

UNC CHARLOTTE



**UNDERGRADUATE RESEARCH
CONFERENCE**



URC 2020

Abstract Book



We are pleased to present the 2020 UNC Charlotte Undergraduate Research Conference (URC) Abstract Book. Even though we had to cancel the URC 2020 because of the COVID-19 outbreak, we still believe it is important to compile and publish the abstracts submitted during the conference registration period. This belief aligns with the mission of the Office of Undergraduate Research (OUR), which is to support undergraduate students through opportunities to communicate their research to the wider community. We would like to thank the five formal sponsors for the URC: Academic Affairs, the Atkins Library, the Belk College of Business Graduate Programs, the Honors College, and the Levine Scholars Program. We also extend a special thank you to the Charlotte Research Institute for their continued support of the Atkins Library Research Awards.

The research project abstracts included in this book would not be possible without the commitment of our UNC Charlotte faculty. Indeed, this abstract book represents the dedication of UNC Charlotte's faculty members who participate as research advisors, mentors, and judges. A big thank you to the faculty for your service to undergraduate research and scholarship at UNC Charlotte. We would also like to especially recognize the conference organizing committee, the staff in the Office of Undergraduate Research, the Bonner Leaders, the Levine Scholars, and the student leaders who all played integral parts in planning for the URC. Most of all, we congratulate our undergraduate researchers for their hard work and research efforts!

Dr. Erin Banks
Assistant Dean, Office of Undergraduate Research

Dr. Erik Jon Byker
Chair, URC 2020 Organizing Committee

UNC Charlotte URC 2020 Organizing Committee Members

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ABSTRACTS

Oral Presentations

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Arts and Design

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Arts and Design

Title: A Comparison of Fugal Writing: From Bach to the 19th Century

Student Author(s): Andrew Abernethy

Faculty Advisor: Dr. James Grymes

Department: Music

The most enduring style of musical composition throughout all western music is counterpoint. This complex style reaches all the way from some of the earliest forms of music to the present-day compositions. In this paper, I will study this highly sophisticated style of composition, specifically the fugue, and how it has withstood the test of time over around 200 years. To do so, there will be close consideration into the fugal writing of Johann S. Bach and why the fugues of J.S. Bach are considered to be the ultimate model for fugal writing. Following, there will be an in-depth look into fugues composed by Alexander Scriabin, Dimitri Shostakovich, and Sergi Rachmaninoff. Lastly, the highly polished and perfected fugues of J.S. Bach will be compared to the composers of the 19th century to understand the influence Bach had on them as well as the different compositional choices made by these composers. Additionally, there will be consideration of the homophonic style of writing that the 19th century composers largely composed in and how this contributed to the breadth of their fugal writing.

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Arts and Design

Title: The Sound of a Nation: Musical Nationalism in 19th and 20th Century Europe

Student Author(s): Alex Caviness **G, H**

Faculty Advisor: Dr. James Grymes

Department: Music

This presentation focuses on how composers in the 19th and early 20th centuries created a national cultural identity separate from dominant cultures. In a time when Germanic art music was predominant, these composers from the cultural periphery of Europe sought to create music that was unique to their country and representative of their cultural heritage. Specifically investigated is how composers from Scandinavia, Bohemia, and Hungary represent their cultural identity in violin repertoire. This examination combines the research in different countries' musical nationalistic movements with specific musical examples taken from violin music. By examining books and academic papers, as well as four specific scores chosen as musical case studies, the various methods nationalistic composers used to represent their home countries can be observed. In Scandinavia, composers like Svendsen incorporated the sound of folk instruments, melodies, and dances into traditional Romantic forms to create their own musical identity. In Bohemia, composers like Smetana and Dvořák were influenced by the Bohemian landscapes and traditional music. Lastly in Hungary, composers like Bartók recorded peasant music in the countryside to bring traditional Hungarian folk music into the classical canon. This research serves to connect the common ideas of multiple forms of nationalism as well as demonstrate how those techniques are used in actual violin music. Examining music from outside the dominant western European canon can enable a better understanding of the culturally peripheral European countries and expand the diversity and inclusion of the traditionally culturally monolithic repertoire of classical music.

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Arts and Design

Title: An Unreliable Narrator:

The Discourse of Language and Neutral Information within the Art Museum

Student Author(s): Sydney Wall **G, H**

Faculty Advisor: Dr. Jae Emerling

Department: Art History

There are a few methodologies that art historical practice relies on when developing a shared history, which have changed over time. Two common approaches in museums are biography and autobiography. The biographical method relies on facts and artifacts that compose idealized truths as interpreted by curators and art historians. Since its development, the biographical approach has become more selective with public information, but remains useful to establish a particular artist's or museum's importance over one another. This methodology provides an easy way for institutions to understand art through the viewpoint of the artists and prevents them from relying on complex theory. It is risky for art institutions to use language implying they may have knowledge of what artists, especially deceased ones, desired. This approach is authoritative and self-serving, leaving the importance of the artwork and its meaning at stake. In order to overcome this and combine history with the visual, art museums commonly use an artist's biography to compose a visual narrative. When museums use biographical information, should we become more attentive to aesthetic and historiographic assumptions that are presented in a supposedly neutral or objective manner, such as museum labels, informational texts, website synopses, and other formal curatorial language? To address this question, I have developed a case study based on the Van Gogh Museum in Amsterdam to analyze their use of language and determine if the biographical method is the most successful and truthful, and in turn, reveal how curators are self-servingly using knowledge.

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Arts and Design

Title: The Veer Children's Park and Spa Revitalization Plan

Student Author(s): Gerald Warren **NC, S, U**

Faculty Advisor: Dr. Wilbur Rich

Department: Political Science and Public Administration

The federal government has funded investments worth \$75 billion in improvements of America's low-income neighborhoods by establishing programs including the Low-Income Housing Tax Credit (LIHTC) and Community Development Block Grants (CDBG), both of which will be the focus of this research. From this project one can gain a better understanding of the general architectural design makeup of the structure that is being developed. By drafting early simple forms and creating a series of 3D models, and by diagramming and drawing simple designs of the structure of the early stages, it is important to observe that the structure is integrated in the ground. This building was given the name the Veer which means sudden change. After exploring the surrounding neighborhood this design would bring a significant economic change to the area. The Veer Children's Park and Spa is located on 9th Street in Charlotte N.C. The purpose for this project is to create a safe place for children and revitalize a community. The Veer will provide a place to play while providing a place of relaxation for the adults. The main goal was to design a structure that would have a correlation with the surrounding natural environment. In conclusion the federal government funding for community improvements can result in the theoretical design of future projects.

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Education and Communication

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Education and Communication

Title: An Investigation of Boundary Setting and Confidence
in Communication Consultants

Student Author(s): Bianca Braswell, Shaina Glass, and Mari Forfar

Faculty Advisor: Dr. Heather Bastian

Department: Communication Across the Curriculum

Research has found that students who work as peer mentors greatly benefit from their experiences. Research also has shown a correlation between self-efficacy and overall confidence in abilities. At UNC Charlotte, the Communication across the Curriculum (CxC) program trains communication consultants to serve as peer mentors and provide one-on-one support to students within select classes. Consultants can serve an important role in helping students develop as communicators, but consultants need to feel confident in their own abilities as peer mentors to do so. This study builds upon previous research by examining how boundary setting influences consultants' confidence levels and, thus, their ability to achieve self-efficacy. Specifically, this study looks at what consultants' report about their confidence levels in boundary setting and what impacts their ability to set boundaries. Likert scale questions that asked consultants to rate their confidence level performing various tasks were analyzed to identify variables that influence their overall confidence and confidence in both setting and enforcing boundaries. Additionally, open-ended questions on the surveys were coded to identify main themes that affect consultants' ability to set and enforce boundaries. Our findings suggest that student-, faculty-, and personal- related issues impact a consultants' confidence in their ability to set boundaries. They also suggest ways to improve consultants' experiences, self-efficacy, and confidence as peer mentors in the CxC program.

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Education and Communication

Title: Influence of Previous Experience on Communication Consultant Confidence:

An Applied Research Study

Student Author(s): Abigail Coffey, Jennifer Knight, and Kaelyn Alexander

Faculty Advisor: Dr. Heather Bastian

Department: Communication Across the Curriculum

Research has found that peer mentorship can play a valuable role in a student's personal growth and development. At UNC Charlotte, the Communication across the Curriculum (CxC) program trains communication consultants to serve as peer mentors and provide one-on-one support to students within select classes. This study investigates how consultants' experiences as peer mentors in CxC relate to and influence confidence levels. Specifically, this study asks: how does previous experience affect communication consultants' confidence overall and in this role? To answer this question, consultants (n=41) completed an online survey consisting of Likert scale and open-ended questions that asked them to reflect on their confidence levels in general and in different aspects of their role. Results indicate that more experience in the communication role increases odds of confidence in several different aspects of consulting. The results also suggest ways to improve consultant confidence in the CxC program by clarifying role responsibilities and facilitating consultant relationships with one another.

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Education and Communication

Title: Menstrual Knowledge, Attitude, and Practices and Its Impact on
Academic Performance of College Students

Student Author(s): Maria Cruzat **H, NC, U**

Faculty Advisor: Dr. Mike Putman

Department: Reading and Elementary Education

There is a lack of understanding of college student menstrual knowledge, attitude, and practices (KAP) and its impact on academic performance. Furthermore, studies specifically regarding college students remain sparse. Menstruation is saturated with stigma and taboos that reinforce gender-based discrimination and perpetuate the idea of menstruators as unclean. The lack of an enabling environment for menstruators has an impact on many fronts. This research study aims to add to this area of literature by answering the following question: How does menstrual knowledge, attitude, and practices impact the academic performance of college students (i.e. study time, attendance, concentration)? Data was collected through a self-administered structured questionnaire distributed among students at the University of North Carolina at Charlotte. A descriptive analysis, bivariate, and multivariate analyses were computed on SPSS to identify factors associated with academic performance.

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Education and Communication

Title: A Preliminary Study of African American English and Latinx Inspired

Linguistic Choice in Picture Books

Student Author(s): Melissa Martin **CE, H, NC**

Faculty Advisor: Dr. Ralf Thiede

Department: English

Recent advances in the cognitive linguistics of language acquisition reveal the importance of linguistic choice in children's books in order to maximize the benefits of interacting with the genre, particularly in promoting the frequency of entrainment between a child and an interactive reading partner such as an older sibling, parent or teacher (Thiede 165; McGee and Schickedanz 742). However, much of this research focuses on the successes of authors writing in a standard dialect for readers sharing fluency in this standard dialect. Contrasts in studies with standard dialect speakers reveal that dialect influences language acquisition so that nonstandard dialect speakers fall behind their peers in measures of reading comprehension (Jarmulowicz, Taran, & Seek; Craig et al.). Studying the linguistic choice of minority authors increases understanding of how language acquisition techniques are received by speakers less familiar with a particular language or dialect, particularly within the genre of picture books given that information is transferred from author to parent to child. The following study explores the linguistic choices of minority authors writing in two nonstandard English dialects, African American English (AAE) and Latinx influenced English, in order to highlight the necessity of books written in dialect, not only for speakers of nonstandard dialects, but for the linguistic benefit of all young readers.

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Education and Communication

Title: Investigating and Comparing Universal Design for Learning in

South Africa and the United States

Student Author(s): Natalia Mejia **G, H, NC, U**

Faculty Advisor: Dr. Erik Jon Byker

Department: Reading and Elementary Education

Universal Design for Learning (UDL) is a conceptual framework and strategy, which empowers educators to make learning accessible for all students of abilities. UDL was conceptualized more than three decades ago in the late 1980s. The theory melds discoveries from brain based research with developments in architectural design and educational concepts like inclusion. The three main principles of UDL include connecting with learners through: (1) Multiple Means of Representation, (2) Multiple Means of Expression, and (3) Multiple Means of Engagement. While UDL is over 30 years old, there is still a disparate degree of knowledge and application of UDL principles among educators in the United States and abroad. Likewise, there is a gap in the literature related to comparative and international investigations of educators' perceptions of UDL. The purpose of this honors thesis is to address this literature gap, by examining educators' perceptions and applications of UDL across two contexts. Specifically, I utilize a cross-cultural survey research design in order to compare and report on the perceptions of UDL among elementary school educators—at the pre-service and in-service levels—in South Africa (n=24) and the United States (n=12). I found similarities and differences among the participants' definitions for UDL, their degree of confidence in their preparation for UDL, their perceptions of the strengths and challenges of UDL, and their beliefs about how they incorporate the UDL principles in their instruction.

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Health Sciences

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Health Sciences

Title: Genetic Variation of Histidine-rich Proteins in Plasmodium falciparum and Performance of Malaria Diagnostic Testing in Assosa, Ethiopia

Student Author(s): Kayla Blackburn **G, H**

Faculty Advisor: Dr. Daniel Janies

Department: Bioinformatics

Malaria is often diagnosed through rapid diagnostic tests (RDT) that react to proteins of Plasmodium falciparum in the patients' blood. Previous studies have shown that the genes, Pfhyp2 and Pfhyp3 that encode the proteins PfHRP2/PfHRP3, which are often targeted in these tests, is deleted in lineages of Plasmodium falciparum in some geographical regions. This deletion results in false negative RDT. However, evaluation of RDT in Ethiopia is lacking. This study seeks to evaluate the presence of the PfHRP2/PfHRP3 protein in P. falciparum collected in Ethiopia. We will extract DNA from Plasmodium falciparum collected in blood samples from different health centers in regions of Ethiopia. We will evaluate the presence of, and where present, amplify the Pfhyp2/Pfhyp3 genes via the polymerase chain reaction, and sequence the amplicons. The Pfhyp2/Pfhyp3 gene sequences and resulting PfHRP2/PfHRP3 proteins will be analyzed. We hypothesize that deletions in the Pfhyp2 gene and, ultimately, the PfHRP2/PfHRP3 protein, are contributing to false rapid diagnostic testing results. We expect those samples tested and verified negative for Pfhyp2/Pfhyp3 to vary in correlation with varying geography, and we will do statistical categorization and testing using these data. This information will be beneficial in developing new malaria tests and in deciphering which kind of diagnostic tests to use in specific geographic areas facing similar gene losses. Better diagnostics will contribute to further abatement of P. falciparum.

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Health Sciences

Title: Uses of Cognitive Behavioral Therapy in College Athletes: A Scoping Review

Student Author(s): Abigail Coffey

Faculty Advisor: Dr. Alicia Dahl

Department: Public Health Sciences

College campuses have seen an increase in adverse mental health outcomes. Within the college environment, athletic departments report about 30% of student-athletes self-reporting being extremely overwhelmed. This compares to 15.9% of their non-athlete counterparts. In addition, mental health within student-athletes is a public health concern, as 28.1% of female athletes and 17.5% of male athletes exhibit clinically relevant depressive symptoms. Concerns around mental health stigma and services underutilization make addressing the problem difficult in this population. A potential solution to overcoming mental health challenges can be achieved through strategies found in Cognitive and Dialectical Behavior Therapies (CBT/DBT), a form of psychotherapy that treats problems and boosts happiness by modifying dysfunctional emotions, behaviors, and thoughts through a solution-based approach. DBT adds a newer component of acceptance and validation. However, there is little research on the effectiveness of these behavioral therapies in this population. This present study, Take a Timeout, looked to conduct a scoping review on the current uses of Cognitive Behavioral Therapy in collegiate athletes in order to build a foundation of current practices and identify gaps in the research. Through a database search using PubMed, PsychINFO, Web of Science, and JSTOR, 391 articles were identified and reviewed for inclusion. Criteria for inclusion include the following: CBT based intervention, and utilization among college athletes. Of the 391 articles, 8 fit the inclusion criteria and were analyzed for similar patterns and findings.

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Health Sciences

Title: Assessing the Prevalence of Kelch Propeller Domain (K13) Resistance

Mutation in Ghana

Student Author(s): Lauren Ducoste **G, H**

Faculty Advisor: Dr. Eugenia Lo

Department: Biological Sciences

Malaria is a significant global public health concern, mostly affecting Sub-Saharan African countries. Artemisinin-Combination Therapy (ACT) is the first line of treatment in Ghana since 2005. Resistance to ACT has been widely reported in Southeast Asia and is of growing concern in Africa. Codon mutations in the kelch propeller domain on chromosome 13 (pfk13) have been linked to ACT resistance, however, the specific mutations that are associated with artemisinin resistance in African *Plasmodium falciparum* remains unknown. This study aims to examine the prevalence of *P. falciparum* malaria in the three ecological regions of Ghana, to estimate the distribution and frequency of pfk13 resistance mutations in these regions. Studying the distribution of the pfk13 molecular marker will help improve the understanding of global artemisinin resistance. A total of 735 dried blood spot (DBS) were collected from the Northern, Central, and Southern regions. *P. falciparum* DNA was detected by quantitative real-time PCR (qPCR) and the prevalence of pfk13 candidate codon mutations will be determined using previously published primers to amplify pfk13. It is predicted that the highest prevalence of malaria will be in the northern savannah region, followed by the central forest region and the southern coastal region due to variation in climate, health care access, and agricultural activity. The prevalence of the candidate pfk13 codon mutations is expected to be highest in the southern coastal and central forest regions than in the northern savannah region due to a greater consumption of antimalarial drugs and better healthcare accessibility.

