mosley**, *Biology*

Mentor: **Conner Sandefur**

The purpose of this study was to identify and characterize bacteria behind the water treatment plant in Pembroke, North Carolina before and after Hurricane Florence. The Lumber River is a 133-mile-long river that runs through the small town of Pembroke located in southeast North Carolina. Located right along the river is Pembroke's Waste Water Treatment Plant. Water samples were collected from the river behind the plant and tested for fecal coliforms. Preliminary data demonstrate the presence of *Escherichia coli* decreased after Hurricane Florence. Further testing to quantify the amount of *E. coli* and identify other gram-negative bacteria is ongoing.

## **13 - Comparing the Biotic diversity of macroinvertebrates in ephemeral ponds to permeate ponds**

**Jazlyn Pointer**, *Biology*

Mentor: **Erika Young**

Ephemeral ponds are temporary bodies of water that occur during specific seasons or weather conditions. While many ephemeral ponds are natural, ephemeral ponds can also be created in new areas due to land clearing and flattening natural drainage's. Due to their short lifespan, ephemeral ponds typically do not have predators like fish making them prime breeding habitat for macro-invertebrates and amphibians. The lack of permanent predators could lead to higher biotic diversity of aquatic macro-invertebrates compared to permanent ponds. A sample was taken from an ephemeral pond in Pembroke NC using dip nets. Macro-invertebrates from the sample were preserved and are currently being identified. After the invertebrates are identified, we will collect a sample from the permanent pond in the same location. The macro-invertebrates will be preserved and identified. Once all is identified from both samples, they will be counted, and the numbers will be inserted into a biodiversity calculation.

**14 - Antibacterial activity of aqueous extracts of *Sassafras albidum*****Fredejah Royer, *Biology***Mentor: **Conner Sandefur**

Native Americans have the highest age adjusted prevalence of type 2 diabetes among racial and ethnic groups in the United States. Additionally, the gut microbiome of individuals with type 2 diabetes is disrupted compared to the normal gut microbiome. We hypothesize that the more recent reduced use of traditional plants by Native Americans underlies the disparity seen in type 2 diabetes. Here, we report initial investigations into the antibacterial properties of *Sassafras albidum*, a plant traditionally used by southeastern Native Americans. Aqueous extracts were created using the leaves of *Sassafras albidum*; these extracts were tested against 13 aerobic and facultative anaerobic bacteria via agar diffusion assays. Extracts were identified as having inhibitory action against *Micrococcus luteus*, *Neisseria sicca*, and *Pseudomonas aeruginosa*. Extracts did not inhibit the growth of *Bacillus subtilis*, *Staphylococcus epidermidis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Enterococcus faecalis*, *Corynebacterium xerosis*, *Proteus vulgaris*, *Proteus mirabilis*, *Enterobacter aerogenes*, and *Staphylococcus aureus*. Future experiments will investigate the impact of aqueous extracts on the anaerobically growing bacteria commonly found in the gut as a potential therapeutic avenue to address the disrupted gut microbiota observed in type 2 diabetes.

**15 - Glucose Metabolism through Pentose Phosphate Pathway and how it effects the development of Congenital Heart Defects****Olivia Spaulding, *Biology***Mentor: **Marilu Santos**

Persistent high maternal glucose levels can be linked to epigenetic changes in the development of the fetal heart. Gene expression profiling by RNA sequencing in several studies has shown that cardiomyocytes reach full maturation in low glucose media whereas, in high glucose media cells over actively replicate and do not reach full maturation. It has been determined that blocking the pentose phosphate pathway will induce cardiac maturation. The pentose phosphate pathway is responsible for generating NADP<sup>+</sup>/NADPH and ribose sugars that contribute to making nucleotides. Prolonged activation of the pentose phosphate pathway synthesizes excess nucleotides resulting in immature cardiomyocytes leading to congenital heart defects.

## 16 - Above and below ground impacts of *Solenopsis invicta*

**Victoria Spencer, Biology**

Mentor: **Erika Young**

*Solenopsis invicta*, the invasive red imported fire ant, easily spreads to new ecosystems and habitats. They are known to form symbiotic relationships with honeydew producing mealybugs that feed on the roots of invasive Bermuda grass. These mealybugs and their plant partners, in combination, aid in colony growth and spread of fire ants by providing optimal carbohydrate and protein nutritional needs. Ants also alter the chemical and physical properties of the soil, creating biodiversity hot spots for microarthropods and microbes. Our study focuses on the impact of fire ants and fire ant removal on biodiversity of microarthropods, microbes, and mutualists in the soil. Boiling water is often recommended as an effective method in eliminating fire ant mounds, with signs of success after just 2 applications and is valuable for ecological studies because one can test the before and after effects of fire ants on their communities. Little is known about what this removal method might do to the non-target soil flora and fauna. In this study, we selected 50 fire ant mounds located in an acre plot, to sample for microbes, microarthropods, and mutualists. We collected soil samples from inside and outside of the colonies before and after boiling water treatment. We measured soil respiration, microbial community diversity, sampled mealybug mutualists, and extracted microarthropods with Berlese funnels. Looking at microbial communities and symbiotic plant and insect interactions fire ants form will give insight on how this species is able to spread to new ecosystems, their effects on the soil community, and how to potentially eliminate them without harm to sensitive belowground systems.

## 17 - *Varroa destructor* Impact on Temperature Regulation in *Apis mellifera* Colonies

**Marica Thomas, Biology**

Mentor: **Kaitlin Campbell**

Honeybees (*Apis mellifera* L.) are effective pollinators and essential to maintaining natural communities. They are critical in global agriculture, contributing to 1/3 of all US crop production. US honeybee population loss hit a staggering 40% decline from 2017-2018 with the main stressor being Varroa mites, an external parasite that transmits diseases. The goal of this study was to determine if there was a relationship between parasite load and temperature regulation. We predicted that hives with higher mite prevalence will have more trouble regulating their hive temperature, an issue which could potentially impact hive health. To inspect for parasites we swept approximately 100 bees from each hive into alcohol and calculated prevalence. We conducted 58 inspections in 12 sampling periods and 9 hives. We used iButtons to measure internal and external temperatures and calculated standard deviation of internal hive temperatures, as a measure of temperature regulation. We used general linear mixed models with mite prevalence, SD of outside temperature, and period as fixed effects, hive as a random intercept and sampling period as a random slope. Our initial results do not show a significant relationship between

temperature regulation and mite prevalence or outside temperature; however, including these variables in the model did improve the fit. Future work will incorporate additional factors such as number of brood frames and population size. Monitoring hives to ensure stable temperature regulation and low mite levels, can inform beekeepers about the health status of their colonies and allow early detection and prevention of colony loss.

## **18 - Spreading Awareness About the Hardships of Farmworker Children**

**Emily Findling**, *Business*

**Jessica Muniz**, *History*

**Evert Garcia-Guzman**, *Chemistry & Physics*

**Alyssa Willis**, *Social Work*

Mentors: **Michele Fazio** and **Brooke Kelly**

Many of the migrant and seasonal farmworkers in the United States travel with their families as they follow agricultural harvests. Consequently, children raised within a migratory lifestyle are often forced to deprioritize education to help earn an income for their family. Approximately 8% of farmworkers in the United States are minors. About 10% of migrant farmworkers obtain a high school diploma. This could be influenced by that fact that children of migrant farmworkers (as young as 11 years old) discontinue school to pursue full-time employment in the agricultural sector. A Farmworkers' Children University Experience Day will be held on the UNCP campus and will consist of a campus tour, interactive activities involving students and faculty on campus, and a self-expression project. This presentation sheds light on the major injustices faced by children within farmworker families and their unique perspectives on the issues.

## **19 - The Negative Externalities of Smoking**

**Courtney Simmons**, *Business*

Mentor: **Lydia Gan**

In this research paper, I will introduce the term externality and how it is applied in our lives positively and negatively. In terms of health and business, I will assess how smoking cigarettes affects those individuals not only who partake in it, but also how it affects cooperate functionality and health of people associated with smokers. Through statistical analysis, I will touch on the outcomes and consequences of secondhand smoke on children, infants, and prenatal developments. In addition I will discuss the negative effects on workplace productivity due to medical leave, absenteeism, damage to workplace property value, and overall employee health. These factors, along with the ever-condemning social stigmatization affiliated with smoking, show the consequences of smoking are a major risk to affiliates and external environments.

## 20 - Simple Method for Rapid and Sensitive Measurement of Trace Water in Organic Liquids

**Jackson Bounds**, *Chemistry & Physics*

Mentor: **Paul Flowers**

The presence of even very small amounts of water in some organic liquids can be extremely detrimental to the effective use of those liquids in various technologies. For example, moisture in transformer oils can degrade the transformer's electrical insulation properties and lead to catastrophic failures, such as explosions and fires. In many industrial uses, organic liquids contaminated with trace water can negatively impact the efficiency of chemical processes and the quality of synthetic products. Technology capable of measuring small amounts of water in organic liquids is therefore important, and presently the most widely accepted method is Karl Fischer titration (KFT). These titrations are relatively labor intensive and require the use of expensive and toxic chemical reagents. In pursuit of alternative methods, a considerable research effort has been aimed at developing various approaches using the lab-standard technique known as gas chromatography (GC)<sup>1-3</sup>. In this poster, a simple, rapid and essentially reagent-free GC method for measuring trace water in organic liquids is described. Use of a hydrophobic chromatographic column and a mass spectrometer (MS) detector allows sensitive and specific detection of water without interference from other sample components. This GCMS method is rapid, requiring only about 3 min per sample, and very sensitive, exhibiting a limit of detection (LOD) of approximately 1 pmol water (or  $\sim 2 \times 10^{-11}$  g). Future work will focus on correlating the results obtained via analysis of split samples by both KFT and the new GCMS method. This research was conducted during the Fall 2018 semester as an assignment in CHM 4270 "Instrumental Analysis".

## 21 - Implementing State of the Art Laser Diode Devices in Optical Lab Activities

**Patrick Britt**, *Chemistry & Physics*

**James Barstrom**, *Chemistry & Physics*

Mentor: **William Brandon**

Laboratory activities based on state of the art, yet inexpensive, laser diode technology were developed to investigate some fundamental aspects of optical phenomena. The activities exploit two different red, green, blue (RGB) laser diode devices. One of these devices consists of three separate color laser (RGB: 650, 532, 405 – nm), conveniently powered by USB 2.0. The other is a more exotic laser diode device arranged such that two dichroic mirrors combine the three wavelengths (RGB: 640, 512, 448 – nm), and the resulting laser beam appears to the human eye as a "white laser". One laboratory activity involves diffraction so that the sizes of the objects undergoing illumination may be accurately determined – essentially an introduction to optical metrology. The other activity involves the measurement of optical rotatory dispersion (ORD) in a chiral fluid (e.g. Karo corn syrup).

## 22 - Microwave-Assisted Synthesis of Heterocycles

**Brandon Cork**, *Chemistry & Physics*

Mentors: **Cornelia Tirla** and **Paul Flowers**

The following project is an investigation of syntheses of heterocycles, using microwave heating. Recently, the new Ionic Liquid (IL) class of fuels and propellants were recognized as contemporary materials with advantages in environmental friendliness and a highly designable temperature range surpassing previous limitations. Given its additional retention of important properties in extreme conditions, this class is potentially useful as artificial, chemical media capable of supporting exoplanet exploration. The prospect of microwave synthesis for this class is a more ecologically sustainable and efficient synthesis of this unique, organic resource.

## 23- Design and Construction of Inexpensive Wave Driver Apparatus

**Dana Lamberton**, *Chemistry & Physics*

**Mariam Gerges**, *Chemistry & Physics*

Mentor: **William Brandon**

Standing waves in vibrating strings provide a visual means of introducing students to resonance and harmonics. In addition to the direct connection to stringed musical instruments, the notion of harmonics and the underlying physical principles provide an analogy to quantum dot fluorescence, and more generally, to the infinite square well potential in quantum physics, via de Broglie wave analysis. Here we describe a very low cost and robust miniature wave driver affording accurate data. The unit requires minimal storage area and set-up time, is virtually “plug-and-play” and promotes “technological ubiquity” by exploiting free apps (smart phones) or freeware (PC).

## 24 - Educational Resources in Magneto-Optics: Faraday Rotation in F2 Glass

**Dana Lamberton**, *Chemistry & Physics*

Mentor: **William Brandon**

The most common glass samples used in advanced teaching labs addressing Faraday rotation include the “flint glasses”, F2, SF59, SF57 and the common glass, BK7. Here, an exhaustive investigation of the F2 sample is provided. Our data, obtained with a custom-made apparatus, is compared to previous investigations of F2, in addition to data provided in the lab manual created by the manufacturer (Leybold) of a commercially available apparatus. Dispersion curves of the Verdet constant, as a function of wavelength, fit with three different physical models are presented.

## 25 - Study of Quantum Cryptography with a Thorlabs Teaching Apparatus

**Dana Lamberton**, *Chemistry & Physics*

Mentor: **Quinton Rice**

A pseudo-quantum system consisting of laser diodes, wave retarders, beamsplitters, and photodetectors was employed to study encryption of data through binary transmission. The Jones vectors for each optical element can be represented in matrix notation and operated on through simple linear algebra computation. The laser diodes emit polarized photon pulses which can be represented by  $2 \times 1$  matrices which are treated as transmitted bits. Because of the inherent randomness of polarized photons through a beamsplitter any intermediate detection and subsequent transmission of bits by a third party can immediately be detected. In this study, a total error rate of 25% was calculated for a 20-bit key and 52-bit protocol when the transmitted signal was intercepted in agreement with theory.

## 26 - Immobilized Lysozyme Enzyme Reactor

**Brian Lowry**, *Chemistry & Physics*

**Evalyne Muhia**, *Chemistry & Physics*

Mentor: **Sivanadane Mandjiny**

In this study, it is intended to immobilize lysozyme enzyme within calcium alginate gel beads. Alginate is a natural polymer found in seaweed, and a copolymer of glucuronate and mannuronate. This soluble polymer was prepared as spherical beads in the presence of calcium chloride solution. The prepared gel in this manner was characterized in different conditions such as pH and different buffers for its activity. The effectiveness of this immobilized enzyme is compared by both batch and continuous process. All the experiments were conducted at normal environmental conditions.