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Health Sciences

Title: Perceived Reproductive Health Needs among Muslim Women in the Southern U.S.

Student Author(s): Sondous Eksheir **CE, NC**

Faculty Advisor and Co-Author: Dr. Jessamyn Bowling

Department: Public Health Sciences

In spite of growing rates of Muslim individuals in the US, we know little about the health of Muslim women in the US. Due to stigma and cultural beliefs, there may be unique influences and patterns of reproductive health care access for this population. This study aims to examine impediments and facilitators of women's reproductive health for Muslim women in the southern US. This multi-method study included in person semi-structured interviews (n=15) and an anonymous online survey (n=76). Participants generally had low rates of gynecological care and cervical cancer screening. The cultural and contextual aspects that increased or restricted access to care in terms of screening, providers and education are discussed. We also identified some misconceptions related to screenings and contraception. In terms of influences on reproductive health care, participants in this study have similarities yet are distinct from Muslim populations in other countries as well as other groups of women in the US. This study points to a need for more population-focused education of providers, as well as awareness about reproductive health and healthcare recommendations and access for Muslim women.

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Health Sciences

Title: False Negative RDT Results in Ghana Specimens are Due to Genetic Deletions

Student Author(s): Jennifer Huynh **G**

Faculty Advisor: Dr. Eugenia Lo

Department: Biological Sciences

Malaria is a serious endemic disease that affects 214 million people around the world annually. Malaria causes high fevers, aches, chills, diarrhea, and can lead to organ failure or death. Each year 445,000 malaria-deaths are reported, and the majority are from African countries. Apart from microscopic examination, another convenient and affordable method of malaria diagnosis is Rapid Diagnostic test (RDT). RDT is a lateral flow immune-chromatographic antigen-detection test that recognizes two specific genes PfHRP2 and PfHRP3 of the parasite species responsible for malaria, Plasmodium falciparum. Recently, there have been several reports of false negative cases detected by the RDT. These false negative cases may be associated with mutations or deletions of the PfHRP2 and PfHRP3 genes in some lineages of Plasmodium falciparum. To determine the possible causation of false negative RDT results, PCR and gel electrophoresis were used to test RDT negative and RDT positive dried blood samples collected from 212 febrile patients in Seikwa, Ghana. Specific primers that flank exons 2 and 3 of PfHRP2 and PfHRP3 were used to amplify the DNA samples and PCR products were visualized on 1.5% agarose gels. Samples that show PfHRP2 and PfHRP3 amplifications were sequenced and compared to the reference PfHRP2 and PfHRP3 gene sequences of the P. falciparum 3D7 strains to identify genetic variants. We predict that samples that contain the parasites but showed false negative RDT results are likely due to partial or full deletion of the PfHRP2 and/or PfHRP3 genes.

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Health Sciences

Title: Access to Dental Care in the Charlotte Community: An Evaluation and
Comparison to Current US Trends

Student Author(s): Elizabeth Kay **CE, H, NC, U**

Faculty Advisor: Dr. Mark DeHaven

Department: Public Health Sciences

The importance of oral health in maintaining overall health has been a topic of research over the past decade. The mouth is known to have an extremely diverse microbiome, where types of harmful oral bacteria have been linked to the development of conditions such as pneumonia and atherosclerotic vascular disease. In this way, the health of the mouth influences the health of the rest of the body and, as such, preventative care in regards to dentistry is highly encouraged by the dental community. However, access to dental care throughout the US is highly variable. Approximately 49 million people have issues finding a dental care provider in the US. It is even more of a challenge for minorities, those of low income, and those with disabilities. The present study looks to construct a comprehensive evaluation of access to dental care in Charlotte, as well as a comparison with that of the US. Patients aged 18 and older seeking dental/medical treatment in the Charlotte area are being given a 15-item questionnaire to complete while in the waiting room of a dental/medical office/clinic. Questionnaires are anonymous and do not include any patient identifiers. As data collection is still ongoing through mid-March, only preliminary results are available at present. Once the complete data set is collected, results will be compared to national trends, which predict that the cost of dental care and distance from a dental office will serve as the greatest impediments to access to dental care in Charlotte.

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Health Sciences

Title: The Phenomenon of the Phenomenal Woman (POPW): Investigating the Socio-Cognitive Impact of Weight-Normative Messaging from Instagram

on College-Aged Black Women

Student Author(s): Catrisse McDowell **H**

Faculty Advisor: Dr. Joanne Maguire

Department: Religious Studies

Minority women who are “college-aged”, or 18 to 24 years old, are experiencing a specific collection of health issues surrounding body image, mental health, nutritional and fitness education and practices. Research on this group, specifically those who are Black, is needed. There is a clear relationship of influence between social media messages concerning healthy living and weight stigma, and the mental health of a collegiate community of minority women. The theoretical framework for this research project will primarily utilize the components of Social Cognitive Theory and Social Comparison Theory. Through the use of an online, forced-choice survey, comprising 40 questions, respondents were encouraged to express their truest opinions about the impact of social media messaging and social comparison in four categories: dietary habits, exercise regimen, mental health, and internal dialogue. The expected results of this survey will showcase the ties between social comparison from Instagram and negatively impacted mental and physical health for this community of women. The pool of knowledge surrounding college-aged black women (CABW) relating to anthropometry, health psychology, health education, nutrition, and exercise is deserving of continual waves of fresh data. Ultimately, this project serves to provide a new, authentic, and striking perspective about the struggles of a community of women who are often overlooked, silenced, and misunderstood.

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Health Sciences

Title: Hands-On Nutrition: Measuring the Effectiveness of Interactive Health Fairs

Student Author(s): Sarah Mullen **CE, H, NC, U**

Faculty Advisor: Dr. Eugenia Lo

Department: Biological Sciences

Malnutrition is one of the largest problems our children face each day. It can be seen on a national scale, state level, and even close to home here in Charlotte. Obesity in our younger generations has skyrocketed, reaching nearly 13.7 million children and adolescents in the US, and the rates in Charlotte are currently upwards of 15% (Johnson, 2019). While large strides have been made to create accessible food options in schools, not all of these lunch line choices are equal in nutritional value, and when the students go home, they are not choosing the healthiest snacks or meals. To combat this epidemic, North Carolina elementary schools begin nutrition education as early as first grade. However, book learning is not always the most effective way of conveying such important information to children who have different learning styles. Studies show that younger children are more receptive to visual and interactive teaching strategies. This research project examines the positive effects a single day hands-on nutrition fair can have on improving young students' knowledge on healthy options they can make in their everyday lives. 450 students at Newell elementary benefited from a 6-station health fair that provided everything from nutrition trivia games to taste-testing and even creating their own recipe cards. The results were measured in a pre and post-survey and analyzed to determine the efficacy of the event.

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Health Sciences

Title: Angiogenesis is Modulated by the Pro-inflammatory Tumor Microenvironment

Student Author(s): Erin Nesslerode and Seth Flynn **H**

Faculty Advisor and Co-Author: Dr. Didier Dréau

Department: Biological Sciences

Vessel formation (i.e., angiogenesis) is essential to breast cancer progression. Indeed, tumor vasculature allows access to metabolites essential to tumor growth but also provides routes for tumor dissemination and metastasis. Anti-angiogenic drugs have therapeutic benefits in preventing the progression of specific cancers but not triple negative breast cancer. It remains unclear if the inflammatory tumor microenvironment (TME) generated by both the extracellular matrix composition along with the activities of the stromal cells, especially macrophages, plays a role in promoting angiogenesis in breast tumor. Here, we investigated whether the innate immune response, specifically the inflammasome activation leading to IL1 β and IL18 pro-inflammatory cytokine secretions, alter 2H11 endothelial cells ability to form vessels. In *in vitro* collagen-based tube formation assays mimicking angiogenesis, we determined the effects of increasing concentrations of IL18BP, presumably by binding IL18, in combination with tumor and macrophage secretions. Results indicate that IL18 alone promotes node and mesh formation associated with angiogenesis. Interestingly, IL18 dose-dependently blunted the inhibition of vessel formation induced by macrophage secretions. An opposite trend was observed with tumor secretions. Taken together, this data emphasizes the role of IL18BP in regulating pro-inflammatory IL18 cytokine in tumor angiogenesis and suggests additional targets to prevent breast cancer progression.

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Health Sciences

Title: Estimating Unmet Needs for PrEP Administration in Mecklenburg County

Student Author(s): Chiamaka Okonkwo **CE, H, NC, U**

Faculty Advisor: Dr. Patrick Robinson

Co-Authors: Dr. Monika Sawhney, Dr. Brian Witt, Renate Nnoko, and Patrick Ro

Department: Academy for Population Health Innovation (APHI)

According to CDC surveillance data, 254 new human immunodeficiency virus (HIV) cases were diagnosed in Mecklenburg County in 2018, ranking the Charlotte metropolitan area as having the 26th highest rate of new HIV diagnoses for all metropolitan statistical areas (MSAs). Pre-exposure prophylaxis (PrEP) is highly efficacious for decreasing risk of HIV infection in at-risk individuals, but barriers may impair efforts to promote widespread administration within the county. Thus, estimation of the number of adults with indications for PrEP to prevent HIV in Mecklenburg County will aid in evaluating current needs. This project develops estimates of the number of adults with PrEP indications in Mecklenburg County using population-representative models previously applied at the national and state levels. Data on insurance coverage were also extrapolated to find numbers of adults with PrEP indications who may require financial assistance to manage costs of PrEP administration. To assess the degree of unmet need, these estimates were then compared to estimates of patients currently receiving PrEP through county providers. It was estimated that 9,436 adults (1.2% of total adults) in Mecklenburg County had indications for PrEP. It was also estimated that 1,490 adults (15.8% of the PrEP-indicated population) lack health insurance and therefore may require financial assistance. These results were then compared to county estimates of PrEP usage, revealing unmet needs in populations at risk for HIV infection, particularly in persons lacking health insurance. Furthermore, this identification of gaps between need and usage can inform future efforts to promote administration of PrEP in Mecklenburg County.

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Health Sciences

Title: Gold Nanoparticle Delivery of DNA and RNA Nanoparticles

Student Author(s): Melina Richardson **H**

Faculty Advisor: Dr. Kirill Afonin

Department: Chemistry

There is strong evidence that nucleic acids have potential as nanotherapeutics; as of 2019, there are six FDA approved nucleic acid-based drugs. However, efficient delivery of the DNA and RNA nanotherapeutics remains a significant barrier to the application of proposed therapies—an efficient system would increase the functionality of nucleic acid nanotherapeutics by improving blood stability, targeted delivery, and renal excretion time. In previous research, programmable, conditionally activated nucleic acid nanoparticles (NANPs) with the capacity to deliver therapeutic cargo or perform a therapeutic function were designed, synthesized, and tested. The research presented here investigates a method of using gold nanoparticles (AuNPs) to efficiently deliver NANPs into cells. AuNPs are a promising candidate due to their biocompatibility, low toxicity and a large surface to volume ratio that allows for binding with NANPs. The completed gold nanoparticle wraps the gold in three layers: a poly(allylamine hydrochloride) (PAH) layer, a layer of NANPs, and a final PAH layer using a layer by layer self-assembly method. We developed and optimized a protocol for binding the NANPs to the AuNP. We then characterized the completed AuNP+NANPs using dynamic light scattering and zeta potential analysis. Finally, we show preliminary results for testing the viability, uptake, and silencing ability of the AuNPs+NANPs in cells. Overall, this work lays a foundation for the future development of a nucleic acid nanoparticle delivery system.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: Oxidative Damage-Associated Micronuclei Formation Results
in cGAS Activation by Microglia

Student Author(s): Yassmin Sarabadan and Alex Suptela **H**

Faculty Advisor and Co-Author: Dr. Ian Marriott

Department: Biological Sciences

Genomic instability is a factor in the development of cancer and neurodegenerative diseases. While healthy DNA is restricted to the nucleus, oxidative stress or X-ray irradiation can cause DNA damage resulting in the generation of DNA containing extra-nuclear bodies called micronuclei. In the cytosol, these can rupture liberating DNA that can be detected by sensors such as cyclic GMP-AMP synthase (cGAS) that, in turn, triggers inflammatory responses. In my project, I will test the hypothesis that oxidative stress or X-ray irradiation-induced DNA damage causes micronuclei formation in microglia, a resident brain cell type, which results in cGAS activation and the subsequent production of inflammatory mediators. In my studies, DNA damage will be elicited in a human microglial cell line and cells that have been depleted of cGAS expression using CRISPR/Cas9 approaches. DNA damage will be initiated by oxidative damage induced using the glucose oxidase/catalase system or by X-ray irradiation. Experimental readouts will include 1) a determination of the proportion of cells containing micronuclei as visualized with confocal microscopy and DAPI staining of extranuclear DNA, 2) Western blot analysis of cGAS protein expression, and 3) enzyme-linked immunosorbent assays to quantify immune mediator production. It is predicted that both X-ray irradiation and oxidative stress will induce micronuclei formation in human microglia, and that cGAS deficiency will decrease the inflammatory responses of these cells. As such, these studies will provide a crucial first step in identifying novel targets for CNS disorders that result from genomic instability.

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S - Sustainability **U** - Charlotte

Humanities

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability

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Humanities

Title: Dark Tourism Following March 11th, 2011

Student Author(s): Morgan Cruz **G**

Faculty Advisor: Dr. Philip Kaffen

Department: Culture and Language Studies

Japan is well known for being a popular tourist destination. Due to the country's plethora of scenic temples and shrines, flavorful food, and unique attractions, many make the exodus to the country to relish in what they have to offer. However, unbeknownst to some travelers is the concept of dark tourism, and Japan definitely does not lack dark tourism locations. Dark tourism can be defined as a type of tourism that attracts travelers to a location where a tragic event has occurred— whether it is a man-made disaster or a natural disaster. Japan has many widely known dark tourism locations such as the suicide forest, the atomic bombing memorials in Hiroshima and Nagasaki, and the abandoned ghost town of Hashima Island to name a few. In recent years, a new dark tourism destination emerged following the nuclear disaster of the March 11th earthquake and tsunami that ravaged the Fukushima prefecture in the Tohoku region of Japan. The disasters caused a nuclear meltdown of the three reactors in the Daiichi Nuclear Power Plant in 2011. The areas that remain untouched since the earthquake, tsunami, and nuclear dealings garnered attention from curious people all over the world due to the magnitude of the events. They attract the curious tourist as well as people who are interested in life after the disaster in Fukushima. My research intends to explore the ethics of dark tourism in regard to Fukushima and Northeastern Japan.

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S - Sustainability **U** - Charlotte

Humanities

Title: Regression or Progression: How the Priesthood Correlation Program

Affected the Roles of Women Within the

Latter-Day Saints Community from its Start Through 1980

Student Author(s): Samantha Gates **H**

Faculty Advisor: Dr. Christopher Cameron

Department: History

At the end of the nineteenth century and beginning of the twentieth century, the Church of the Latter-Day Saints of Jesus Christ (LDS) was seen as very advanced in terms of equality and women's rights. The Church and its founder, Joseph Smith, openly promoted a number of practices and ideals that advocated equality of the sexes. However, by the late twentieth century, Mormons started to become one of the most conservative religious sects. Women felt they had lost their independence when the priesthood hierarchy of the Church eliminated their newspapers, their financial control of the Relief Society and their role as teachers to the youth. This research will argue that the Priesthood Correlation Program of the 1960s was the most significant factor to shift the role of women in Mormonism from being considered progressive to domestic. The Correlation Program redirected all power within the Mormon Church and auxiliaries to directly under the control of the priesthood hierarchy. This was designed to centralize the power, curricula, doctrines, finances and organizations of the Church in response to a rapid increase in membership during the twentieth century. To investigate the move towards conservatism, I will study the growth of the LDS Church within the twentieth century, the Correlation Program, its intended and actual effects on women, and the public campaign against the Equal Rights Amendment that the Church led in the 1970s.