## 27 - Amoxicillin in African Drug Samples: Using HPLC to Demonstrate the Precision of the Method

**Kaysey Manista**, *Chemistry & Physics*

**Zixian Jiao**, *Chemistry & Physics*

Mentor: **Meredith Storms**

Several environmental factors related to storage, such as light, temperature, and humidity can produce detrimental effects to medications. The way medications are handled and stored over time plays an important role with the overall quality of the drug substance. Pharmaceutical companies in the United States are required to adhere to the regulations set by the Food and Drug Administration. In other countries, however, these regulations are not as important. For instance, in many African countries, medications are sold without packaging and there is a lack of reliable electricity to keep medications cool and to power

refrigerators. Many medicine outlets in Southern Africa are not managed by pharmacists. In fact, the region has one pharmacist per 23,375 people in Sub-Saharan Africa, leading to a lack of knowledge to know how to properly handle pharmaceutical drugs (Kome and Fieno, 2006). The purpose of the research is to demonstrate that the developed HPLC method which will be used to analyze the purity of amoxicillin capsules obtained from African countries meets the requirements for precision and ascertain the limit of detection. The results of the research will help pharmaceutical manufacturers in African countries as well as those who market the medications to understand the importance of drug stability to produce safe and effective products in an effort to improve the overall health of people.

## **28 - HPLC Method Validation: A Global Application for the Analysis of Amoxicillin**

**Ethan Williamson**, *Chemistry & Physics*

Mentor: **Meredith Storms**

Several factors can determine the purity and efficacy of certain pharmaceutical compounds. These environmental factors play a huge role in how drug manufacturers store and handle compounds. Several countries that are without resources such as dependable electricity and clean water, also suffer from not receiving proper healthcare, which includes not receiving correct medication. The main goal of this research is to validate the HPLC method which will be used to analyze the purity of amoxicillin capsules collected from selected African countries to show the importance of safe and effective pharmaceutical products. Before the samples can be analyzed, it is necessary to meet several criteria for a validated HPLC method. Thus, the aim of this research is to demonstrate the linearity of the HPLC method as well as to show that the method meets the requirements for tailing factor and column efficiency.

## **29 - 10 Things an Educator Should Know From a Parent's Perspective**

**Carly Rochelle**, *Education*

Mentor: **Marisa Scott**

The objective of this research is to establish a framework for student's in the School of Education at the University of North Carolina at Pembroke (UNCP) and to benefit health care professionals who work with children with disabilities in the school setting. This research is also intended to bridge the gap between parent's expectations and the services provided in the school setting. Using a survey, this study involved participants who have children with disabilities from infancy to adulthood and focuses on diverse proposed demographics. These participants included American Indian, African, African American, Hispanic, Hispanic American, Asian, and Asian American parents. Along with the survey, participants provided the top ten things that educators and professionals should know to effectively understand and teach their child through multiple services. In the school setting, such services include, but are not limited to, mental health counseling, occupational therapy, physical therapy, and speech-language therapy. Services that are given in the

school by other professionals and educators also include assistive technology, specific accommodations, modifications of course work, paraprofessionals, and more provided by the participants. From this research, teachers will have a better understanding of parent's perspectives of services in the classroom and will encourage inter-professional collaboration between those who work in schools to provide the appropriate services needed for children with disabilities to learn effectively. This study was created to prepare students at UNCP for jobs relating to education and to lead them to be successful educators in the future.

### **30 - First-year Students, Pen Pals, and Educational Transitions: A Service-Learning Project**

**Hannah Middleton**, *Education Specialties*  
Mentor: **Scott Hicks**

Throughout the academic career of a student, many important transitions occur. One of the most important transitions is the transition from high school to college made by first-year university students. This project takes a close look at this transition through the researcher's experience coordinating a service-learning project that engages first-year students to reflect on this transition. Every fall, UNCP students enrolled in Honors UNV 1000: First-year Seminar courses participate in a service-learning project in which they write letters to middle school students enrolled at CIS Academy in Pembroke. Their letters relate their experiences as a new student at the university, what they are experiencing as they transition from high school to university, and advice about how their pen pals can also successfully make this transition. The CIS students in turn give advice to their first-year pen pals about succeeding in school, describing their hopes and goals for the future, and asking questions about the experiences of university students. This research presentation gives a brief history and overview of the many important aspects of the planning and execution of the project as well as a brief discussion of the benefits that have been observed by first-year students participating in the project.

### **31 - Geography of Lung Cancer in North Carolina**

**James Campos**, *Geology & Geography*  
Mentor: **Dennis Edgell**

The spatial distribution of lung cancer is explained by environmental and other factors. The correlation between smoking and lung cancer is well known, but environmental impacts from urban areas and radon levels can also contribute to higher lung cancer rates. North Carolina is ranked 23rd in the nation for smoking rate but is ranked 13th in the nation for lung cancer rate. This project examines geographic factors and explanations of lung cancer rates in the state. Lung cancer data were obtained from the Center for Disease Control (CDC). Zone maps are used to show distributions. Rural areas tend to have higher lung cancer rates than urban areas due to lifestyles, isolation, socioeconomic status, or the

delay or dismissing of cancer screenings. The 5 largest populated counties from least to greatest Durham, Cumberland, Forsyth, Wake, and Mecklenburg do not feature in the top of the list for lung cancer rates. Pamlico County is the county with the highest rate of lung cancer in the state. Radon zones show the amount of gas, radon that is present in an area. It is divided into 3 zones. Zone 1 which is highly potentially hazardous, zone 2 is moderately potentially hazardous, and zone 3 is low potentially hazardous. Western NC is considered zone 1 and 2. The 5 counties in the top 10 for lung cancer rates reside in Western NC, 4 of those counties are in zone 2 while only one, Rockingham County is in a level zone 1. Warren, Vance, Franklin, and Wake are not in Western North Carolina but are zone 2.

### **32 - Differences in Pollen from Southeastern North Carolina Bee Hives In the Same Environmental Conditions**

**Sally Cook**, *Geology & Geography*

**Brandon Le**, *Biology*

Mentors: **Martin Farley** and **Kaitlin Campbell**

Generally, melissopalynological studies in North America have reported on pollen from honey from beekeepers without much detailed information on the location of the hives or comparison of results from closely located hives. We analyze honey individually from seven hives located together on the UNC Pembroke campus from the 2018 season to determine differences among hives. All of these hives occur in the same microclimate, weather, and other environmental conditions. There are two sets of hives within which the bees are fairly closely related and two hives that are distinctly different. Samples were processed by standard techniques: 10g of honey was diluted by ethanol and centrifuged to eliminate the ethanol and honey. The organic residue was acetolyzed and strew mounted for light microscopy. To date, we have completed replicate analyses of pollen concentrations per 10 g of honey for all the honeys. This allows us to control for different analysts and possible differences among slides in the mounting process. Overall pollen concentration per 10 g in these samples ranges from average low of 3,190 grains (very poor on the international standard scale) to 32,200 (intermediate on the standard scale). Concentrations are consistent within each hive. The use of replicate sampling will make possible eventual comparison of sample results by ANOVA. There is so far no obvious pattern associated with the relationships of the bees for the hives. These concentration results are consistent with concentrations determined for the combined honey sample we collected from UNCP hives for 2017. In addition, these concentrations are consistent with the lower values we have recorded in the past for rural southeastern NC compared to concentrations for honeys collected in the Triangle (concentrations typically above 100,000/ 10 g honey). Work continues on further delineation of difference among the honeys.

### 33 - Coastal Eutrophication of North America

**Darian Covington**, *Geology & Geography*

Mentor: **Dennis Edgell**

The objective of this research is to provide an educational understanding of coastal eutrophication as it affects North America. Approximately 71% of the Earth's surface is covered by water, and oceans make up about 96.5%. Eutrophication, over-enrichment of waters via nutrients, threatens and degrades coastal ecosystems around the world. Two main symptoms of eutrophication include hypoxia (depletion of oxygen) and harmful algal blooms. Additionally, other contributing eutrophication factors such as fertilizer runoff and fossil-fuel usage destroy aquatic areas and promote loss of biodiversity. These are leading causes in leaving the ocean with scant or zero oxygen, rapidly killing marine life, and causing millions of dollars in damage. Hypoxia in the coastal environment has created 'dead zones' where marine life cannot be sustained. There are 762 worldwide coastal regions impacted; 479 sites identified as hypoxic, 55 sites recovering from hypoxia, and 228 sites experiencing eutrophication. There are 405 identified dead zones worldwide. In North America, there are 131 eutrophic and hypoxic coastal zones. Rise in eutrophication is primarily attributed to increase of intensive agricultural practices, population growth, and industrial activities. This increases release of greenhouse gases alongside nitrogen and phosphorus flows into the environment. This project highlights the ecological destruction we are causing the ocean through eutrophication due to lack of environmental consciousness. Maps, charts, and updated data from National Oceanic Atmospheric Administration (NOAA) will be summarized. The purpose is to inform, educate, and bring awareness to these issues.

### 34 - The Geography of the National Football League: Research Project

**Charles Johnson**, *Geology & Geography*

Mentor: **Dennis Edgell**

I believe that there needs to be an increase in qualitative and quantitative studies done that report findings about the research concerning the regions and movements associated with the National Football League. The reason for my concern is because of the fact, that players and team personnel must travel across different geographic regions and quite often across the United States and abroad. Then my next concern is how the National Football League's presence effects different locations on the map. I will conduct my research by pulling sources from several peer-reviewed scholarly journal articles, scholarly websites, and news articles to create a foundation of credible and relevant information to provoke quality learning. The maps that I plan to utilize will display key locations of the National Football League, weather patterns, elevation changes, and other specific facts that secure my claim that more research needs to be conducted that represents facts about how geography affects the National Football League and how Geography is itself affected by the National Football League. I expect to find out that there are geographical factors that actually effect

players' performance such as the elevation changes, weather, and air quality differences. This project is very interesting to me because I happen to be an athlete myself.

### **35 - Groundwater Research**

**Tori Saunders**, *Geology & Geography*

**Edgar Lopez Roldan**, *Geology & Geography*

Mentor: **Daren Nelson**

The University of North Carolina at Pembroke (UNCP) is located in the rural coastal plain of southeastern North Carolina. One of the great assets of our region is its abundant groundwater resources that is being developed for both industrial, agricultural, and domestic supplies. The Southeastern North Carolina Groundwater Project has been very successful in helping our students excel in their academic and professional development as well as increase recruitment within our Geo-environmental program by providing internships in partnership with local water resource leaders. The Robeson County Water Department, local well drillers, and the Geology and Geography Department at UNCP has collaborated together in this program to monitor local groundwater resources. UNCP has multiple wells on campus in which has been monitored for the last 3 years. The data has been added to an online ArcGIS database and water surface maps have been created to understand the groundwater use on our campus. This presentation will discuss how the students collected, used, and analyzed the data to construct these maps and why it is important that faculty/students understand how they are using their water, by how much, and how the wells are reacting to the use.

### **36 - Weather, Climate, and Professional Baseball**

**Amir Shomari**, *Geology & Geography*

Mentor: **Dennis Edgell**

Baseball is a sport that is traditionally played outside. Aspects of the game are dependent on the state of the atmosphere, even after enclosed stadiums and artificial fields were popularized. The atmosphere exerts a significant impact on how fast a pitch will travel, how much the ball will move in the air, and how far a hit ball will travel. Small differences in air density, humidity, wind and temperature affect the flow of air around a baseball. Home runs could become routine fly balls, or vice versa depending on the state of the atmosphere. Even the Coriolis effect has a minute influence. Weather also has physiological influence on players. Baseball has always been "a game of inches" where any of these small variations explain the difference between winning or losing. This poster project will present and discuss how these atmospheric features play key roles in baseball. Many factors explain why so many home runs were hit in the first few years at Coors Field, Colorado, and why that has now changed. Some of the atmospheric effects on the flight of a baseball are well understood by fans, other factors are poorly understood, sometimes the opposite reasoning is regarded as truth. This educational project will clarify some of these

issues. Climate has an influence on stadium location and orientation, it even influences the popularity and marketing of the sport. Retractable domes are rising in popularity. The climatology of the stadiums recently built in Arizona and Seattle stadiums are discussed. Perspectives of climate on the business of professional baseball in the United States and Canada are also provided.

### **37 - Mount Rushmore National Memorial**

**Damita Stephens**, *Geology & Geography*

Mentor: **Dennis Edgell**

Mount Rushmore National Memorial is an iconic feature of American cultural landscapes. The four Presidents engraved in granite were chosen by the sculptor Gutzon Borglum to represent the birth, the growth, the development and the preservation of the United States. The memorial receives more than two million annual visitors. The popularity of the memorial places some strain on the supporting infrastructure of the monument. This poster project offers a description of the renovation and reconstruction efforts with the expressed intent to enhance the comfort and accessibility for all visitors to the Presidential monument. Although \$14 million dollars has been allocated for the upgrade, a stipulation is made that the four heads of the presidents are not to be touched. Areas leading to the memorial will be upgraded to facilitate accessibility for everyone, and especially improve the experience for special needs visitors.

### **38 - Rethinking U.S. Power Plant Vulnerability to Earthquakes**

**Connor Watt**, *Geology & Geography*

Mentor: **Dennis Edgell**

The U.S. is overwhelmingly dependent of fossil fuels and nuclear power for almost all its commercial energy. American power generating plants are at some risk to earthquakes. Some power plants are located perilously close to or along earthquake faults. Damage to nuclear reactors is of utmost concern to the public. However, damage to large fossil-fuel based plants is also an issue, as their supporting industrial and transportation infrastructure is vulnerable to ground liquification. The vulnerability of energy production facilities to an earthquake depends on two factors, the proximity to known fault lines, and the ability of the power plant and its supporting infrastructure to withstand an earthquake, which depends on its design, construction, upkeep and age.