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S - Sustainability **U** - Charlotte

Humanities

Title: Restoring the French Café: Coffee, Class, and Consumer Culture

during the Bourbon Restoration

Student Author(s): Kellie Giordano **G, H**

Faculty Advisor: Dr. Christine Haynes

Department: History

This project examines the history of coffee in France during the Bourbon Restoration (1815-1830) to argue why there was seemingly a reinvention of the French café in the wake of Napoleon. Drawing from a wealth of travelogues to Paris and provincial France, recipe books, maps, images, household literature, quantitative data and manuals for coffee preparation among other primary sources, this thesis argues that cafés in France, both in Paris and the provinces, acted as a vehicle for social mixing and cultural exchange at home and abroad. Ranging from cafés in the public sphere and coffee in bourgeoisie homes, to the controversies and foreigners' reactions to French coffee, this work encompasses a vast study of consumer history that historiography has largely overlooked. Largely due to an influx of foreigners and heightened trade that enabled the affordability of coffee after the French borders reopened for the first time since the Revolution, broader clientele and cross-cultural exchange give the French café new definitions, which this thesis explains in-depth. However, many past works tend to analyze merely Parisian cafés during the Old Regime or French Revolution itself, rather than the consequences of radical political change. As this thesis conveys, the Bourbon Restoration and subsequent Allied Occupation of France after Napoleon (1814/1815-1818) contain rich accounts of primary evidence to suggest the reinvention of the café. Moreover, this work seeks to explain why holistically, all of these factors combined to "restore" the café across the classes and Europe more broadly during the early-nineteenth century.

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S - Sustainability **U** - Charlotte

Humanities

Title: Charlotte, NC: The Collaboration of the Mill Men

Student Author(s): Gabriella Goodall **H, NC, U**

Faculty Advisor: Dr. Amanda Pipkin

Department: History

In 1880, North Carolina began to construct textile mills throughout Charlotte, and three large companies: D.A. Tompkins, Chadwick-Hoskins, and Highland Park Manufacturing Co. owned the majority of the textile mills within the city. The three company owners collaborated with each other to establish a successful, productive textile industry in Charlotte. The purpose of this research is to explore the collaboration of the three large company textile owners, D.A. Tompkins, E.A. Smith, and C.W. Johnston, in Charlotte, NC from 1880 to 1920. Past historians developed arguments on the positive contribution of mill owners, the establishment of mill village communities, and the strategic use of paternalism by factory mill owners. However, there is a lack of research on the unique collaboration and camaraderie of mill owners that allowed the three large companies to dominate the textile industry and develop the city of Charlotte. This project uses The Daily Charlotte Observer, diaries, interviews, and various Charlotte, N.C. archives to discover the purpose of the collaboration. The exploration of the mill owner collaboration is divided into three parts. First, from 1880 to 1900, I explore the mill owners' early development of collaboration and the purpose of the unification of owners. Secondly, from 1900 to 1910, I focus on the mill owners' unified actions and outcomes of the partnership of the three companies. Lastly, from 1910 to 1920, I discovered the three owners' use of paternalism developed from early mill establishment to create similar welfare activities that created comparable working conditions for the mill workers.

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S - Sustainability **U** - Charlotte

Humanities

Title: Translating the 'Love' of Rare Diseases:

Linguistic and Cultural Analysis of *My Son, My Teacher*

Student Author(s): Najir Johnson **G, H**

Faculty Advisor: Dr. Monica Rodriguez

Department: Languages and Culture Studies

This presentation describes some of the challenges and complexities in translating the literary text *My Son, My Teacher* (2018). In the reference literature, Molina and Hurtado Albir (2002) discuss a functionalist approach that can be used to analyze the translation techniques used for such a literary text. The literary text of this study is an English-language translation of *My Son, My Teacher*, translated from Spanish and written by the best-seller author Isabel Gemio. This book illuminates the stories of patients with rare diseases and their effect on families, and the translation allows the readers in the English-speaking world to explore the overlooked world of rare diseases. This study implements a three-phase model (Nord 1991) that consists of (i) source-text analysis, (ii) transfer of the translating process, and (iii) synthesis or recoding. Specifically, this presentation focuses on the challenges associated with the transfer of linguistic and cultural characteristics of literary texts. This analysis also describes the textual complexities of rendering literary style and tone while overcoming challenges posed by the specialized language of health care discourse. This study aims at describing an in-depth analysis of most commonly used translation techniques leading to a translated narrative that is accessible to a new audience. The analysis of a new English-language edition with culturally-rich contextualized annotations (and commentary of linguistic and cultural elements) fills a gap in the literature of translating the 'love' that pain brings out in the context of rare diseases.

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S - Sustainability **U** - Charlotte

Humanities

Title: Defeat but not Ignominy: The New Orleans Afro-Creoles Behind Plessy v. Ferguson

Student Author(s): Paul Kinny **H**

Faculty Advisor: Dr. John Smith

Department: History

In 1896 in Plessy v. Ferguson, the U.S. Supreme Court upheld state laws requiring racial segregation known as Jim Crow laws. This decision cleared the path for a wave of Jim Crow laws which pervaded the South. The New Orleans Afro-Creole community had initiated the challenge to the law which resulted in the Plessy decision. This paper shows that this community possessed unique characteristics in the 1890s which enabled it to take a case challenging segregation laws to the Supreme Court. The paper describes the long history of freedom and the unions of free African-American women and French Creole men which resulted in a large, prosperous, and respected mixed-race community living in New Orleans prior to the Civil War known as the “free people of color.” In 1892 the Afro-Creole descendants of this community had the wealth and education that provided the resources necessary to bring the Plessy case. Moreover, they carried high expectations for a fair place in society that would not let them acquiesce in Jim Crow laws that placed them in a subordinate position. Although they lost the Plessy case, a lone dissenter, Justice John Harlan, wrote a powerful dissenting opinion which preserved their beliefs for eventual adoption by the Supreme Court in 1954. Thus, this paper illustrates how the New Orleans Afro-Creoles made a little-known but significant contribution in the early stages of the civil rights movement.

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S - Sustainability **U** - Charlotte

Humanities

Title: Mona Ozouf's Influence on the French Historiography of Today

A Noted Historian's Reaction to A Chorus of Cacophony

Student Author(s): Teresa Lowenstein **G**

Faculty Advisor: Dr. Christine Haynes

Department: History

The cacophony of differing opinions connected with religion, communism, and feminism prompted Mona Ozouf's research. Her reaction to the academic arguments created a new scholarship. This paper seeks to highlight Mona Ozouf's contributions to the study of the French Revolution and the influence of her studies on historiography today. It will also seek to explain why she became a historian and the reasons for her research by illuminating the genesis of her research and the evolution of her work. Fifty-six years ago, Professor Ozouf's first entry into print took place in 1963, with the publication of her first book *L'École, l'Église, et la République, 1878-1914* (The School, The Church and the Republic). Now credited with over eighty-seven books and numerous articles; she is the recipient of many awards. Indeed, her contributions remain a valuable source of information for historians. Over the course of years, she changed previous interpretations to the festivals that took place during the French Revolution and encouraged further research into the area. Indeed, the areas of research she delved into resulted in books that continue to be cited by historians. Still it must be noted that though not all historians agree with her (especially in respect to her position on feminism) this too encourages additional research and challenges others to present opposing views. Finally, the dictionary she co-edited contributes to the collected scholarship of historiography through the addition of a new tool for historians.

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S - Sustainability **U** - Charlotte

Humanities

Title: Women at War: American Advertising and the Reinforcement of

Domestic Roles During World War II

Student Author(s): Madeline Murphy

Faculty Advisor: Dr. Amanda Pipkin

Department: History

The majority of research on American women during World War II focuses on women's entry into the workforce. While such existing research has provided a strong foundation for the study of women's experiences during World War II, scholarship largely overlooks women who remained in domestic roles. This research project seeks to provide a more complete understanding of the role of American women in domestic roles during World War II. Because this paper aims to fill a hole in the intersections of existing historiography, it has the potential to make a significant contribution to both historians and scholars of gender studies' understanding of domesticity during World War II. Existing scholarship suggests that advertising served an essential purpose in "selling the war" to the American public and played a major role in the creation of social norms. Through an examination of advertisements selected from LIFE magazine, with a particular focus on gendered language, portrayals of women, and links between the war effort and the home, this paper provides a close analysis of the influence of American advertising on the militarization of the gendered domestic sphere. This essay concludes that advertising tied women's domestic work to the war effort within a framework of limitations which inhibited long-term change to the American gender hierarchy. These limitations, including the reinforcement of domesticity, maintenance of traditional femininity, and ultimate subservience to men, defined women's wartime contributions in terms of their traditional gendered roles.

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S - Sustainability **U** - Charlotte

Humanities

Title: Race through the Film Reel:

An Analysis of Post-Revolutionary Mexican Film

Student Author(s): Areanna Nixon **G, H**

Faculty Advisor: Dr. David Dalton

Department: Culture and Language Studies

Following major revolutions, societies often modify or reconstruct racial categorization and concepts of privilege. Scholars have noted that through media, particularly film, directors capture snippets of societal discourse which can be analyzed to better understand the construction of various ideologies. In this paper, I interrogate how Mexico's Golden Age of cinema reflected post-revolutionary race relations through a discussion of *María Candelaria*, a Mexican film by the celebrated director Emilio Fernández. Using the movies themselves as my unit of analysis, I will consider three main questions concerning the characterization of the Mestizo-Indigenous binary; 1) How do the films present and construct characters of indigenous descent? 2) How are these characters treated and spoken to when compared to their mestizo and Criollo counterparts? 3) What roles do indigenous characters take on in the societal and national context(s)? Critical examinations of popular entertainment offer valuable insight into the underlying presumptions which are woven into the fabric of society. I aim to build upon the already established body of Film and Latin American studies research in which a number of scholars have identified Emilio Fernandez's cinematic productions as worthy tools of analysis. Previous findings from such investigations lead me to conclude that the representations of Indigenous groups within these films are more harmful than helpful.

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S - Sustainability **U** - Charlotte

Humanities

Title: From Labor Strikes to Environmentalism:

The Gendering of Appalachian Activism in the Twentieth Century

Student Author(s): Katelyn Roach **H, NC**

Faculty Advisor: Dr. Karen Cox

Department: History

This paper addresses the roles that Appalachian women assumed in the economy of coal that reinforced hierarchical gender roles, thereby excluding them from an industry that relied heavily on their labor for survival. It considers the different forms of labor that women performed, as they worked informally as domestic laborers as well as within the coal industry as miners. Despite their eventual entrance into the formalized economy as miners, women remained economically and socially excluded from the coal industry. This would ultimately lead to women assuming roles as environmental activists during the second wave of feminism from the late 1960s to the early 1990s. Much of the current research on this topic has been conducted by social scientists who have evaluated the present economic and sociological reasons for the gendering of environmental activism in Appalachia. However, the historical context by which this gendered activism materialized has not yet been thoroughly addressed. It is for this reason that this paper takes a comparative historical approach by contrasting women's environmental activism during the second wave of feminism and the labor activism that occurred during the first half of the twentieth century. Finally, its evaluation of the emergence of environmental justice movements is particularly relevant in a sociopolitical context that seeks to romanticize and ultimately revive environmentally and economically destructive extract industries.

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S - Sustainability **U** - Charlotte

Humanities

Title: Zones of Sacrifice: A Closer Look at the Past, the Present and Where
the History Influences the Now

Student Author(s): Maya Robinson **G**

Faculty Advisor: Dr. Philip Kaffen

Department: Languages and Culture Studies

This research project is about sacrifice zones and it came from taking an honors Japanese class that was based around the triple disaster in Japan. We read many different works that talked about 3/11. One body of work that we read, briefly touched on sacrifice zones and I became intrigued despite the small amount of information presented in it. After closing reading this section and thinking about what I could contribute to this work, this led me to the question of "are zones of sacrifice pre-determined, this is the basis of my project focusing mainly on Fukushima and Chernobyl. Sacrifice zones are areas in a country or city that has been used as a way to further the nation in some way. This definition will be expanded on in my research. Through history, reading about other sacrifice zones, data, translated works from Japanese and peer-reviewed articles, this will help me come to my conclusion. In which, I hope to prove that these zones are pre-determined through their history and other data. This research is important because a lot of areas even in the United States are subject to these sub-par conditions at the expense of having mundane things like wood and paper. These areas are often silenced due to a major body and it's a lot of build up before something huge happens like a nuclear explosion or water pollution, but it's important to showcase how we can prevent these things from happening by recognizing the signs.

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S - Sustainability **U** - Charlotte

Humanities

Title: Not all Skinfolk are Kinfolk: The Impact of the Miseducation of

Black Homogeneity in America

Student Author(s): Neud Saint-Cyr **G, H**

Faculty Advisor: Dr. Debra Smith

Department: Africana Studies

The idea of a need for oneness in the black community at large has been unrefuted and celebrated. This notion has been supported by many popular figures and paradigms, in particular, the Pan Africanism paradigm, which calls for the unity of all black people regardless of origin, on all levels and aspects of life. In this research the author aims to show that the assumption of homogeneity in the black community is the root of tensions in the black community between African Americans and black immigrants. Through an autoethnography, the researcher, a black immigrant living in America, argues that negating cultural differences and adopting the motto of the need for uniformity may actually be causing more tensions between the African American community and the black immigrant community, which encompasses immigrants from the Caribbean and Africa. Through juxtaposing statistical data and the author's own life experiences she attempts to prove that the dismissal of vital information, such as socio-economic differences and health disparities that are present amongst the two respective groups in the United states, allows for the intensification of prejudices instead of solidarity. This notion of homogeneity hinders the understanding of the manifestation racism and classism in America for all parties involved.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Humanities

Title: Dark vs Normal Tourism in the Wake of the 3/11 Disaster in Fukushima

Student Author(s): Shalini Sarkar **G, H**

Faculty Advisor: Dr. Philp Kaffen

Department: Language and Culture Studies

The main question of my project is to explore the future of tourism in Fukushima after the 3/11 Fukushima Daiichi Disaster, and what the differences are between current “dark tourism” industry in Fukushima, which is run by volunteers and aims to educate visitors about the disaster, versus the future Fukuichi Kanko Project which aims to replace a site in Fukushima and bring “normal” tourists to the area. I will attempt to gather information on what people who are from Fukushima and were affected by the disaster feel about the dark tourism versus normal tourism in Fukushima, both presently and in the future. Previous literature includes newspaper articles on local tourist groups and a website from a Japanese government think tank called Genron which has plans to open a tourist destination in Fukushima. To conduct my research, I will use online databases such as JSTOR to find peer-reviewed articles on both general and Fukushima based dark tourism articles, and articles about the Fukuichi Kanko Project. I will also use newspaper articles from trusted newspapers, gathered mostly online, that discuss dark tourism in Fukushima as well. I expect to find differing opinions on which type of tourism will be better for Fukushima, as well as to ascertain the main goals of tourism for the future of Fukushima. This research is important as Fukushima has yet to recover economically and socially from the events of the 3/11 Fukushima Daiichi Disaster, and this project will explore the possible future of Fukushima.

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S - Sustainability **U** - Charlotte

Humanities

Title: Silent Women: Malinche and Pocahontas in Academia

Student Author(s): Anna Urrutia **G**

Faculty Advisor: Dr. Carol Higham

Department: History

The historiographies on Pocahontas' and Malinche's myths, and their legacies regarding the conquest of the Powhatan of North America's East Coast and the Aztecs of Mexico, are plentiful. For decades scholars have studied the way these stories have been altered by the public, and consequently, how historic realities have influenced them. However, the academic sphere's understanding of the narrative is not free of bias. Historians have let their research on these indigenous women's lives be clouded by their own modern perspectives. As a result, research in the twenty-first century dealing with Malinche and Pocahontas has unfortunately fallen victim to a dichotomization of their conclusions on the indigenous women's narratives. This research paper seeks to do a comparative analysis of the historiographies of both Pocahontas' and Malinche's narratives in academia from 1992 to the present-day. In order to figure out how both women's roles in the colonization of North America's native societies have been altered by historian's own perspectives, as well as to learn how these biases have reflected on the legacies of both indigenous women. Utilizing multiple scholars' analysis of the women's narratives, from Camila Townsend's *Malintzin's choices: an Indian woman in the conquest of Mexico*, to Helen Roundtree's *Pocahontas Powhatan Opechancanough: three Indian lives changed by Jamestown*, this paper seeks to understand how scholar's research on each woman's story compare, ultimately seeking to determine the reason for these prejudices and reflect critically on how they affect modern academic understanding of Malinche and Pocahontas.