Most people are familiar with the earthquake zones associated with Earth's tectonic plates. Earthquake damage to a nuclear plant has already happened with the Fukushima nuclear power plant disaster in Japan in 2011. Such an event could potentially happen here in the U.S. as well. The U.S.G.S. has mapped many other potentially hazardous seismic areas across the country in the past few decades. Many of these zones happen to be in densely populated areas, where the seismic danger was not known when the power plants were built. Human-induced earthquakes are also an issue. The possibility of earthquakes strong

enough to damage U.S. power production infrastructure is very real. This project will outline those power plants of the U.S. which are particularly vulnerable to seismic activity. Maps of vulnerable areas are presented. Suggestions for the mitigation of possible power plant and environmental damage is discussed.

### **39 - Chicago's Inner-City Life and Culture**

**Aaliyah Weatherington**, *Geology & Geography*

Mentor: **David Walton**

When I took Dr. Walton's "History of Hip Hop" course, he mentioned the term 'drill rap.' Because of the limited time we had in the semester, we did not discuss a lot about drill rap, so I decided to do further research and found interest in it. 'Drill rap' is characterized with "trap-influenced beats...paired with violent lyrics that focus on gang life, drugs, guns and killing. Drill itself means to fight or scrap and can also refer to a firearm" (Diego, 2016). Diego's definition helped me understand that 'drill rap' is associated with violence in Chicago. I then developed a research question: how did this subgenre develop in such a particular location? To answer the question, I gathered some historical data for Chicago regarding crime, income, and education (since they all intertwined with each other) during the 80s/90s. I also gathered some present data regarding crime, income, and education so I could compare the six datasets. In addition, I focused on different neighborhoods in Chicago for each of the three datasets so my maps would not be cluttered. For instance, if I just focused on North Lawndale, it would be very difficult to effectively convey the historical and present statistics on crime, income, and education on my maps. Instead, I focused on six neighborhoods for two reasons: it is not a cluttered mess and it effectively shows that 'drill rap' applies to more than one Chicago neighborhood. Also, I produced a map illustrating the diaspora of Hip Hop music in the United States. This map shows the spatial pattern of the origins of Hip Hop as a whole as well as the origins of drill rap in Chicago.

### **40 - Environmental Risk of the Proposed Atlantic Coast Pipeline through the Watersheds of Robeson County**

**Rachel Williams**, *Geology & Geography*

**Trevor Jacobs**, *Geology & Geography*

Mentor: **Dennis Edgell**

The Atlantic Coast Pipeline may be built from the shell deposits in West Virginia to deliver natural gas to customers in Robeson County. There is significant concern about possible environmental damage, particularly to the water quality that could be affected by the pipeline through construction or a possible leak. This pipeline is designed to bring cleaner, more cost-efficient fuel to residents, as the region moves away from traditional coal and petroleum fuel resources. The pipeline could also bring some jobs, stimulate economic growth, and be a source of increased property tax revenue. However, there are possible

dangers and worst-case environmental scenarios which should be understood. This presentation is intended to educate our local population about potentially devastating environmental damage to our watersheds. ArcGIS maps will be utilized to portray and evaluate the environmental risk, and extent of possible damage to the region over time. Maps to be presented include "Proposed Build of Atlantic Coast Pipeline" and another map of "Robeson County Watersheds". This map analysis will communicate to the public these environmental risks and the extent of the damage if an accident occurs.

#### **41 - The Great Escape Park**

**Charli Bullard**, *Health, Physical Education & Recreation*  
**Tyriek Ramseur**, *Health, Physical Education & Recreation*  
**Kayla Taylor**, *Health, Physical Education & Recreation*  
**Ricardo Lindo**, *Health, Physical Education & Recreation*  
Mentor: **Marian Wooten**

The Great Escape Park is a design intended to serve the therapeutic needs that are believed to be present in the community of the University of North Carolina at Pembroke as well as the surrounding community of Pembroke, NC. The intent is to target staff, faculty, and students of UNCP, as well as the people (of all ages) of the Lumbee Tribe and community of Pembroke, NC. The Great Escape Park will have several learning opportunities to offer all groups, and will allow children and youth of all ages to engage in our community's environmental health, and expose kids to be environmentally cognizant. Located centrally on UNCP's campus, children will be made comfortable with a university campus, providing opportunity for encouraging of our community, town, and tribe's children to pursue a higher education right here at home. The Great Escape Park is believed to serve the therapeutic needs of everyone to improve both mental and physical health in Pembroke, NC. The park will offer several fitness amenities such as a walking track, yoga platform, and availability to fitness classes. The park will also offer mentally therapeutic amenities such as hammocks, picnic areas, study areas, and fishing areas. The Great Escape Park will provide public restrooms for men and women as well as small sized sinks and toilets for kids. There will be a main building that will include fishing poles, gardening tools, yoga mats, playground equipment, fitness equipment that will only be operated by park personnel. The Great Escape will also provide free wifi for all users in all areas of the park.

#### **42 - A Safe Haven for Relaxation**

**Courtney Eaton**, *Health, Physical Education & Recreation*  
**Ismarie Rosario Garcia**, *Health, Physical Education & Recreation*  
**Hunter Martin**, *Health, Physical Education & Recreation*  
Mentor: **Marian Wooten**

The purpose of this project was to create a recreation facility on the campus of the University of North Carolina at Pembroke (UNCP). The mission of this project was to

develop a safe haven for relaxation and peace for the university community to escape the stresses of everyday life. This creative project explores the process of facility and site design, which entails many features. Knowledge in programming, funding, construction, and management structuring assisted in success of this project. Survey writing was found to be the most effective source to compile useful information to accomplish the mission. UNC Pembroke does not judge based on sex, gender or ethnicity. A park that supports and protects these principles greatly assists and pushes the university into the future.

#### **43 - New Park Proposal**

**Ean Ormsby**, *Health, Physical Education & Recreation*

**Craig Strickland**, *Health, Physical Education & Recreation*

**Ericqueisha Bratcher**, *Other not listed*

**Shianne Koehnle**, *Health, Physical Education & Recreation*

Mentor: **Marian Wooten**

This project was to build a new park facility on the UNCP campus, in the existing baseball stadium park. Our mission when designing the facility is to improve the quality of well-being for UNCP students, faculty, and community, through the development of a well maintained and thoughtfully constructed outdoor park. Based on our research of college students, campuses are lacking more areas to allow the needed time and space to decompress from the rigors of daily tasks involved in being a student. Learning this information prompted us to take action to develop a survey to gather a better understanding of what students, faculty, and the community would most use in a facility. Completion of this survey allowed us to garner a thorough design of a facility that would best encompass the needs of the students, faculty, and community of UNCP.

#### **44 - UNCP Park**

**Hailey Shepard**, *Health, Physical Education & Recreation*

**Kristopher Bethel**, *Health, Physical Education & Recreation*

**Camille Hooker**, *Health, Physical Education & Recreation*

**Demarkeis McInnis**, *Health, Physical Education & Recreation*

Mentor: **Marian Wooten**

The mission is to develop a tranquil environment for students and staff members at The University of North Carolina at Pembroke (UNCP) and for the community. The intended project will provide the following: a place to relax and unwind, study areas, play area for children, a dog park, new basketball hoops, platform for unlimited possibilities, turf field, tennis courts, and a walking trail that will surround the park. The park will continue the endless beauty and historical architecture that the campus provides through the statues and buildings that will be within the park. It will add value to the campus in the sense that it will increase morale, add locations for events to be held, and provide the community with a place to escape. The park is intended for use of all ages and will be open to the public.