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S - Sustainability **U** - Charlotte

Mathematics and Computer Sciences

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S - Sustainability

U - Charlotte

Mathematics and Computer Sciences

Title: A Numerical Method for an Inverse Source Problem for Parabolic Equations

Student Author(s): Phuong Mai Nguyen

Faculty Advisor: Dr. Loc Nguyen

Department: Mathematics and Statistics

Two main aims of this paper are to develop a numerical method to solve an inverse source problem for parabolic equations and apply it to solve a nonlinear coefficient inverse problem. The inverse source problem in this paper is the problem to reconstruct a source term from external observations. Our method to solve this inverse source problem consists of two stages. We first establish an equation of the derivative of the solution to the parabolic equation with respect to the time variable. Then, in the second stage, we solve this equation by the quasi-reversibility method. The inverse source problem considered in this paper is the linearization of a nonlinear coefficient inverse problem. Hence, iteratively solving the inverse source problem provides the numerical solution to that coefficient inverse problem. Numerical results for the inverse source problem under consideration and the corresponding nonlinear coefficient inverse problem are presented.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Mathematics and Computer Sciences

Title: A Globally Numerical Convergence Method to Reconstruct the 1D Absorption

Coefficient from External Measurement

Student Author(s): Drusti Patel **H, S**

Faculty Advisor: Dr. Loc Nguyen

Department: Mathematics and Statistics

The aim of this research is to solve a coefficient inverse problem. This is the problem computing the absorption coefficient of a medium from the external measurement of the wave fields in time. Roughly speaking, the absorption coefficient measures the ability of a material to transfer received energy into heat. Since different materials have different absorbing properties, the computed absorption coefficient provides some information about the internal structure of the medium. Hence, solving this inverse problem allows us to identify the internal structure of a medium without breaking it apart. Hence, this problem has potential applications in many important fields; for example, biomedical imaging. The data for this problem is the wave field that is governed by a differential equation. To solve this problem, we have to study some property of the wave propagation and differential equations. Our method consists of two stages. We first derive a differential equation that does not depend on the absorption. Then, in the second stage, we solve that equation by a predictor-corrector process. The convergence of this process will be verified numerically. It is worth mentioning that, unlike the least-squares optimal control, the proposed method in this thesis does not require a good initial guess. Some numerical examples will be displayed.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Science, Technology, and Engineering

Title: Impaired Inflammatory Response in MΦ Derived from
Bone Marrow Cells from Survivors of Sepsis

Student Author(s): Joseph Allender and Laura Huff **H**

Faculty Advisor: Dr. Mark Clement

Department: Biological Sciences

Sepsis survivors have increased risk of mortality and morbidity. This may be related to persistent immune impairment, but the mechanisms are not understood. We hypothesize that inflammatory/oxidative stress during sepsis alters bone marrow stem cells so that immune cells (macrophages, MΦ) derived from those stem cells are impaired even after resolution of sepsis. C57BL/6 mice were implanted with temperature probes and were subjected to cecal ligation and puncture (CLP) or sham. Late antibiotics produced severe sepsis, while mild sepsis resulted from early antibiotics. Mice were monitored using body condition scale (BCS) and temperature (BT). At humane endpoint of BT 21 mice were euthanized (non-survivors). Mice surviving 3 days were survivors. Bone marrow was isolated and cultured to drive differentiation to MΦ for 7 days and stimulated with IFN-γ + LPS and assessed by NO production (nitrite level) and induction of iNOS. Non-survivors had BCS of 16.5±0.29 and BT of 24.6 ± 0.53. MΦ from marrow from non-survivors showed impaired pro-inflammatory response (41% decrease in nitrite vs control and similar iNOS expression). Survivors were indistinguishable at euthanasia from controls suggesting complete recovery from sepsis. Nevertheless, MΦ from bone marrow from these survivors showed significantly impaired nitrite (figure 1, p=0.0022 vs control) and equivalent decrease in iNOS. Our results show that sepsis induces changes in bone marrow function persist even after in vitro expansion and differentiation into MΦ. This occurs in marrow cells from non-survivors and survivors. These results suggest epigenetic modifications may persist indefinitely giving rise to impaired innate defense mechanisms.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: The Effect of Detergent Concentration on the Binding Constant in the

Microscale Thermophoresis Experiments

Student Author(s): Maria Arango

Faculty Advisor: Dr. Irina Nesmelova

Department: Physics and Optical Sciences

The study of protein-protein interactions gives vital insight into the molecular biology of the cell, provides the opportunity to understand pathogenesis processes, and supports the development of pharmaceuticals. Microscale Thermophoresis (MST) is a technique based on the physical principle of thermophoresis by measuring the motion of molecules along microscopic temperature gradients and providing information about molecule size, charge and hydration shell. In the experimental setup using the Monolith NT. 115 instrument a sample solution contained in a capillary is placed on a sample tray and is locally heated with an IR laser. The infrared laser induces a microscopic temperature gradient and the movement of molecules is detected and analyzed using either covalently attached dyes, fluorescent fusion proteins, or intrinsic fluorescence. During the experiment potential problems can arise amid assay design such as the surface adsorption of the sample material to the glass capillaries. This effect limits the mobility of the molecules in the temperature gradient and is seen in the high fluorescence values from the walls of the capillaries. To optimize this experiment, buffer additives such as detergents can be used to stabilize samples in solution. Different amounts of detergent concentration will be added to the solution and its effect on the binding constant between varieties of molecules will be recorded. This procedure can be replicated to deliver improved data quality and sample stability and provide crucial information for the development of more targeted and effective pharmacological agents and advance the fields of pharmacology and pathology.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Expanding the Coordination Chemistry of Heterocyclic Telones

Student Author(s): Kirk John Arcena

Faculty Advisor: Dr. Daniel Rabinovich

Department: Chemistry

A number of metal complexes supported by N-heterocyclic thione (NHT) and selone (NHSe) ligands have been prepared in our research group in recent years. More specifically, silver(I) compounds $[Ag(IArE)_2]X$ (Ar = Xy, Mes, Dipp; E = S, Se; X = NO₃, BF₄, ClO₄) have been synthesized and their anticancer activity investigated. Seeking to expand the scope of this project, we described in this presentation our efforts to prepare the corresponding tellurium analogues, namely metal complexes of the N-heterocyclic telone (NHTe) ligands IArTe. For example, several mercury(II) complexes (IArTe)HgX₂ (X = Cl, Br, I) have been prepared but their full characterization has been hampered by their relatively low thermal stability. In contrast, we have successfully isolated and fully characterized a few silver(I) species of general formula $[Ag(IArTe)_2]X$, which constitute the first NHTe complexes of silver to be prepared. In a similar vein, our attempt to prepare cadmium(II) and other metal derivatives will be outlined in this presentation.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Chemogenomic Screening as a Potential Means of Identifying the Hsp70

Co-chaperone HDJ2 as a Hub for Anticancer Drug Resistance

Student Author(s): Jacob Blackman **H**

Faculty Advisor: Dr. Andrew Truman

Department: Biological Sciences

The mutated proteins that allow cancer cells to grow fast are highly unstable. They require the help of cellular repair machines (known as chaperones) to keep them active. For the past twenty years, researchers have tried to develop drugs to stop these chaperones from working. However, chaperones are present in both normal and cancer cells and anti-chaperone drugs and as such are highly toxic to patients. Chaperones work with a range of helper co-chaperone proteins that regulate activity. In this study we are examining the possibility of preventing cancer cell growth by using an inhibitor of the HDJ2 co-chaperone. This will be accomplished by testing the effect of inhibiting HDJ2 and observing how this alters the potency of well-characterized anticancer drugs. Any combinations of drugs that work well together will be studied further in mini tumors called spheroids.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Ethylene Glycol: A High Concentration Cryoprotectant for Vitrification

Student Author(s): Rachel Caputo **H**

Faculty Advisor and Co-Author: Dr. Charles Lee

Department: The Center for Biomedical Engineering and Science

Vitrification is emerging as a new approach to tissue and cell preservation. The process of vitrification generates a glass-like state of the sample by cooling it in a rapid and controlled manner, temporarily halting metabolic activity. However, vitrification conditions remain to be optimized to define a minimally toxic, affordable combination of penetrating and nonpenetrating cryoprotectants which will successfully result in vitrifying cells. Remarkably, following stepwise loading and unloading of the combination of penetrating cryoprotectant ethylene glycol, which quickly diffuses across the plasma membrane (2), with the non-penetrating cryoprotectant sucrose, cryoprotectant toxicity was greatly reduced (1-4). Thus, here we investigated the effects of two ethylene glycerol and sucrose combination vitrification solutions on hepatocytes. Specifically, we compared a 40% ethylene glycol (EG) + 0.6M sucrose and a 45% (v/v) EG + 0.75 M sucrose solutions as potential vitrification solutions (VS) for HepG2 cells. Following incubations in the vitrification solutions/process, survival of the cells were determined based on nuclear propidium iodide staining, a marker of dead cells. This study investigates the potential of combination ethylene glycol and sucrose as a more effective cryoprotectant for vitrification. Successful vitrification could lead to a more in-depth investigation of metabolic activities and the ability to cryoprotect larger sample. Moreover, an optimized vitrification solution will improve cell and tissue preservation.

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Science, Technology, and Engineering

Title: Effects of Bioflavonoids Genistein and Quercetin on DNA damage and

Repair Pathway in XRCC4 (-/-) Hematopoietic Stem Cells

Student Author(s): Ami Changela **H**

Faculty Advisor: Dr. Christine Richards

Department: Biological Sciences

DNA double-strand breaks (DSBs) are among the most deleterious DNA lesions. Correct repair of DSB damage is crucial to genome stability, normal cell function, and proliferation. Chromosomal breaks can occur in a programmed manner through meiosis, immunoglobulin class switching, reactive oxidative species, DNA replication errors, polymerase stalling, ionizing radiation, and chemotherapeutic drugs such as topoisomerase II inhibitors. Etoposide is a topoisomerase II inhibitor and has a strong association with MLL-AF9 breakpoint cluster region (bcr) translocation in therapy-related leukemia. A strong association has led to the hypothesis that exposure during pregnancy to biochemically similar compounds can promote infant leukemia [1]. Some dietary compounds such as bioflavonoids genistein and quercetin are most biochemically similar to etoposide [1]. To test the hypothesis, the MAG cell line and XRCC4 (-/-) cell lines were genetically engineered. Mutant XRCC4 gene is used to understand the crosstalk involved in genistein and quercetin exposure and repair pathway choice to understand the underlying mechanisms of chromosomal translocation in stem cells. Cells will be treated with bioflavonoids genistein and quercetin to identify the consequences of loss of XRCC4 protein on the C-NHEJ and Alt-EJ and enable us to understand in a potential increased risk of infant acute leukemia. Colonies will be isolated, DNA extracted, and PCR will be performed to determine the genome sequence across the translocation site. We expect the XRCC4 (-/-) cells treated with bioflavonoids will have increased translocation events with more insertion and deletion events characteristic of Alt-EJ.

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Science, Technology, and Engineering

Title: Implementing a Quantum Optimization Algorithm to
Control Qubits for Quantum Computing

Student Author(s): Christopher Daniel **H**

Faculty Advisor: Dr. Donald Jacobs

Department: Physics and Optical Sciences

Given the current promise of quantum computing to increase the efficiency of optimization algorithms, it is important to utilize these quantum algorithms for useful applications such as quantum state transfer control. Quantum state transfer control involves searching for the propagator to transfer an arbitrary initial quantum state to a target final quantum state. The quantum approximate optimization algorithm (QAOA) was recently developed to accommodate optimization problems where the maximum of a cost function is required for an optimal solution. Our cost function to maximize for quantum state transfer control is the infidelity of a five-qubit transverse field quantum Ising ring model. The infidelity is a measure of how close the initial quantum state and the target quantum state are from each other. We demonstrate good unitary transformation angles for an approximate solution with the ability to find the best solution as the number of iterations increases.

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Science, Technology, and Engineering

Title: Coordination Chemistry of Expanded-Ring Heterocyclic Chalcogenones

Student Author(s): Keri Dowling

Faculty Advisor: Dr. Daniel Rabinovich

Department: Chemistry

The synthesis, characterization, and coordination chemistry of six new N-heterocyclic thione (NHT) and selone (NHSe) ligands containing a saturated 1,3-diazepine ring (SDiaz) and bulky aromatic (Ar) substituents on the nitrogen atoms is described in this presentation. In particular, a series of closed-shell (d10) metal complexes have been synthesized in order to understand the effect that the size of the heterocyclic ring has on the Lewis basicity of the ligands relative to their analogues based on five- and six-membered rings. More specifically, several cadmium(II) and mercury(II) complexes (SDiazArE)MX₂ (M = Cd, Hg; E = S, Se; X = Cl, Br, I) have been isolated and characterized by a combination of analytical and spectroscopic techniques. This presentation will also outline our preliminary exploration of the reactivity of the NHT and NHSe ligands towards elemental iodine and the preparation of homoleptic cationic silver(I) complexes [Ag(SDiazArE)₂]X (X = NO₃, BF₄, ClO₄) that may have potential anticancer activity.

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Science, Technology, and Engineering

Title: Determining the Mechanism of FAM35A-Associated Chemoresistance

Student Author(s): Kylie Fackrell

Faculty Advisor: Dr. Junya Tomida

Department: Biological Sciences

Prostate cancer (PCa) is among the most common malignancies, and approximately 32,000 men die of the disease annually, especially of metastatic castration-resistant prostate cancer (mCRPC). mCRPCs display high-mutation rates in DNA double-strand break (DSB) repair genes including BRCA1/2 genes. Since BRCA1/2-defective cells are sensitive to DSB-inducing chemotherapy, BRCA1/2-altered mCRPC may be responsive to poly-ADP ribose inhibitors (PARPi), that cause DSBs during DNA replication. The mechanisms of resistance to PARPi observed in other BRCA1/2-deficient cancers are unclear. Recently, FAM35A deletion was shown to induce PARPi resistance in BRCA1-deficient breast cancer cells. Since FAM35A is also deleted in 6-13% of mCRPC while both BRCA1 and FAM35A mutations are rare, deficiencies in other repair genes including POLQ may contribute to PARPi resistance in mCRPC. Our preliminary data indicates that, while single knockout preserves sensitivity, the double knockout of FAM35A-POLQ generates resistance to PARPi and another DSB-inducing agent, etoposide. Our hypothesis is that depletion of FAM35A and POLQ completely eliminates one DSB repair pathway, causing hyperactivation of the homologous recombination pathway. First, we will assess chromosomal instability by staining micronuclei. We expect to see decreased chromosomal instability in FAM35A-POLQ double knockout cells following DNA damage agent treatment. Second, we assess the presence of RAD51 foci consistent with repair via HR by immunostaining. We expect increased RAD51 foci in double knockout cells. Future research will further our understanding of POLQ expression in FAM35A-depleted PCa and mCRPC.

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Science, Technology, and Engineering

Title: Inflammasome Inhibition and Fibroblast Pro-inflammatory Cytokine
and Collagen Secretions in Breast Cancer

Student Author(s): Emily Floyd **H**

Faculty Advisor: Dr. Didier Dréau

Department: Biological Sciences

Inflammation contributes to a pro-inflammatory and pro-fibrotic environment in breast cancer. In breast tumors, fibroblasts actively participate in both inflammation and fibrosis secretions of pro-inflammatory cytokines and collagens. Whether in fibroblasts NLRP3 inflammasome activation promotes secretions of IL1 β and IL18 cytokines and/or of collagen I and IV is unknown. Here, we investigated whether NLRP3 inflammasomes critically affect fibroblast secretions of IL1 β and IL18 cytokines and of collagen I and IV in vitro. Specifically, L929 fibroblasts were incubated in conditions activating NLRP3 inflammasomes, i.e., incubation with LPS and ATP; and concurrently treated with increasing doses of NLRP3 chemical inhibitors. The NLRP3 inflammasome inhibitors targeted the NLRP3 oligomerization and/or the ASC1 scaffolding protein oligomerization. Our data indicates that the MCC950, a NLRP3 inflammasome inhibitor preventing NLRP3 oligomerization, dose-dependently prevented fibroblast secretions of both IL-18 and IL-1 β pro-inflammatory cytokines. MCC950 also altered fibroblast collagen IV production. In contrast, low but not high concentrations of ISL, a NLRP3 inflammasome inhibitor preventing ASC1 oligomerization, prevented IL1 β secretions. Interestingly, the fibroblast collagen I:collagen IV secretion ratio were dose-dependently decreased in the presence of either MCC950 and ISL NLRP3 inflammasome inhibitors. Taken together, these results support the key role of NLRP3 inflammasome activity in fibroblasts and suggest new potential targets to prevent breast cancer progression.