Integrating concepts that appeal to all will allow for the community to come together as a whole and increase involvement.

#### **45 - Sammy Cox Park**

**Andrea Smith**, *Health, Physical Education & Recreation*

**Joshua Boyd**, *Health, Physical Education & Recreation*

**Angelica McNair**, *Health, Physical Education & Recreation*

**Mikayla King**, *Health, Physical Education & Recreation*

Mentor: **Marian Wooten**

Our group is creating a fictional facility on the campus of The University of North Carolina at Pembroke (UNCP). Our mission is to provide a space that unites UNCP and the community through arts, play, and culture. This facility will be one big park but will have three different sections. The first section will be the game area where people can gather with their friends to destress and have a little fun. The second area will be the stage area; this is where monthly concerts, talent shows, open mics, and other major events will be held. The last section will be the actual park, which will also include study areas and walking trails. This park will be equipped with special attractions such as a water feature, eating areas, multiple different games, and accessible amenities.

#### **46 - American Indians During the Civil War**

**Sydney Oxendine**, *History*

**Keyona Hargett**, *History*

Mentor: **Jaime Martinez**

The topic of slaves is quite prominent when discussing the Civil War, but what about Native Americans? Native American Nations had different stances on the Union and the Confederacy. Some tribes chose to fight alongside the group that benefited them the most while others chose to remain neutral during the war. The Pamunkey Nation in Virginia, the Catawba and Lumbee in South Carolina, the Creeks and Cherokees in Indian Territory, and the Lowry Group (Lumbee) in North Carolina were very different groups of American Indians but they shared in the fact that they were oppressed by the Confederacy in similar ways. The Pamunkeys were forced to be laborers in 1861-1862, while the Lowry Gang chose to “lay out” as an alternative. In a similar case, men from the Catawba and Lumbee communities in South Carolina were conscripted or forced into labor. Some Creek and Cherokee groups west of the Mississippi River rebelled against the Confederacy. By using primary sources, an untold story about Native American resistance to the Confederacy began to unfold. The difficulty lies with giving a voice to a ethnic group with little surviving primary sources. One must decipher the story of Native Americans through the little documentation left by white Americans. The effects of Native American resistance to and oppression from the Confederacy are still not clear, but what is evident is that Native

American tribes were active during the Civil War and determined to participate in ways that reflected their own interests.

#### **47 - Thomas and Patsy: The Jefferson and Gender Norms in the Early Republic**

**Samantha Pilkenton**, *History*

Mentor: **Mark Thompson**

This project examines the relationship between Martha “Patsy” Jefferson Randolph and Thomas Jefferson in the context of gender roles/norms during the Revolutionary and Early Republic era in the United States. It provides conceptual framework for their relationship by discussing the ideas of the Age of Enlightenment, like *feme sole* and *feme covert*, as well as the developed focus on gentility among urban elite as the United States became established. This looks at the change from women’s roles staying within the home world to viewing the female role as an adaptable role to accommodate varying, ever-changing needs of American society. This contextualization outlines women’s roles in society to identify the ways in which Jefferson’s relationship with Randolph was both similar and different from the societal norms. This project looks specifically at their relationship in terms of Jefferson’s expectations of Martha in her adolescence and the shift in their relationship as she matured into one of his greatest confidantes.

#### **48 - Peyotism and the Native American Church Movement: an Ethno-Geographic Study Using a “Five Themes” Approach**

**Richard Varner II**, *History*

Mentor: **Dennis Edgell**

The Native American Church Movement (NAC) and its predecessor, peyotism, are a geographically and culturally distinct form of indigenous worship. At its core belief, this ethnic religion is characterized by the sacramental use of the peyote plant, *Lophophora williamsii*, which contains measurable amounts of the organic alkaloid, mescaline. The purpose of this project is to demonstrate the unique ethno-geographic relationships held between the environment and the practitioners of peyotism. The “five themes of cultural geography” concept (after Jordan-Bychov, 2014) is used as an educational framework in order to explain essential aspects of the faith in a concise but accessible manner for a general education audience. Maps of the distribution of the religion and the peyote plant are used to convey the theme of cultural region. The cultural diffusion theme is also shown with maps, depicting the faith’s origin and dispersion from northern Mexico. Peyotism’s link to the environment demonstrates the theme of cultural ecology, as the religion’s continued existence is tied to the specific climate and physiography of the peyote plant. The theme of cultural interaction is explored, in the many ways that peyotism is linked to other aspects of indigenous culture, contemporary society, and law. The visible and tangible imprint of peyotism on the cultural landscape is thematically expressed through indigenous art and the erection of ceremonial dwellings.

## 49 - Navigating Social Media: Tricks and Tips

**Samantha Smith**, *Mass Communications*

Mentor: **Peter Grimes**

For the purposes of this application, I will be conducting research on social media and how it ties in with marketing, what the “tricks” are and how to engage the audience while acting as a professional entity, such as a magazine. Unrelated to social media, I will also be comparing what I have learned in courses here at UNC Pembroke with what I will be doing as a web editor and social media consultant. I want to highlight the differences in conduct, performance and expectations on the job versus what I have come to expect.

My hypothesis is that there is a key to social media. It is not this unknown entity that only young people can navigate. There are certain languages to use to attract the attention of the corresponding audiences while still being professional and objective. I want to create a schedule and plan for Peter Grimes that all businesses and publications can adapt to fit their needs and audiences. To do this, I must first find examples of social media accounts of publishing companies and magazines that have a larger following and active viewers. Through analysis of successful and unsuccessful accounts I will learn what the differences are and highlight those. From there, I will be able to create an outline for anyone attempting to navigate social media and use it effectively.

## 50 - Using computational modeling to explore the effects that the gut microbiota has on glucose regulation in type 2 diabetes

**Cody Morazan**, *Mathematics & Computer Science*

Mentor: **Conner Sandefur**

Type 2 Diabetes (T2D) is a chronic metabolic disease that causes the body to irregularly produce and respond to the hormone insulin, which results in elevated blood glucose levels. When intestinal epithelial cells are inflamed and disrupted the gut microbiota lose their balance and diversity which in turn causes the unregulated metabolism of carbohydrates into glucose and desensitization of insulin signaling. As glucose continues to leave the intestinal lumen and enter the blood without proper insulin production to utilize that glucose, this metabolic dysfunction ultimately results in chronic T2D and can be fatal. T2D statistically affects Native American adults more than any other race or ethnicity. Plants that were once used to control such diseases are no longer used as often and it is known that the gut microbiomes of Native Americans are moderately different than the gut microbiomes of other races and ethnicities. In this project, we created a computational model of glucose-dependent microbiota in intestinal epithelial cells. This model serves to outline the relational differences between a healthy representation of the relationship between gut microbiota and glucose, and a diabetic representation of the same relationship. This new model was created using parameters that were altered using a parametric sensitivity analysis and by means of the normal distribution. The implementation of a successful model could potentially aid in future therapeutic interventions for T2D by altering gut bacteria.