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Science, Technology, and Engineering

Title: Hoping for Gold in a Charlotte Sinkhole:

A GPR Survey

Student Author(s): Emma Heavener, Jonese Pipkin, Hannah Park,

Shelby Chester, and William Cottle **NC, U**

Faculty Advisor: Dr. Andy Bobyarchick

Department: Geography and Earth Sciences

A sinkhole formed in the basement of an urban Charlotte, NC, home in an area known to be underlain by the abandoned underground Chinquepin gold mine. This study aims to explain the relationships between the shallow subsurface geology of the mine and the origins of and hazards associated with the sinkhole. We hypothesize that the sinkhole was caused by mine collapse and that it is probable that additional voids exist beneath the house. To test this hypothesis, we conducted a non-intrusive ground penetrating radar survey on the basement floor using 400 MHz and 100 MHz antennas. A reference survey was also conducted in an adjacent grassy field (400 MHz only). Reconstructions and 3D models show several void-like depressions in the basement substrate. A larger subsurface anomaly may be connected to the sinkhole. Data from the neighboring grassy field also reveal strong characteristic anomalies suggestive of underlying partially filled voids. We conclude that the subsurface beneath the home and neighboring area likely contain remnants of mine excavations. Because ground subsidence has already occurred over part of these excavations, we suggest that future sinks of similar magnitude may occur in the area.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Raw Single-Walled Carbon Nanotubes as Material for

Electrical Double-Layer Supercapacitors

Student Author(s): Terawit Kongruengkit **NC, S, U**

Faculty Advisor: Dr. Jordan Poler

Department: Chemistry

Energy companies within the U.S are building wind and solar plants capable of generating up to 72 GW of energy by 2020. Full transition to renewable energy is bottlenecked by the intermittent nature of wind and sunlight, leading to demands of energy consumption being out of phase with production. One solution is to store unused energy during high generation cycles, which will create an energy reserve that avoids energy distribution interruptions. Companies such as Tesla and BMW are spending resources on developing battery technologies. However, batteries are prone to degradation, and their intrinsic lower power density compared to capacitors becomes a problem when large power withdrawal is required. Novel research in energy storage systems is using nanomaterials. For example, our lab has shown that molecularly spaced single-walled carbon nanotubes (SWCNTs) yield larger specific capacitance than pristine materials because of an increase in ion-accessible surface area. The current obstacle to commercializing SWCNTs supercapacitors is the high cost of purified SWCNTs. We will present experimental results using unpurified SWCNTs (raw SWCNTs) that are a fraction of the cost of purified SWCNTs. Raw SWCNTs contain a mixture of assorted SWCNTs tube sizes and amorphous carbon species. Raman spectra of the raw SWCNTs have shown a 35% increase in diamondoid-to-graphene vibration when compared to the purified SWCNTs. We will present a full electrochemical analysis of these novel materials, including spectroscopic and microscopic characterization. Changes in specific capacitance, energy, and power will be compared to the type and concentration of intercalated molecular spacers.

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Science, Technology, and Engineering

Title: Photovoltaic and Electrochemical Energy Storage Application in Drones

Student Author(s): John Luke and Wanseok Oh **S**

Faculty Advisor: Dr. Yasin Raja

Department: Center for Optoelectronics & Optical Communications

To date, the use of non-sustainable energy sources has been a significant and primary resource for energy needs. Sea-level rise is a result of climate change due to CO₂ emission from the non-sustainable 'burning process.' Renewable energy sources, specifically photovoltaic (or PV), have emerged as a viable technology for producing energy while preserving the environment. Solar cell efficiency has improved dramatically over the years, with synergetic effects of new approaches such as materials, designs, manufacturing methods. For example, NREL reported a multi-junction solar cell with a concentrator showed an efficiency of 47.1%. Another challenge posed is the intermittent nature of solar energy based on the time of the day, seasons, and weather conditions. Power conversion and management of this nature require significant advancements in storage techniques and capacity. With the insurgence of new materials, energy storage has evolved to address these requirements. Electrochemical Energy Storage (or EES) typically comes in four variants: Capacitors, Supercapacitors, Batteries, and Fuel Cells, all of which have advantages and limitations. The optimization of PV systems and EES present many implementation possibilities and opportunities. For this review and concept work, we focus attention on the use of PV and EES drone technology. Drones represent a growing segment of the market for personal, business, and military applications. Implementing an advanced system of solar cell collection and EES in drones could improve flight time, reduce weight to charge density to achieve extended, or in some cases, unlimited flight time. Regardless of the application, the increase in efficiency of the PVs and energy storage represents a profound effect on the future of energy production.

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Science, Technology, and Engineering

Title: Analyzing Repetitive DNA Involved in Tissue Regeneration in Echinoderms

Student Author(s): Gerald Mabe **H**

Faculty Advisor: Dr. Daniel Janies and Dr. Denis Jacob Machado

Department: Bioinformatics and Genomics

Past studies have shown that echinoderms can undergo complete organ regeneration when exposed to trauma [4,5]. Among echinoderms, *Sclerodactyla briareus* (the hairy sea cucumber) and *Ophioderma brevispina* (the serpent star) have shown great regenerative potential [1,7]. The specific biological mechanisms for their extensive tissue regeneration are currently unknown. Annotated genomes of the brittle star and the sea cucumber are known to contain a high number of repetitive elements when compared to other animals [3]. Past research has already implicated numerous repetitive sequences that code for secretory and fibrinogen-related proteins during organ regrowth in echinoderms [8]. We hypothesize that the high proportion of repetitive elements in the genomes of echinoderms modulate the gene regulatory mechanisms involved in complete tissue regeneration by up-regulating or down-regulating genes associated with this process. To test this hypothesis, our team will utilize currently available PacBio and Illumina genetic data from hairy sea cucumber and brittle star tissues. We will assemble the genomic data with REPdenovo and undergo annotation with RepeatModeler and RepeatMasker to obtain the repetitive sequences. The repetitive sequences will then be categorized and counted for use in discerning the specific sequences responsible for tissue regeneration. The categorized repetitive elements will be compiled into a single dataset that will be published online to NCBI's GenBank [2]. The genomic resources produced from this project will also be used by our colleagues at Wake Forest University Institute for Regenerative Medicine to perform experiments in vivo that examine the precise gene regulatory mechanisms involved in echinoderm regeneration.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Assessing the Influence of Bioflavonoids on DNA Repair in XLF- cells

Student Author(s): Symonne Martin **H**

Faculty Advisor: Dr. Christine Richardson

Department: Biological Sciences

Chemical agents, ultraviolet rays, irradiation, and normal cellular processes can cause damage to our chromosomes. A common source is double-stranded breaks (DSB). If DSBs are not repaired in a timely manner or repaired incorrectly, it can cause changes in proteins, cancer, or cell death. Classical non-homologous end-joining (c-NHEJ) is typically error-free. Homologous recombination is known to be error-free or includes substitutions. Alternative end-joining (Alt-EJ) may introduce insertions, deletions, and micro-homologies. Bioflavonoids are polyphenolic biomolecules consumed in everyday diets. At high concentrations (ex. supplements) the molecules stabilize DSBs and promote translocations, potentially by promoting one repair pathway over the others. A region of the genome that plays an important role in DNA damage repair is the XLF gene. This gene works with the XRCC4 gene to ligate the ends of broken DNA strands and influence successful repair. The research aims to determine the incidence of insertions, deletions, and mutations of XLF-/- cells that have been treated with bioflavonoids. A murine cell line engineered to contain two green fluorescent protein transgene exons on separate DNA strands with the XLF gene removed will be treated with bioflavonoids. Translocated DNA strands, designated by green fluorescence, will be amplified and sequenced. We hypothesize that the treatment of XLF-/- cells with bioflavonoids will lead to an increase in the number of deleterious alterations of the genome. By understanding the DNA repair pathway and the role of bioflavonoids, we can target those at higher risk for certain leukemias and decrease the overall rates of cancer.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Investigating the Distribution of Trehalose and Water in LAD

Processed Samples Using Confocal Raman Spectroscopy

Student Author(s): Riley McKeough, Daniel Furr, Fan Zhang, and Yong Zhong **H**

Faculty Advisor: Dr. Susan Trammell

Department: Physics and Optical Sciences

Protein-based therapeutics and diagnostics have important applications in modern medicine ranging from cancer treatment to disease detection. The current method for the storage of proteins is freeze drying. However, dry-state preservation has become an attractive alternative approach due to no-need for ultralow temperatures, economical storage costs and logistical flexibility for shipping. Light assisted drying (LAD) is a new processing technique that uses a near-infrared laser to illuminate and desiccate a protein suspended in a trehalose solution. The rapid desiccation of the solution by LAD forms an amorphous trehalose matrix for the preservation of the protein. Anhydrous preservation requires low water content for room temperature storage and uniform water content throughout the sample is needed to accurately determine appropriate storage conditions. In this study, Raman spectroscopy is used to evaluate the water/trehalose content of LAD processed samples as a function of position. Each sample consisted of a 40uL drop containing 0.49 mg/ml lysozyme in 0.2M trehalose and 0.33x Phosphate Buffered Saline (PBS). Samples were LAD processed using a 5W 1064nm laser. Confocal Raman spectroscopy with excitation 532nm and 100x objective was used to detect Raman peaks of water and trehalose at five locations 20µm beneath the surface of each LAD processed sample. Ratios of the peaks at 850cm⁻¹, 900cm⁻¹, and 3400cm⁻¹ were used to determine relative trehalose/water content. The results show LAD processing produces low variation of trehalose and water in samples. Future work will be using Raman spectroscopy to measure trehalose/water distributions after LAD processing with varying parameters.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Life on the Edge: Using Otolith Microchemistry to Assess
Habitat Use Patterns in Marsh Fish

Student Author(s): Julia Nelson and Hannielle Joseph **H, NC, S, U**

Faculty Advisor: Dr. Paola López-Duarte

Department: Biological Sciences

Fish habitat use is an important metric to evaluate the ecological function of coastal ecosystems. Otolith (inner ear bone) microchemistry is a valuable tool that can be used to reconstruct the environmental histories of fish. As new layers of calcium carbonate are deposited on the otolith throughout the life of the fish, trace elements present in the water column are incorporated. The approach has been applied in multiple fish species and habitats. However, its utility in understanding habitat use patterns at smaller scales has not been established. The goal of this project is to determine whether otolith microchemical signatures vary significantly across marsh-resident species and subhabitats. In this study, we compared the otolith microchemistry of two related species, *Fundulus grandis* (Gulf killifish) and *F. xenicus* (diamond killifish). *Fundulus* spp. occupy various marsh subhabitats, such as marsh edges, creeks, and ponds. We analyzed the otolith microchemistry of adult and juvenile fish from two species and from different sub-habitats. Elemental concentrations were measured using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). Our preliminary results suggest that the chemical composition of these otoliths changes more with ontogeny than it does with sub-habitat. Continuing efforts to distinguish chemical signatures in otoliths will need to factor in the differences detected between juveniles and adults.

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Science, Technology, and Engineering

Title: Effects of Environmental Stressors on the Regeneration Rate
of the Model Sea Anemone *Nematostella Vectensis*

Student Author(s): Danika Ng **H**

Faculty Advisor: Dr. Adam Reitzel

Department: Biological Sciences

Regeneration of cells and tissues is an essential biological process for all multicellular organisms. Cnidarians, like the sea anemone *Nematostella vectensis*, can repair and replace any of their cells upon damage and are an ideal model system to determine the mechanisms for this regeneration process. Mammals, including humans, utilize hair cells of the inner ear for hearing, but these organisms are unable to repair them when they are damaged, resulting in hearing loss. Thus, cnidarians like *Nematostella* can be important experimental models to understand the mechanisms of regeneration of these vibration-sensing cells. In my research, I have studied how particular environmental stressors might limit the regeneration of hair cells by exposing sea anemones to ethanol, the antibiotic streptomycin, and ultraviolet radiation. Groups of twenty sea anemones were exposed to one of three stressors and regeneration success was compared to a control (100 mL of 15ppt seawater). After the exposure period, the eighty anemones were anesthetized to count their initial number of tentacles and then excised. For the next 10 days, tentacle regeneration was quantified and then categorized based on degree of regeneration: "full" (75-100% regeneration of initial tentacles), "partial regeneration" (50-74% regeneration), and "little to no regeneration" (0-49% regeneration). The mean number of sea anemones in each regeneration category will be compared using T-tests and ANOVA. My research shows that ultraviolet radiation and streptomycin exposure are particularly detrimental to tissue regeneration, compared to the regeneration of animals exposed to ethanol and the controls.

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Science, Technology, and Engineering

Title: Investigation of Regeneration Associated
Genes in Brittle Stars

Student Author(s): Mary Overton **H**

Faculty Advisor and Co-Authors: Dr. Didier Dréau, Dr. Daniel Janies,
Dr. Vladimir Mashanov, and Dr. Jan Kosfky

Department: Biological Sciences

Echinoderms are known for their ability to regenerate all tissues, even as adults. However, little is understood about the molecular mechanisms regulating organ and tissue regrowth after injury in Echinoderms. The Notch signaling pathway serves a variety of functions in animals including differentiation, fate specification, and proliferation. We chose the Notch signaling pathway as a starting point as it has been previously reported to be important in tissue regeneration in some Echinoderms such as sea cucumber *Holothuria (Selenkothuria) glaberrima* and sea urchin *Lytechinus variegatus*. In this study, we examined molecular mechanisms of limb epimorphosis (regeneration of adult tissues) in brittle star *Ophioderma brevispina* after autotomy (dropping of a limb). We examined the expression of Notch receptor and delta-type ligand genes (which produce signaling molecules) in *O. brevispina*, spatially and temporally, by in situ hybridization and RT-qPCR analysis of regenerating tissue at different timepoints post autotomy. With the results of these experiments, the regulation of regeneration-related genes can be altered by techniques such as RNAi to modulate the process of regeneration. This work paves the way for modulation of the regenerative process in echinoderms and will advance our understanding and the development of regenerative medicine in humans.

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Science, Technology, and Engineering

Title: Activity Rhythms of Egg-bearing Fiddler Crabs

Student Author(s): Leyna Pence and Taylor Parker **H, NC**

Faculty Advisor: Dr. Paola López-Duarte

Department: Biological Sciences

Sand fiddler crabs (*Leptuca pugilator*) time daily activities to the tidal cycle. An internal, tidal clock helps this and other estuarine species track the environmental changes that occur throughout the tide. Fiddler crab adults are typically active during low tide, but remain inactive in their burrows during high tide to avoid predators. This activity pattern is different for ovigerous (bearing eggs) crabs. They remain in the burrows throughout embryonic development (~14 days). Our previous work indicates that the entrainment of this circatidal (circa=almost) clock occurs during this incubation period. However, the mechanism(s) by which tidal information is transmitted to the embryos is still unknown. To identify the behaviors exhibited by the female crab that may entrain the clock in the embryos, we measured the activity (horizontal displacement) of ovigerous crabs relative to that of male and non-ovigerous crabs. Crabs were recorded in constant conditions using video tracking (Ethovision 14.0, Noldus). We hypothesized that ovigerous crabs exhibit activities synchronized with the tidal cycle during incubation and are not inactive in the borrows, as it would appear from field observations. Even though there is high variability in their behavior, preliminary results suggest that ovigerous (n=11) and male (n=9) crabs are the most active groups during low tide (Mean±SEM: 38±28 and 48±5 cm/hr, respectively) relative to non-ovigerous crabs (n=10, 11±25cm/hr). More experiments are underway to examine the possibility that activity patterns displayed by ovigerous crabs set the circatidal clock in developing embryos.

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Science, Technology, and Engineering

Title: The Role of Transcription Factor NF-kB in Regeneration
and Embryogenesis of the Sea Anemone *Nematostella Vectensis*

Student Author(s): Jason Samaroo **H**

Faculty Advisor: Dr. Adam Reitzel

Department: Biological Sciences

Regeneration is a complex molecular and cellular process in which organisms replace damaged or missing cells or tissues. Regeneration has been studied for decades all focused around answering the fundamental question: why do some organisms have remarkable regenerative capabilities while others do not? Regeneration can be studied from an interdisciplinary perspective that seeks to find the link between regenerative ability and development. Marine organisms have proven to be a useful model of study for regenerative biology as they exhibit an abundance of stem cell bioactivity and have been studied for 200 years as systems to understand the whole-body regeneration phenomenon. Using a sea anemone (*Nematostella vectensis*) with remarkable regenerative capacity as our model, the expression and spatial distribution of the immune response protein NF-kB can be measured to determine the role of this transcription factor protein in regeneration. NF-kB is a transcription factor that plays a role in regulating immune response from cnidarians to humans, with properties of the protein being evolutionarily conserved between the two species. Understanding the molecular mechanisms involved in independent regenerative processes and the link between regeneration and embryogenesis could be fundamental to all organisms.

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Science, Technology, and Engineering

Title: Vps501 Localizes to the Vacuole Membrane Using a

Noncanonical Lipid Binding Motif

Student Author(s): Aaron Stecher and Shreya Goyal **H**

Faculty Advisor: Dr. Richard Chi

Department: Biological Sciences

Maintaining cellular health is the most essential biological activity for all living things. From yeast to humans, cells must ingest nutrients and deliver them to distinct intracellular compartments. Collectively, this is referred to as the endo-lysosomal system. While the major constituents of the endo-lysosomal system have been well defined, the molecular mechanisms that govern this critical process have not. Miscues can lead to a multitude of human pathologies, including Alzheimer's, Parkinson's, pathogen invasion, and cancer. The endosome is the central distribution organelle for incoming nutrients and similar to a FEDEX/UPS delivery service, the endosome uses a network of complex cellular highways to sort cargo to proper destinations. The SNX-BAR protein family is highly involved in this process. SNX-BAR proteins use an evolutionarily conserved Phox-homology (PX) domain to recognize phosphatidylinositol 3-phosphate (PtdIns3P), the major lipid moiety of the endosome. Our lab has recently discovered a novel SNX-BAR in yeast, which we have named Vps501. Vps501 is unique from other SNX-BAR proteins in that it resides on the vacuole (yeast lysosome) membrane. In this study, we have used sequence analysis to demonstrate that Vps501 is mutated in key residues of the PX canonical binding motif, and therefore cannot bind PtdIns3P at the endosome. We have also discovered a noncanonical lipid binding motif in Vps501 and hypothesize it mediates vacuole localization. Using site-directed mutagenesis, we have engineered mutations to this secondary motif in GFP-Vps501 and have found it mis-localizes, indicating that it is necessary for Vps501 recruitment to the vacuole membrane.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Dehydration of Nucleic Acid Nanoparticles (NANPs)

for Stable Storage and Transportation

Student Author(s): Allison Tran and Justin Halman **H**

Faculty Advisor: Dr. Kirill Afonin

Department: Chemistry

RNA therapeutics are an emerging class of pharmaceuticals with strong potential for clinical application. Recent advancements in nanotechnology have allowed for the design and development of nucleic acid nanoparticles (NANPs), novel structures made of DNA and RNA. NANPs are highly dynamic structures with tunable physicochemical properties and the capability to utilize various therapeutic moieties. Despite their efficacy, maintenance of the NANPs' structure during production, packaging, and shipment remains a pressing issue due to their sensitivity at higher temperatures. Transportation of samples in the liquid phase requires constant refrigeration, greatly increasing costs. Because of the likelihood of their exposure to a wide variety of temperatures during shipment, there is a critical need to refine the drying methods for long-term stabilization. This project proposes several methods of dehydration of NANPs, including via heat and infrared radiation (IR), Light-Assisted Drying (LAD), and lyophilization. LAD involves the use of a near-IR laser that utilizes controlled temperature settings and uniform distribution of heat, allowing for consistent and reproducible results. Lyophilization is the process of drying samples by freezing them and allowing their contents to sublime in a pressure-reducing vacuum, thus eliminating the need for destructive heat energy. The results indicate that both methods preserve the stability of NANPs much more effectively than storage in solution or dehydration via heat and IR. Overall, these refinements in the NANP dehydration process are crucial in formulating an optimal strategy for producing stable and fully functional structures, an advancement in their development towards clinical applications.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Nucleic Acid Devices that Control Thrombin Activity in Vivo

Student Author(s): Nguyen Truong

Faculty Advisor: Dr. Kirill Afonin

Department: Chemistry

Thrombin is the principal enzyme of hemostasis in the blood coagulation cascade. Its key role is converting fibrinogen into fibrin for clot formation. Hence, the regulation of thrombin activity will enable the treatment of conditions such as venous thrombosis, pulmonary embolisms, and cardiovascular diseases to inhibit thrombin's pro-coagulant activity. Anticoagulant drugs reduce the risk of blood clots by breaking up dangerous blood clots that form in blood vessels or heart. However, current anticoagulants' lack of quick reversibility can have lots of side effects including bruising, minor bleeding, and lowering red blood cell count. Aptamers are single-stranded DNAs or RNAs selected to bind with specific target molecules. In addition to their low cost and low immune stimulation, they are also fully biocompatible and biodegradable. A vast library of thrombin-binding aptamers has been produced and evaluated in phase 2 clinical trials. However, due to their small size, they are rapidly cleared out of the body by renal excretion. In this study, we designed nucleic acid nanoassemblies to act as scaffolds for aptamer coordination. The benefit of this strategy is to prolong aptamers' circulation time in blood in vivo by increasing their molecular weights. In addition, the reverse complimentary strand of an aptamer's sequence can act as an antidote to fully bind and disrupt the three-dimensional structure to cancel its intended function. As a result, we are able to successfully control the coagulation process between normal and prolonged coagulation in vivo experiments.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Transcriptome Analyses of the Infection Pathway in Duffy Negative Individuals

Student Author(s): Haley Wheeler **G, H**

Faculty Advisor: Dr. Eugenia Lo

Department: Biological Sciences

Malaria is a life-threatening disease caused by the protozoan parasite Plasmodium, causing 219 million clinical cases in 87 different countries in 2017. The African region carries the majority of the malaria burden, with 92% of malaria cases and 93% of malaria deaths. Despite extensive research, the complex multistage lifecycle and rapid evolution of the parasites have led to only a handful of control options. The life cycle of Plasmodium begins in the Anopheles mosquito where sporozoites develop in the saliva which is then injected into the human blood stream when the mosquito feeds. The sporozoites invade the liver cells and develop into the schizont stage until it ruptures the cell and goes on to invade the human blood cell. When it enters the human blood cell, it goes through development from ring stage, trophozoite, and then schizont. Once it has become a mature schizont, it bursts the red blood cell where it releases merozoites that go to invade more red blood cells and repeat the process. Erythrocyte invasion involves multiple interactions between parasite ligands and host receptors. In *P. falciparum*, there are several established invasion ligands such as PfEBA-175, PfEBA-181/JESEBL, and PfEBA-140/BAEBL secrete from the parasite micronemes and bind to cognate host receptors such as glycoporphins A, B, C and receptors X, Y, and Z. Some of the invasion ligands have overlapping and partially redundant roles. In *P. vivax*, only a single ligand protein – Duffy Binding Protein (DBP), has been studied in great detail. *P. vivax* uses DBP to bind to the Duffy antigen/chemokine receptor (Fy glycoprotein, or CD234) to enter human erythrocytes. The lack of Duffy antigen expression among most Africans explains the rarity of *P. vivax* malaria in Africa. However, recent studies reported several cases of *P. vivax* infection in Duffy-negative individuals in different parts of Africa, suggesting that Duffy-negative individuals are no longer resistant to *P. vivax*. This phenomenon raises the questions of how *P. vivax* invades Duffy-negative human erythrocytes. This research aims to successfully revive in vitro *P. vivax* culture, extract RNA from symptomatic patient samples and create an RNA transcriptome library with the goal to identify novel gene transcripts potentially govern the *P. vivax* invasion pathway. Blood samples that were microscopically positive with *P. vivax* were immediately processed for cryopreservation. They were then cultured to three major stages: ring, trophozoite, and mature schizont stage. RNA was extracted from these respective culture samples using direct-zol RNA Miniprep Plus kit. RNA libraries were constructed prior to sequencing on the Illumina Hi-Seq system. The *P. vivax* gene expression profiles will be compared among the three parasite stages and key gene transcripts during the erythrocyte invasion process will be identified.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: ICEing Students Out of the Classroom: 287(g) Enforcement and
Hispanic Students' Academic Achievement

Student Author(s): Yesika Sorto Andino **G, H, NC, U**

Faculty Advisor: Dr. Jason Giersch

Department: Political Science and Public Administration

In the United States, there are currently an estimated 1.09 million undocumented children and youth. In an effort to control the movement of immigrants within the United States, Immigration and Customs Enforcement (ICE) created 287(g) allowing ICE to enter agreements with local law enforcement agencies in cities and counties. Prior studies have focused on the impact of different forms of immigration enforcement on immigrant or Hispanic students' academic achievement through test scores, school attendance, and school dropout rates. This current study explores 287(g)'s association with Hispanic students' academic achievement, as measured through End-of-Grade test scores. I examine the differences existing between Hispanic and White students' test scores and explore differences between Hispanic students' academic achievement in 287(g) enforcing and non-enforcing counties. This study utilizes a mixed-methods approach through the use of a test score dataset and 287(g) enforcement data. Through interviews, I explore the role school administrators undertake if/when their community experiences greater immigration enforcement. Preliminary results do not suggest that Hispanic students in 287(g) enforcing counties perform academically less than students in 287(g) non-enforcing counties. Furthermore, in 287(g) enforcing counties, the White-Hispanic gap lessens. As perception changes with age, differences in test scores between older and younger Hispanic students were observed. The study and findings suggest that Hispanic students may be developing resilience in the face of increased immigration enforcement. This study provides a framework for understanding Hispanic students' academic experiences in the context of increased immigration enforcement.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: The Clerkship Advantage

Student Author(s): Megan Bird **H**

Faculty Advisor: Dr. John Szmer

Department: Political Science and Public Administration

Former appellate and Supreme Court law clerks are often employed by top law firms, the Solicitor General, and elite law schools. They're courted by private companies with signing bonuses and impressive salaries. Clearly, they are favored by employers, but are justices more persuaded by former clerks than non-clerk attorneys? We examine whether clerkship causally influences the outcome of a U.S. Supreme Court case. We isolate the hypothesized clerkship effect by controlling for factors like attorney experience and former law school. The data show that both former appellate and Supreme Court clerks do in fact enjoy an advantage arguing before the U.S. Supreme Court, and it's not just their experience that contributes to their success. The findings help us understand the influence of lawyers on the Supreme Court and what factors may affect the outcome of a case. This has broader implications for public policy and who is best poised for courtroom policy making.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Attitudes Toward Immigrants Receiving Government Assistance

Student Author(s): Neal Duncan **H**

Faculty Advisor: Dr. Beth Whitaker

Department: Political Science and Public Administration

The attitudes toward immigrants in the U.S. is a topic that has had extensive research over the years, but it is a topic that is evolving and it is important to reevaluate the factors involved. My research will focus on attitudes toward immigrants receiving government assistance, which is lacking in the current research. The findings of this research will be an important addition to the understanding of immigrant attitudes, as the U.S. has seen recent increases in anti-immigrant sentiment. This study will use experiments in both an MTurk survey and a POLS lab survey to test the attitudes toward hypothetical immigrant profiles. I will answer the questions: Are Americans less likely to support the naturalization of immigrants who receive government assistance? And are Americans more likely to show support for European immigrants over Latin American immigrants? I expect to find higher support for immigrants who are not receiving government assistance. Also, I expect to find higher support for European immigrants over Latino immigrants.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Joint Effects of Sense of Control, Job Control, and Dispositional Mindfulness
as Relating to Work Engagement

Student Author(s): Marviene Fulton

Faculty Advisor and Co-Author: Dr. Alyssa McGonagle

Department: Psychological Sciences

Work engagement, a positive mental state, is marked by healthy heavy work investment and includes vigor, dedication, and absorption. Multiple research studies indicate that employees with high work engagement have higher productivity and well-being. Identifying predictors of work engagement is important for designing interventions to increase work engagement. The aim of this study is to better understand predictors of work engagement. We apply the Self-Determination Theory to examine individual and joint (combined) effects of sense of control (personal trait), job control (environmental authority), and dispositional mindfulness (an alterable trait) as relating to work engagement. Participants (N = 277) were employees from a large Midwestern university who completed an online survey. Results of hierarchical linear regression revealed that job control, sense of control, and dispositional mindfulness all positively predicted work engagement. Further, the effect of sense of control was significantly weaker when job control was low. A three-way interaction effect was also observed, such that the negative effects of low job control on the positive relationship between sense of control and work engagement were lessened by higher levels of dispositional mindfulness. Because dispositional mindfulness can be increased through mindful interventions, our results indicate that mindfulness interventions may be especially helpful for individuals in low job control positions. Based on this, an intervention study is warranted.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Investigating How Undocumented Immigrants Report and
Pursue Legal Action for Domestic Violence

Student Author(s): Betsabe Gonzalez **CE, H, NC, U**

Faculty Advisor: Dr. Johanna Schuch

Department: Geography and Earth Sciences

The purpose of this research is to investigate how undocumented immigrants report domestic violence and pursue legal action in Mecklenburg County, North Carolina. The main questions concerning my research are: What is the process for reporting domestic violence and pursuing legal action in Mecklenburg County? What challenges do undocumented immigrants specifically encounter in these processes? What can be done to make the system more navigable for immigrants? I used quantitative data from several Charlotte-Mecklenburg public offices and programs, including data on U-Visa applications and court cases. I additionally pursued qualitative data from seven interviews with local experts in the areas of immigration and domestic violence. These interviews inquired about how their agencies currently help the immigrant population and what challenges often surface when servicing them. During a domestic violence situation, victims can seek help by reaching out to various local agencies for resources, legal help, shelter, and mental health support. These agencies do not ask immigration status. That said, a high portion of immigrant victims do not report or present themselves in court because of the fear of possible deportation. When they do report, the process is often difficult to navigate and agencies are not fully equipped to deal with undocumented immigrant clients. Recommendations include educating law enforcement and agencies to better handle the unique obstacles undocumented domestic violence victims face, as well as advocating against policies that make immigrants fearful to engage with institutions.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: The True Purpose of Defense: WNBA Edition

Student Author(s): Christian Hithe

Faculty Advisor: Dr. Liz Johnson

Department: Computer Science

The research question for this project is, does better defense win championships or does better offense win championships in the WNBA? There has been no previous research on this particular category. There has been some research that mentions the WNBA; however, many people do not find enough data to complete their analysis regarding the WNBA. I am gathering information on all 23 seasons of WNBA play to analyze the effects of defense on championship teams. Also, using my connections as being a women's college athlete for finding more accurate information. The expected finding is that great defense wins championships. This research is important because exposure for women athletes as myself is needed. The WNBA is a different game compared to the NBA. The WNBA needs the same attention as the NBA because of the continuous hard work and entertainment provided by those women.

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S - Sustainability **U** - Charlotte

Social Sciences

Title: Railroad Cars and Social Class: African American Women's
Struggle for Respectability in Public Spaces

Student Author(s): Dale Jackson **H, NC, U**

Faculty Advisor: Dr. Sonya Ramsey

Department: History

This project will explore the question about how the railroads and Southern ideologies contributed to a form of discrimination that demeaned the social status of African-American women from the Reconstruction Era that followed the Civil War to the 1920s. Much of the work published by other historians that are related to this topic revolve around racial discrimination, segregation laws, and how the railroads became the center of tense race relations in the Southern states. However, much of the emphasis on this research revolved around both men and women. Research that did deal exclusively with women usually centered on smaller periods of time. The story of how Southern thought and the railroads took away an African-American woman's place in society after slavery ended requires more attention. I want to completely tell the story of the discrimination endured by African-American women from the time of Reconstruction to the segregation laws that started being passed in the 1880s and into the employment opportunities provided for women by the railroad companies during World War I. By taking a feminist historian approach and examining primary court documents and secondary historiography, I hope to prove that the railways were one of, if not the biggest, issues that ignored an African American woman's social standing as well as removing her from what Southern states at that time considered "women of good character."

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Social Sciences

Title: Erasing the Stigma: Closing the Gap

Student Author(s): Chantel Lynn **CE, H, NC, U**

Faculty Advisor: Dr. Natasha Randle

Department: Management

I am pursuing a career in financial planning and find it essential to understand my “why” when embarking on such a strenuous career. My “why” is simple. As an African American woman, I know from experience that women are typically overlooked when it comes to finances and various forms of wellness. However, oftentimes we as a society don’t associate financial prosperity with wellness. I want to change that narrative for black women and figure out a way to approach financial planning from a more holistic perspective and create a better experience for black female clients. To do so, I have been researching financial therapy which is a discipline that draws on both financial planning and psychology. This approach is more beneficial for black women because we tend to need trauma counseling that others don’t. Combining the cognitive-behavior theory with the psychoanalytic theory will allow black women to understand the economic system that black women are in. This will, in turn, re-shape their financial approach and potentially give them a more positive view of finance. My goal is to put together a workshop that would use the tools of financial therapy to help black women and peers build financial literacy and acknowledge their financial behavior in a workshop model. The workshop will consist of a panel discussion moderated by me, composed of financial planners and counselors. It’s important for counselors to be present on the panel because they will be able to address the behavioral aspects of the discussion.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Perspectives on Facilitating English Language Learning among
Immigrant and Refugee Children: The Role of Social Connectedness

Student Author(s): Afra Mahmood **CE, H, NC, U**

Faculty Advisor: Dr. Christopher Mellinger

Department: Languages and Culture Studies

Upon arrival to the United States, a child's ability to adapt, adjust, and develop is shaped by several variables. The degree of social connectivity a child has with his or her receiving community is linked to a higher level of self-esteem as well as improved outcomes in academic development. Recognizing social connectedness as a critical strategy in supporting staff and community members in engaging students in effective learning, several non-profit organizations offer services that build a child's social and human capital. To recently arrived immigrant and refugee children, these organizations contribute to increased integration into the host community by emphasizing the importance of belonging out of shared norms, interests, and beliefs. A contributing factor for successful integration, language access acts as a mediating factor that further supports a child's level of social connectedness. Social connectedness with peers and/or a caring adult may support immigrant and refugee children in the English language acquisition process. Language is heavily cited as a form of social capital and a highly effective "equalizer" in the United States. This project investigates the role of our BRIDGE for KIDS, a 21st Century Community Learning Center and non-profit organization, in assisting students to navigate the barriers and challenges faced throughout the English-language learning process. Through observational research conducted at the center, and interactions with the educators who work directly with the children, insights into the resources necessary to sustainably support the language acquisition process for the immigrant and refugee community in Charlotte, North Carolina will be gained. Hispanic students' academic experiences in the context of increased immigration enforcement.