## 51 - Explaining State Variation in Incarceration Rates

**Jacob Newton**, *Political Science & Public Administration*

Mentor: **Martin Mayer**

State incarceration rates have been a topic of much policy discussion. One notable issue missing from much of the literature is the various determinants that account for state differences in incarceration rates. Why are some states more or less likely to incarcerate their citizenry than other states? This project examines the fifty states in a cross-sectional state comparative model. Using a dependent variable of state incarceration rate, we offer and test several explanatory models, including socioeconomic factors, political explanations, social control mechanisms, and structural factors. We find socioeconomic explanations to be the most robust, but we find varying degrees of support for each of our four models.

## 52 - Capital Punishment: The Ailing Lethal Injection

**Carlos Rodriguez**, *Political Science & Public Administration*

Mentor: **Renee Lamphere**

This presentation investigates the current implementation and issues surrounding lethal injection, the most prominent method of capital sentencing. The necessity of researching such a topic and its methodology derives from the controversial nature of capital punishment and how several issues are creating plateaus towards its usage and legal status within the United States. Since the first recorded execution in the United States in 1608, the rise of abolition groups in the late 1700s followed by the seminal Supreme Court case, *Furman v. Georgia*, the death penalty has seen many revisions in execution methods, the legality and limitations of executions, and states either placing a hiatus or total abolishment on its usage. As of February 23, 2019, 31 states, the federal government, and the United States military authorize the use of capital punishment. In the realm of capital sentencing, the usage of lethal injection is experiencing three conundrums that is delaying its usage: reports of botched and failed executions, several constitutional questions that entail its creation as well as the controversial drugs used in lethal concoctions, and the lack of needed drugs to create said concoction, which has resulted in a subset of issues. Additionally, this presentation addresses the previously mentioned issues and seeks to propose possible solutions as well as possible implementation methodologies that may diminish the frequency of issues the death penalty is currently undergoing.

### **53 - To Help or Not to Help?: Empathy and Socioeconomic Status**

**Moriah Addison**, *Psychology*

Mentor: **Shilpa Regan**

Research suggests people of lower socioeconomic status (SES) tend to be more empathic towards others compared to those of higher SES (Piff, Kraus, Côté, Cheng, & Keltner, 2010). Participants consisted of 176 college students of diverse ethnicities and social classes. Participants were randomly assigned to read one of two scenarios involving people of low and high SES in a car accident. Afterwards, participants answered questions regarding the scenarios as well as a trait and demographic questionnaire.

Results did not show a significant difference in empathy when asked if the individuals should be helped. Participants reported individuals in the low SES scenario ( $M = 4.45$ ,  $SD = .85$ ) and the high SES scenario ( $M = 4.56$ ,  $SD = .73$ ) both should be helped,  $t(174) = .942$ ,  $p = .35$ . The majority reported the individuals in the high SES scenario were either high class (75%) or middle class (23.7%). In the low SES scenario, 51% of participants reported the individuals were low SES and 40% of participants reported the individuals were middle SES. Thus, the results may have been affected since our low SES scenario was interpreted to be low and middle SES. It may also be that the lines between low and middle class are blurred. In addition, our sample presumed the individuals in both scenarios were largely White/Caucasian, which is surprising given our sample is ethnically diverse and minorities are more likely to be of low SES. The entire sample was also concerned for others ( $M = 4.21$ ,  $SD = .92$ ) which suggests the sample was empathetic regardless of SES of the scenario. Thus, an empathic personality trait may be more influential than SES in helping behaviors.

### **54 - "I'm Sorry to Ask You This but It Would be Helpful for You to Do Your Job": The Effects of Type of Language Used By Male and Female Supervisors.**

**Andrew Sheppard**, *Psychology*

Mentor: **Kelly Charlton**

In an effort to study the effect of type of language used in a professional setting, participants read about a male or female supervisor who used either direct or stereotypically feminine language to direct a project. Results indicate that type of language used affects ratings of the supervisor.

### **55 - Appearance and the Assumption of Personal Characteristics through the Lens of Gender**

**Korrinne Bethel**, *Sociology & Criminal Justice*

Mentor: **Brooke Kelly**

This research project is an investigation into the assumptions people make about others based on the gender they assume a person to be. In the culture that my participants are a

part of, gender is often viewed as binary: women and men have particular characteristics that oppose each other. Men are masculine, strong and assertive. Women are feminine, gentle and caring. This study delved into whether people continue to associate certain characteristics with a person based on the gender they have assigned to the person.

## **56 - Oral Health of Children**

**Savanna Brewer**, *Sociology & Criminal Justice*

Mentor: **Renee Lamphere**

Statistics and research articles provide information on dental care in children from all over the world. Also, research reveals that undeveloped countries face disparities that prevent oral health from being a major concern. Research suggests that culture, social class, and background affect the oral health of children. Some authors suggest that independent of socioeconomic level, more equal societies have better health because they are more cohesive and supportive, and individuals have a mutual understanding (Guedes, Piovesan, Antunes, Mendes, & Ardenghi, 2014). Using the research design to survey parents and caregivers of children will provide data about the demographics, oral health history, and type of drinking water pertaining to each participant. After analyzing this data, conclusions and trends of the oral health of children can be studied. Researching the importance of oral health in the lives of all children will stimulate society to view oral health as an equal part of overall health.

## **57 - Food Insecurity Among UNCP Students: A Descriptive Study**

**Megan Brinson**, *Sociology & Criminal Justice*

Mentors: **J. Porter Lillis** and **E. Brooke Kelly**

Food insecurity may be defined as a lack of reliable access to an appropriate amount of affordable, nutritious food. A nationally recognized problem, food insecurity is also known to be an issue for college students. This study is descriptive research based on survey responses of UNCP students (n = 251) about their experiences with food insecurity in college, current level of food security, and suggestions for change. The 79-question survey was administered using Qualtrics and all UNCP students were invited to participate via email. This research endeavor was chosen for funding through the Student Undergraduate Research Funds program of the PURC Center. This study will assess the prevalence of food insecurity at UNCP. Among the demographic variables considered in this analysis are race, gender, social class, number of dependents, etc. The findings from this study will help us to understand the incidence of food insecurity of UNCP students and to assess potential needs.

## 58 - Probation & Parole Officers

**Darius Mangum**, *Sociology & Criminal Justice*

Mentor: **Renee Lamphere**

Most of the general public, including criminal justice students, do not fully understand what it takes to be a probation or parole officer. There are many obstacles, and sacrifices each and every officer must go through in order to meet or exceed expectations. It is no secret that this career is stressful, as with other careers in law enforcement or corrections. These officers risk their lives on a daily basis, and the amount of stress they have to endure is more than honorable. It takes a special individual to serve his or her community by closely monitoring individuals who have committed crimes against society. It is not a career that is made for everyone, and it is not an occupation to be taken lightly by the officer or offenders. There are over 4 million Americans currently under community supervision, which is also similar to 1 out of every 5 adults in the United States, making this career field much needed. I intend on educating my fellow classmates on a possible career of becoming a probation and parole officer.