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S - Sustainability **U** - Charlotte

Social Sciences

Title: Of Suffering and Suffrage:

The Relation of Women's Labor Movements to the Suffragette Cause

Student Author(s): William Mora **H**

Faculty Advisor: Dr. Mark Wilson

Department: History

The question this project seeks to answer is, "What relation did women's labor have to women's suffrage?" The previous histories of both labor and women's suffrage tended to be separated with only some overlap, whereas this project seeks to combine the two histories into one narrative. The methodology includes using many newspapers and magazines, as well as correspondences between labor and suffrage activists, to show correlations and collaboration between the two movements. The findings I expect to show is that due to the instability of labor tactics broadly, working class women favored suffragette causes in order to achieve political legitimacy to realize many of their political goals. The overall importance of this study is to illustrate the economic and social roots, as well as give concrete examples of what women were concerned with, that gave the suffragette movement it's militancy and effectiveness.

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S - Sustainability **U** - Charlotte

Social Sciences

Title: "Through Struggles to Victory":

Intersecting African American Women's Activist Organizations during the Great Depression

Student Author(s): Leah Rausch **H**

Faculty Advisor: Dr. Sonya Ramsey

Department: History

African American women experienced immense hardship in the United States during the Great Depression of the 1930's. It was common knowledge at the time that African American women were the first to be fired and last to be hired due to prejudices against their race and sex. Despite oppression, African American women joined forces to aid the unemployed through the means of Unemployed Councils established by the Communist Party, as well as the National Council of Negro Women (NCNW) launched by Mary McLeod Bethune, and the civil rights work of the National Association for the Advancement of Colored People (NAACP). The intersection of these organizations was not always seamless, as the struggle for economic and racial freedom could be attained through different strategies that sometimes conflicted between organizations. For example, the Unemployed Councils valued collective action and overt protests (sometimes violent) while the NCNW and NAACP utilized diplomatic protest and education in their fight for change. This research paper seeks to incorporate the opportunities that the Unemployed Councils of the Communist Party opened for African American women's economic activism. Controversy over methods and ideals of the Communist Party overshadows the extensive assistance to poor and working class African American women by the Unemployed Councils between 1929 and 1935. This research is an important contribution to African American labor history, and the history of leftist organizations in the United States.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Crisis for the University Student: Changing Rents and Growing Campuses

Student Author(s): R. Connor Wood **CE, H, NC, U**

Faculty Advisor: Dr. Claire Schuch

Department: Geography and Earth Sciences

The U.S. Department of Education reported that the cost of higher education has more than doubled in the last three decades (2016). Still, university enrollment has increased by 27% increase from 2000 to 2017 (Condition of Education). With rising tuition and greater demand for housing close to growing campuses, students' task to find affordable housing options is increasingly more difficult. According to College Data (2018), 40% of the college cost burden is housing. This substantial burden has already forced 36% of college students to be housing insecure and 9% to be homeless (Goldrick-Rab et al, 2018). This crisis of student housing is felt around the country and the 16 institutions in the University of North Carolina System are no different. As such, it is essential to understand changes in the housing supply and prices surrounding the institutions. This study investigates how UNC System student housing has changed since 2000, what factors are driving these potential changes, and what the implications of these changes are for students. This study also investigates how spatial differences affect the university's student housing. I do this by examining housing costs in comparison to institution enrollment changes and changes in local rents and by conducting key informant interviews to understand a qualitative perspective of students & staff. Preliminary findings from UNC Charlotte show an average increase of 25% in tuition & housing costs and 59% of students currently feeling cost-burdened by their rents. Expanding the study to encompass the entire UNC System, this study will begin to provide insight in the cost-burden of nearly 240,000 students.

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ABSTRACTS

Poster Presentations

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Arts and Design

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Arts and Design

Title: The Legitimacy of Pop-Saxophone within Jazz

Student Author(s): Scott Brumfield **H**

Faculty Advisor: Dr. Jay Grymes

Department: Music

Pop-saxophone is commonly heard across music ranging from the 1980's to recent releases, and these solos can energize a crowd while implementing jazz techniques. This style of music is newer than jazz, but uses those jazz techniques in current music mixed with other styles creating a style that can be engaging and also catchy. I will be supporting the legitimacy of pop-saxophone within jazz, and in doing so I will transcribe three solos from different pop-saxophone artists. These transcriptions will be used to support the jazz techniques that are used in Gerald Albright, Eric Marienthal, and David Sanborn's solos from different well known pieces. These artists are well educated and are sophisticated saxophonists that chose to go in a different direction than performing jazz. So far, I have not been able to locate any articles, or journals that have addressed this topic. This topic seems to be more of a niche, and something that hasn't been researched most likely because of how pop music is viewed by scholarly musicians. Researching this topic would contribute to the field of music by hopefully increasing the reputation of pop-saxophone within jazz, and it would be important since there are not published articles or journals that focus on this topic.

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Arts and Design

Title: Getting the Words Right:

Analysis of Gabriel Faure and the Poetry His Melodies

Student Author(s): Ivey Cherry **G**

Faculty Advisor: Dr. Jay Grymes

Department: Music

The 19th-century French composer Gabriel Fauré was known for exploring the limits of both poetic expression and composition. This presentation will examine the development of Fauré's vocal writing style from a recent conservatory graduate through a working composer and how he communicated poetry in his mélodies. 4 mélodies pulled from different periods of his life serve as musical examples: "Au bord de l'eau" comes from his tour of Parisian salons with Camille Saint-Saens with text by Sully Prudhomme; "Les berceaux" comes from a noted time of depression following his broken engagement to Marianne Viardot, daughter of salon hostess Pauline Viardot, with more text from Prudhomme; "Les Roses d'Ispahan" follows his marriage to Marie Fremiet with text from Leconte de Lisle; and "Prison" follows the composition of the La bonne chanson song cycle dedicated to Emma Bardac, his lover, both with texts coming from Paul Verlaine. Biographical sketches on Fauré, Prudhomme, de Lisle, and Verlaine contextualize subject matter and stylistic conventions and frame this study. Analyses of Fauré's compositions expose his compositional style related to contemporary poetry with identifiable motifs, melodic imitations of nature, and reconceptualization of the meter. Combining theoretical, historical, and poetic analyses, this presentation will provide an insight into the development of Faure's powerful creativity and restraint.

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Arts and Design

Title: Back to the Basics

Student Author(s): Cierra Stevenson **CE**

Faculty Advisor: Dr. Jay Grymes

Department: Music

Classical music seems antiquated and lackluster to the general public. There is a divide between the genre of classical music and the popular music of today that most people see. By stripping music down to its most basic elements I will teach the general public that the divide between the two musical genres is much smaller than it appears. The basic elements of music are melody, harmony, rhythm and form. Each song from today's culture has every element mentioned and people already know of these elements, so by using examples from what they know already it will enhance the pedagogical aspect of this paper and connect to my audience. After labeling, defining and providing an example from my audience's world I will connect this newly found vocabulary to an example from the Romantic era in classical music. By teaching each element with two examples, one from each world, the divide between the genres will grow smaller. This paper will give the definition, pedagogy and example information used in the final presentation. The definition will give background information, development through history and the etymology of each element. The pedagogy will have an objective listed and a breakdown of how I will be teaching the vocabulary definition then it will have a small analysis of the example from today's culture followed by its connection to the classical music example.

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S - Sustainability **U** - Charlotte

Arts and Design

Title: Barbara Strozzi: Her Life and Works

Student Author(s): Amber Ward **G**

Faculty Advisor: Dr. Jay Grymes

Department: Music

My research is on Barbara Strozzi, an Italian composer from the 17th century, and the musical work that she did in her lifetime. In the 17th century, women composers were few and far between, yet she has all 8 of her Opuses successfully published and preserved to this day. My research method(s) involve reading all published work on her from books, articles, and analyzing her musical works. I am utilizing the UNCC Library as well as libraries outside of the UNC Charlotte community. The findings of my research are that despite being a woman in the 17th century, she was successful in her own right, without the assistance of a man, which was very rare. She published and preserved her own music under her own name, something practically unheard of at the time. This research is important because highlighting women in Baroque music is a topic that is not talked about in typical music history and Strozzi was such an innovative composer, her life and works deserve recognition even some 400 years later.

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Education and Communication

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Education and Communication

Title: The Impact of Poverty and Food Insecurities in the
Charlotte Region and Surrounding Areas

Student Author(s): Morgan Brown **CE, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

My community-based research project centers around food insecurities within a household. My project partnership is with the Central Baptist Church Food Pantry. This non-profit organization strives to help local families in need and the volunteers find it a privilege to serve families for both physical and spiritual needs. The organization has a “wish list” they distribute to the church congregation. Throughout the month, members bring in items from the wish list, as well as cash donations. The food pantry is open on the second Tuesday of every month from 10:00 a.m. - 12:00 p.m. My research involves the relationship between food pantries and local households with food insecurities within the Charlotte region. This research will reflect on the importance of the impact of hunger for one’s health and well-being. Central Baptist Food Pantry program provides eighteen items per household per month including foods for breakfast, lunch, dinner and even snacks. Household items are also provided, including items such as paper towels, Kleenex and toilet tissue. Lastly, I will research the association between poverty and food insecurity as food insecurity increases when income-to-needs ratio decreases. My research will involve my participation in shelving and bagging the food, monthly giveaways and other collection efforts associated with the Central Baptist Church Food Pantry.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Education and Communication

Title: Fueling the Family

Student Author(s): Vanessa Calderon

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

For this poster research project, I am seeking to find how family vacations can benefit morale within the family unit.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Education and Communication

Title: Filling the QTPOC Gap at LGBTQ+ Youth Organizations

Student Author(s): Coreth Cerecedo **CE, NC, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The purpose of this community-engaged research project is to explore the barriers that are hindering QTPOC youth from accessing LGBTQ+ organizations/ resources. This project will conduct an overview of the Time Out Youth organization with the population of interest being QTPOC youth. A review of the literature indicates that QTPOC youth face greater probability of homelessness, isolation, discrimination/stigma than any other identity group. Thus, I will research the geography of Charlotte and locate areas with QTPOC children and identify barriers that are preventing them from access to an LGBTQ+ organization such as Time Out Youth. Additionally, I will be volunteering at the Time Out Youth Center drop-in space to become more acquainted with its population and the programs services. I anticipate for the results to indicate income as a main barrier. Future plans for applying this research is to develop strategies to remove such barriers.

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Education and Communication

Title: Where Arts Meets Communities

Student Author(s): Keisha Correa **CE, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The purpose of this community-engaged research project is to investigate how art and culture events impact the communities in ways that bring diverse cultures together to bridge traditional divides and strengthen the community. BOOM is a festival full of the unexpected, art, and performances which unite many neighborhoods in Charlotte to come together in Plaza Midwood for three days to engage and participate in all that's available. A review of the literature indicates what ways can art and culture events or festivals bring people together to spark collaboration among many diverse groups. I'll be participating in this festival to conduct further research on how or what the festival is doing to bring many age groups and people from different backgrounds together impacting them. I will be working through the website to provide detailed information for guests to find out about the events happening at BOOM so they participate and be informed. At the end of my research I anticipate to find whether art can truly bring communities and people together and in what ways does it influence them. In the future I plan on volunteering for the festival to continue seeing the growth it has provided for the community.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: Overexpansion of South Charlotte Neighborhoods

Student Author(s): Gabe Daugherty **CE, NC, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The purpose of this community engagement project research project is to explore the impact that growing neighborhoods in Charlotte have on the social and economic climate in Charlotte. The setting of the project will be in the South Charlotte community looking and working with partners in the community to put on a transportation summit to discuss the impact on the surrounding communities. I have found that as growing neighborhoods and surrounding communities expand, transportation tends to be an issue and a privilege for different areas of the city of Charlotte. I plan to present my findings and to fight for the surrounding and growing communities.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: Affordable Housing and Implications on Youth

Student Author(s): Erin Kennedy **CE, NC, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The on-going argument of affordable housing and its place in society has never seemed to discuss one main part of the families moving into these communities: youth. When people start to discuss low-income housing, adults are the topic of discussion; how they will afford the home, why they can't work harder to pay for their own home, and how the funding will come about for these people. Youth are always left out of the discussion, and if the discussion does turn to youth it never turns to their long-term success. I will start the conversation about youth and bring it to the forefront that they should be one of the main topics of discussion when transitioning a family from homelessness to low-income housing. I will collect data, talk to professionals, and volunteer in these communities to try and figure out some of the implications on children's long-term academic success and mental health. Through comparing the academic success of homeless children and housed children I will be able to see if there is a correlation between the two. I will then find the potential stressors for children when they are homeless to the possible stressors of children when living in a home. Although housing may not increase a child's mental health, it may shift the concentration of their thinking. Through this project, youth will become the main topic of discussion, they will be at the forefront, and they will be the ones that dictate the future of affordable housing.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: Investigating the Most Effective Methods for Teaching Civic Education
and Leadership to K-12 Students

Student Author(s): Elise Lyght **CE, H, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The purpose of this community-engaged research project is to investigate the most effective methods for teaching civic education to school-aged students. The research takes place within the Charlotte-Mecklenburg county and is conducted by the nonprofit organization GenerationNation with participants being students in grades K-12. A review of the literature states that civic education is crucial for encouraging students to be active members of society, and that utilizing historical and critical perspectives when teaching can affect great change within communities. Research will be conducted through surveys, group dialogues and interviews, as well as examining existing data regarding GenerationNation's previous student impact. Service for the project will be conducted through attending Charlotte-Mecklenburg Youth Council student meetings as an adult volunteer and coordinating a group of UNC Charlotte students to help with mentoring high school students. We anticipate that the results of this research project will be a newly developed curriculum guide surrounding civic education leadership that GenerationNation can use in its programming. The project will continually be evaluated to ensure that progress is being made in student impact.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: The Impact of Food Scarcity on Academic Success in a Title 1 Elementary

School in Concord, North Carolina

Student Author(s): Regan Martin **CE, U**

Faculty Advisor: Dr Susan Harden

Department: Middle, Secondary, and K-12 Education

The purpose of this community-engaged research project is to investigate the impact of food scarcity on academic success in a Title 1 Elementary School in Concord, North Carolina. The project is taking place at Weddington Hills Elementary School and in Downtown Concord. The school community will be involved, with a focus on lower socio-economic families. A review of the literature indicates that food scarcity has a detrimental impact on the mental and physical wellbeing of the person affected, in return this often results in poor academic achievement or performance. For the research portion of this project, I am looking into academic journals and school data from the past couple of years to observe the correlation between food scarcity within a Title 1 school and academic achievement among students who are affected. The service portion of this project is an outreach to families at the school who experience food scarcity on a daily basis. These families are not often represented during school functions due to work schedules. The goal of this service is to get more churches involved in helping to obtain food for these families and to host a family event at one of the establishments in Downtown Concord. I anticipate the results will show that there is a strong correlation between food scarcity and academic achievement as well as a strong attendance rate for this family event. The future plan for this project is to continue family events that are accessible to the entire student body and their families.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: What is the Impact of Hands-on Activities on the Reading Comprehension Levels of
Elementary School Students?