## 59 - The Impact of Premarital Cohabitation on Family Outcomes

**Tineshalee Rosado**, *Sociology & Criminal Justice*

Mentor: **Renee D. Lamphere**

In the last couple of decades, the number of individuals living together before marriage have increased significantly in the United States. Individuals that live together before marriage are more likely to divorce and create many negative effects to their families and children. These couples have also been found to be linked with the likelihood of marital disruption. This paper analyzes the negative effects that premarital cohabitation has in families and how the institution of marriage has better outcomes for families. To answer this question, I present an analytical research that reviews the existing evidence of the effects it has in children development and family stability. The study concludes that premarital cohabitation affects children psychologically, educationally and sociologically. The findings of the research also conclude that premarital cohabitation affects the society changing how individuals see the institution of marriage.

## 60 - Corporal Punishment & Delinquency

**Jordan Williams**, *Sociology & Criminal Justice*

Mentor: **Renee Lamphere**

Corporal punishment refers to physically reprimanding in a corrective way one's actions. Corporal punishment is typically used among parents to discipline their children. This research investigates whether or not corporal punishment is directly tied to delinquency. Overall, the findings were nonconclusive, as some research suggest that strict corporal

punishment experienced during childhood would lead to delinquency, and other data shows that it is an array of factors that lead to delinquency and cannot be solely blamed on corporal punishment.

## Exhibits

### 1 - Multi-Block Relief Printing

**Lilly Fowler**, *Art*

**Cali Stuckey**, *Art*

Mentor: **Brandon Sanderson**

For my exhibit, I will demonstrate the process of creating a multiple-color relief print. Relief Printing originated in China, and was popularized by Ukiyo-e printmaking in Japan. I will be using a modern adaptation of these techniques to create my own work. I will have blocks, ink and a printing press on hand for people to view and participate in the process. Participants and viewers may also take a finished print home with them.

### 2 - Interpreting the Self

**John Rhodes**, *Art*

Mentor: **Brandon Sanderson**

Each one of us goes through a unique experience as we live our lives, in which we examine ourselves and determine who we are. This is not always a conscious process. Often we reflect on our experiences and interactions and instinctively (and sometimes subtly) alter ourselves in response. I wish to explore this idea of self-interpretation through visual images dealing with common issues of identity such as community, faith, race, sex, body image, etc. I will produce a thematic series of relief prints, which uses wood-blocks and carving tools to create raised areas that are inked and then printed on paper. These will be exhibited in a local venue. This will allow the University community and the local community to interact as one and begin a conversation about shared experiences.

### 3 - Unholy Trinity

**Lemuel Subdias**, *Art*

Mentor: **John Labadie**

Unholy Trinity is a mixed media drawing created with graphite, gold leaf, and acrylic paint. The idea for this piece came from various influences, including art from the Renaissance, Baroque, and Classical eras. It began as an assignment with the theme called

“Doppelgänger” (“double walker” in German), defined as a double or second self. The premise of this assignment is to create a visual representation of your personal double or alter ego. I began to delve into more research in art of the listed eras and found the common use of gold leaf in royal and religious artworks in Byzantine- Early Renaissance artwork. I used male figures in Greek robes, inspired by the Classical era. The dramatic lighting and faces from late Renaissance-early Baroque pieces is shown in this drawing as well. This is the primary focus of the series. I created a thematic series primarily focusing on portraits. This serves as a reflection of personal stories and a reflection of my own personality. The series is titled Unholy Trinity as an homage to religious pieces from earlier periods, while reflecting personal stories and exploring my persona. I read through various journals and documents that I had kept from my childhood through adulthood and created art pieces to display themes that reoccurred throughout my life. I have more works that serve as a supplement to the primary piece. The smaller works explore thematic development across different media. The theme for my concentration is the contrast and embracing of masculinity and femininity in a person. There is a short oral presentation and a video to accompany the exhibition of the portraits.

## Performances

### **La fábula de la nevera, el cuchillo y el mechero**

by Carlos Bernal

#### **Acto Latino**

Mentor: Dr. Ana Cecilia Lara

The Acto Latino is a small group of hard-working Native and Non-Native Spanish Speakers who advocate for diversity and inclusion here at UNC-Pembroke. Acto Latino is the first Spanish theatre organization in the University of North Carolina at Pembroke and we are honored to have the opportunity to represent the Hispanic culture.

We, as a group, are very grateful for all the support from the university and individuals who have given us a place in which we are able to perform and make Acto Latino possible. This April we will have the opportunity to go to Madrid, Spain to perform the play written by Carlos Bernal “La fábula de la nevera, el cuchillo y el mechero” specially adapted for Acto Latino.

The story line of the play consists of a family who is living off the pension of the deceased mother. In the beginning scenes, the family talks about the biblical story of Cain and Abel and why Cain murdered his brother. This is a foreshadowing of an event that occurs in the play. The brothers in the play are Matias, who is the younger sibling and Ruben who is the older, he has a wife and a daughter. They all live under the same roof, and in the story, discord can be seen between the two brothers; during the play they are passive aggressive towards each other. The play especially portrays a feeling of jealousy and what it can make one do.

#### **Cast of Acto Latino**

1. Joselyn Salmeron as Eva
2. Azael Humberto Pérez as Rubén
3. Trent Adams as Matías
4. Maite Malén Easterling as Juana
5. Nancy Martínez as la niña
6. Wendys Cruz as Policía N°1
7. Indiana Hawkins as Policía N° 2

**Kyrie from *Ego Flos Campi***

By Juan Gutierrez de Padilla (1590-1664)

**Pembroke Singers**

Mentor: Dr. Jose Rivera

*Ego Flos Campi* is mass setting by Juan Gutierrez de Padilla (1590-1664) considered by music scholars as one of the most imaginative colonial-Hispanic composers. The musical selection performed today Kyrie is the first movement of Padilla's mass setting, the remaining movements derive from the Mass Ordinary (Kyrie, Gloria, Credo, Sanctus, Agnus Dei.) The compositional style Padilla employs is referred to as parody technique where the "motto motives", two of which are introduced in the Kyrie, serve as unifying element throughout the entire work. The texture of the mass is set for eight voices (double choir) a cappella, however instrumental doubling of voices was commonly observed in the cathedral music of the era. Passages in Gutierrez de Padilla's *Ego Flos Campi* suggests the composer employed rhythmic devices found in indigenous and popular styles including the African *negrilla*, Portuguese *jacara*, and songs of the Aztec folk tradition. Today, the UNCP Pembroke Singers will be performing the first movement Kyrie. Later this summer, our choir will be performing portions of this mass along with several collegiate ensembles at a Symposium paying tribute to the music of Juan Gutierrez de Padilla in Puebla Mexico. Coincidentally, Padilla served as chapel master at the Cathedral in Puebla, and is still considered today as one of Mexico's most influential composers of the colonial era.

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Erin Nicole Gainer  
Saoirsegrainne Aoife Mclain  
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