Student Author(s): Autumn McDonald **CE**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The purpose of this community-engaged research project is to investigate and explore if hands-on experiences, such as nature-walks, improve the reading comprehension of elementary school students. The research is set in the UNC Charlotte Botanical Gardens through a partnership with the Charlotte-Mecklenburg Public Library system and consists of participation of Charlotte-Mecklenburg librarians and elementary school students who engage in the Stories in the Woods reading program. A review of literature indicates that hands-on experience increases the reading comprehension of students, as well as makes reading more enjoyable when able to make real life connections. The research portion of this project consisted of gathering data of the emotional and educational impact of hands-on activities after reading. This research was gathered through a series of surveys and observations. The service aspect consisted of engaging in Stories in the Woods and interacting with students and parents at the UNC Charlotte Botanical Gardens. Through this experience I was able to see the connection of hands-on experience with story comprehension in elementary students. This project solidified that hands-on activities related to the stories that students read has a direct correlation in the improvement of their reading comprehension. After this community-engaged research project I plan to create activities that connect with common children's books in order to help future students be able to better comprehend what they read.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: Impact of Representative Role Models

Student Author(s): James Moody **CE, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

This community-engaged study was an investigation of the true impact of relatable role models. This research explored what would happen if more minorities were in positions of power in areas that they represented. Hopefully the youth would aspire to be more like the leaders instead of limiting themselves to shorten lives filled with authority issues. The data will be collected by giving the students a short questionnaire asking them their opinions of the event and the panel of speakers. The results of the survey are a small success seeing as the questionnaire was only given to twenty middle school students. However, seventeen of them said the representational leadership inspired them. The location of the school may have swayed the results; most of the students who attended the school are African American or of another minority race. Also, recent racial issues could promote a heightened sense of black nationalism and the students could be merely responding to what they are absorbing. Another step for this test would increase the sample size and include more minorities such as women, LGBTQ, or people from different nationalities; the shift in leaders will hope to strengthen the argument by affirming it is crucial to provide visible role models that represent the populations' morals, beliefs, and culture.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: The Effectiveness of Community Partnerships in Schools

Student Author(s): Morgan Parker **CE, NC, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

In the following project, I will be researching how community partnerships impact student learning. To research this topic I will conduct interviews, surveys and use peer reviewed scholarly articles to gain knowledge and come to a consensus. I will conduct interviews with community partners that partner with Kimberley Park Elementary School in Winston-Salem, NC. I will also conduct a survey accessing the children at that school on the effectiveness that the partnership has on their learning. In my findings, I predict that community partnerships have a positive effect on student learning. This research is important because it will help educators gain knowledge on how students may learn best through community engagement.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: The Effect of Food Access on the Brain and
Body of Child and Adolescent Students

Student Author(s): Annie Sung **CE, G, H**

Faculty Advisor: Dr. Erik Jon Byker

Department: Reading and Elementary Education

The purpose of my research project was to investigate the relationship between a child's food access to their academic and mental performance in school within the Western Cape of South Africa. In the past decade, there has been a significant increase in research conducted on the effects of inadequate nutrition on mental health/functioning and physical health/functioning. Taking the research that has been conducted within South Africa and utilizing personal research while in the country, I was able to see connections and formulate additional hypotheses about these connections. For this research, I utilized Peer Reviewed research already conducted on South African health and education, empirical data, and interviews of South African primary school teachers. While this research is unfinished, insufficient food consumption was found to have strong correlations with students' poorer academic performance, stunted brain and body growth, an increased difficulty to grasp new concepts, and participation in the classroom. It was found in a previous research study that more than 3/4 of the children living in township districts under the age of 2 are eating a "minimum acceptable diet". Issues associated with HIV and Aids, with South Africa being one of the worst affected regions in the world, also relate to this lack of nutrition for children when it comes to mothers not breastfeeding their infants due to infection.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Education and Communication

Title: Improve the Access of Transportation in Charlotte

Student Author(s): Kelly Turrubiarres Cielo **CE, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

This research presentation discusses ways to extend and promote transportation to stimulate the economy. I have received an internship to help organize and execute a transportation summit. We will be hosting a transportation summit and many important people from the government and community leaders will assist to get funds and bring awareness to problems and solutions they have. No findings yet. My expected result is to get the recognition and funds to expand the transportation system in south Charlotte. This research is important because it has been proven in other places that an increase in transportation will promote the economy.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: Relationship Between Language and Stress for Latinx Adults in the
Charlotte-Mecklenburg Area

Student Author(s): Alex Barrera-Fuentes **CE, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

In my project, I am measuring the relationship between language and stress levels. Does not knowing English cause higher stress levels for these Latinx individuals in the Charlotte-Mecklenburg area? During the time of my research, I am conducting an initial survey of how these individuals may feel stress from not being able to communicate in English. I will then follow up individually and see if anything changes throughout the time with my community partner (Camino Community Center). With my community partner, I am serving as a coordinator for English language classes that are free for the individuals participating. These classes will be conducted every Wednesday from February 12th until May 13th. These classes are intended to help the individuals improve their comprehension of the English Language. By the time of the conference, I will interview the participants to see how comfortable they feel with their English comprehension and if these classes helped lower any of the stress, they have from being a Latinx, non-English speaker. The participants come from many different backgrounds, ranging from Charlotte towards the Concord area and many are clients of Camino Community Center's primary care clinic. This project will be in conjunction with Dr. Adriana Medina from the Cato College of Education and Dr. Keri Revens.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: E-cigarettes: A Healthy Adjunct to Smoking Cessation?

Student Author(s): Kimberly Beck **S**

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Smoking and associated lung diseases remain a significant cause of preventable deaths worldwide. A growing need for smoking cessation has led to many interventions associated with reducing the prevalence of smoking and smoking-related deaths. E-cigarettes are electronic nicotine delivery systems (ENDS) that have increased in popularity among smokers in the cessation process. ENDS have been advertised as a safe and effective alternative to aid in the cessation process. The purpose of this project is to create an educational guide for smoking cessation staff in order to provide the most current evidence-based literature on the use of ENDS for smoking cessation. **Methods:** Safety and efficacy of these products will be evaluated using the most up-to-date research available. Baseline knowledge of staff regarding these products and services will be evaluated and analyzed in correlation with the current smoking cessation process as determined by the facility's Certified Tobacco Treatment Specialist. The educational guide will be based primarily on in-hospital data in order to enhance the smoking cessation teaching process within the facility. Outside data sources, including surveys, will be utilized to distinguish the overall knowledge of educators and areas for needed improvement. **Results:** Results are pending. **Conclusion:** The goal of the smoking cessation educational guide is to provide staff with the tools and resources needed to properly and thoroughly educate patients on the harms of cigarette smoking with attention to the use of electronic nicotine devices as a potentially harmful aid in the cessation process.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: The Overuse of Inhaled Nitric Oxide (iNO) in the Cardiac
ICU and its Need to be Restricted to an Initial Dose of 20ppm

Student Author(s): Mark Bodnar

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Inhaled nitric oxide (iNO) when closely monitored has been shown to be safe and has significant advantages as a selective pulmonary vasodilator. It has a particular role in postoperative management of several cardiopulmonary conditions and in the assessment of pulmonary vasodilator capacity, not only prior to cardiac transplantation, but also in planning therapy for other forms of pulmonary hypertension. Often overdosed at 40ppm in the operating room (OR), iNO should be started at 20ppm in the cardiac ICU (CICU) setting, past which, little or no clinical benefit is documented. Its overuse is potentially causing patients to become reliant upon it and therefore extending their time on mechanical ventilation. This project hopes to influence the decreased use of iNO at the onset of various cardiac surgeries. Methods: 627 data points were evaluated from 82 patients via a retrospective chart review. Varying iNO starting doses and their effects on patient outcomes were categorized. Dosing, weaning and PaO₂ data points were analyzed along with patient symptoms, length of hospital stays, and days on mechanical ventilation. Results: Of the 82 patients reviewed, only 26% were initially dosed at 20ppm iNO. Evaluation of the 627 data points displayed a direct correlation between initial dosing and positive response to the weaning process. Ventilator length of stay averaged 9.2 days for patients initially at 40ppm compared to 3.6 days for patients on 20ppm. Conclusions: The findings concluded that an initial dose of 20ppm iNO is not only sufficient but also significantly decreased ventilator length of stay and the reliance on iNO.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: A Patient Centered Approach to Understanding the Pulmonary Function Test

Student Author(s): Christy Brown

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Pulmonary function testing is important in the diagnosis and management of many respiratory diseases. Adequate and effective patient education may improve testing quality and result in better outcomes with regard to disease management. **Methods:** Interviews with two pulmonary function technicians were conducted regarding the current state of patient education within the pulmonary function lab. Information was collected through an evidence-based literature review to determine patient education needs. Facility surveys were also administered to determine if other departments were utilizing a patient education binder. **Results:** Results are pending. **Conclusions:** The goal of the patient education binder is to aid in increasing patient knowledge and understanding regarding the purpose and individual elements of pulmonary function testing.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: How Does Well Water Testing Improve the Water Quality and Educate the Community
of Private Well Owners, in Gaston County?

Student Author(s): Ha'Sheem Brunt

Faculty Advisor: Dr. Susan Harden **CE, NC, U**

Department: Middle, Secondary, and K-12 Education

In 1989, The Gaston County Department of Health and Human Services (GCDHHS) assumed responsibility for the well program in Gaston County. During this time the data for private wells were completed on paper forms, realizing this was difficult to sustain and lacked durability, the GCDHHS recently planned to convert these forms into more sustainable sources. The conversion from paper forms to more usable, durable, and digitized data will help maintain the records online. Through establishing the "Healthy Wells" program, with a \$670,000 five-year grant from the Centers for Disease Control and Prevention, GCDHHS was able to make this happen. The grant allows the county to use the latest technology to track and monitor local wells. The Healthy Wells Program, with help from UNC Charlotte students, will establish a public digital database of the county's wells and promote the protection of private wells. The students testing the well water hope to improve the quality of water as well as educate them about their wells. As of early 2018, students have digitized more than 4,000 private wells and identified 132 samples testing positive for coliform and 6 samples testing positive for E. Coli. Through research, the additional data and updated records, local health specialists will more easily identify trends, locate sources of contamination, and provide timely alerts to local well owners about potential threats. Also, this allows the county to provide pre-service and continuing education for not only local health specialists but for the local residents who are drinking the water.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: Assessing Inadequacies in Respiratory Therapy Education and Training for the
Treatment of Neonatal/Pediatric Populations

Student Author(s): Alicia Carrese **NC, U**

Faculty Advisor: Dr. Brian Ring

Department: Kinesiology

Background: When neonates are born in facilities with a dedicated NICU team, the respiratory care practitioner (RCP) on that team is very comfortable caring for the neonate. When the neonate is born unexpectedly in an outlying facility, the RCP called primarily cares for adult patients. The lack of exposure to the neonatal population may manifest with the RCP unprepared to deal with the emergency. Methods: One hundred and seventy-seven respiratory therapists were surveyed to assess their comfort level and education in caring for neonatal/pediatric patients. Fourteen respiratory therapy educators and current students were surveyed to assess the amount of time spent caring for neonates/pediatrics and the barriers that prevent them from doing so. Results: Stratification of response rates between those with or without NICU experience (n = 124, n = 53) demonstrated that seventy-one percent of respondents without NICU experience required to attend neonatal deliveries do not feel adequately trained to be involved in neonatal emergencies. Sixty percent of educators' state that students do not receive an adequate education in the neonatal/pediatric population (n = 3). Eighty percent of educators (n = 4) state that their personal comfort level is the major limitation regarding clinical training for their students. There were conflicting results regarding clinical hours provided between the educators and students (60% > 41 hours, 40% < 41 hours). Conclusions: There is a need for more didactic and clinical education in the neonatal/pediatric specialty of respiratory care. The development of a four-year entry-level could be a potential solution.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: The Installation of Active Humidified Rewarming Techniques in Post Cardiac
Bypass and Return of Normothermia

Student Author(s): Kristen Collins

Faculty Advisor: Dr. Brian Ring

Department: Kinesiology

Background: Thermoregulation and rewarming is imperative after a cardiac bypass surgery patient is admitted to the intensive care unit to allow reperfusion of vital organs and for enzymatic function to initiate. A respiratory driven protocol for initiating active rewarming at higher variable temperatures will decrease delays in normothermia, decreasing risks associated with hypothermia. Methods: An interview was performed with a cardiac intensivist who shared input on the imperative needs for reducing time between admission into the ICU and obtaining normothermia after patients have been previously separated from cardiac bypass. There has been evidence linked between patients with hypothermia and increasingly impaired coagulation with surgical patients causing bleeding risks. Regarding the development of a respiratory protocol to ensure patients can be thermonormalized. Results: After performing a survey to other respiratory care professionals and leaders it was gathered that there is not enough education prepared for the proper utilization for rewarming patients after they have been on cardiac bypass. There are more HME's being used on ventilator circuits than active rewarming techniques. There was a 43% response rate stating there was not a rewarming protocol that was present in their department. Conclusion: Developing a rewarming protocol for a device named Anapod is in effect. This device is registered with the US FDA and compliant with FDA Quality System Requirements. Education will be provided to the respiratory department and post comprehension will be analyzed for appropriate utilization. Respiratory therapists will take the responsibility for post ICU admission to reassure effective rewarming for patient success.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: The Value of Peak Inspiratory Flow Rate (PIFR) in Personalizing

Pharmacotherapy for the COPD Patient

Student Author(s): Sharon Cornelison

Faculty Advisor: Dr. Jhaymie Cappiello

Department: Kinesiology

Introduction: Dry powder inhalers (DPIs) are breath actuated. In contrast to metered-dose inhalers or the slow-/soft-mist inhaler, patients using DPIs need to generate an optimal peak inspiratory flow rate (PIFR) during the inhalation maneuver for effective drug delivery to the airways. Assessment of adequacy of patient PIFR may improve medication delivery.

Methods: To evaluate recommended PIFR assessment approaches, the author reviewed the instructions for use of the In-Check™ DIAL G16 and the prescribing information for 6 DPIs approved for use in the treatment of COPD in the United States. To evaluate applied PIFR assessment approaches, a PubMed search from inception to July 3, 2019 was reviewed for reports of clinical and real-world studies where PIFR was measured using the In Check™ DIAL G16 or through a DPI in patients with COPD. **Results:** 28 applicable studies were identified. Evaluation of collective sources showed that instructions related to positioning of the patient and the DPI, instruction for exhalation before the inhalation maneuver, the inhalation maneuver itself, and post-inhalation breath-hold times varied and, in many instances, were vague and/or incomplete. Consequently, an expert panel of physicians and other clinicians made practical recommendations for PIFR assessment, in an effort to standardize the process and to better ensure accurate and reliable PIFR measurements in both clinical trials and everyday clinical practice. **Conclusions:** There are considerable variations in the way PIFR should be or has been measured. These findings underscore the need for a standardized method of PIFR measurement in the COPD population.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: MamaVIEW: A Mixed-Methods Study Examining Health-Related Factors During Pregnancy Among Black/African American Women in Mecklenburg County

Student Author(s): Jocelyn Davis **CE, NC, U**

Faculty Advisor: Dr. Alicia Dahl

Department: Public Health Sciences

Despite the progress made in maternal and child health, African American infants in Mecklenburg County (2020) are five times more likely to die during their first year of life than are White. African American mothers experience disproportionately high rates of poor maternal health outcomes and are also dying at a very alarming rate compared to other races. The research conducted will examine the risk factors that are present during pregnancy with African American women in Mecklenburg County, NC. The purpose is to understand the barriers and the enabling factors of health during their pregnancy. At the same time, this will be the first step to identifying prenatal health needs for the African American population. Eligible participants using quantitative methods have the opportunity to partake in a cross-sectional survey (i.e., in the place of their preference or on the tablet) provided by the researchers. Research questions are developed to interpret the perceived levels of food security, social support, chronic conditions, their built environment, stress, health care access, and physical activity. To evaluate the perceived barriers and enabling factors of health during pregnancy in African American women, the use of qualitative Photo-Elicitation Interview (PEI) methods will be used for participants to express health-related needs during pregnancy. Societal and health system factors contribute to high rates of poor health outcomes, and these results will identify the specific influences that need to be addressed in Mecklenburg County, NC.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: Respiratory Care Mentorship Programs

Student Author(s): Heather English

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: This project was conducted to determine if the use of a one-on-one Respiratory Care mentorship program is desired and in what ways it could provide benefits to students, as well as newly licensed practitioners. The ever-changing field of Respiratory Care can be overwhelming for students, as well as new graduates entering into employment. The need for one-on-one mentoring relationships could prove beneficial in providing guidance and support. **Methods:** Two Respiratory Care experts were interviewed to discuss their thoughts pertaining to the growth of the field, educational and career planning, professionalism and mentorship relationships. Literature pertaining to mentorship relationships within healthcare field educational programs were reviewed and surveys were sent to Associate in Applied Science in Respiratory Therapy programs, as well as one Bachelor's of Science in Respiratory Therapy program to gather opinions on one-on-one mentorships. **Results:** Results from the interviews, literature search and surveys profoundly supported one-on-one mentorship for Respiratory Therapy students, as well as the implementation of mentorship programs for students and newly licensed practitioners. **Conclusion:** The implementation of one-on-one mentorship programs would be profoundly beneficial in providing resume and interview assistance, professionalism guidance, future career and educational planning, as well as many other factors. The most effective programs would include experienced mentors in the field with robust character traits, while the mentees share similar traits, most importantly being willing to accept feedback and guidance during their educational journey and upon entering into the field of Respiratory Care.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: A Survey of Educational Needs for End-of-Life Care:

A Perspective in Respiratory Care

Student Author(s): Mary Ryan Galt

Faculty Advisor: Dr. Brian Ring

Department: Kinesiology

Background: Respiratory therapists are often present and active during end-of-life (EOL) situations. There is a lack of apparent education on death and dying for respiratory therapists in current school curriculums; it is believed that on the emotional and professional support in approaching these stressful situations for caregivers themselves may be inadequate. **Methods:** A survey was sent to 218 current respiratory therapists with varying amounts of experience in different specialties. 49 responses were recorded with questions pertaining to length of time in profession, comfort level with end of life care, experiences with curriculum before licensure, support offering after difficult patient deaths, and use of non-invasive therapies to in regard to prolonging life vs. comfort care. **Results:** All assenters identified as current respiratory therapists; 95.9% currently work in critical care. When asked if they had received training specific to death and dying, 56% answered no while pursuing their education. Of the 20 respondents that did acknowledge some training, only three had more than five hours total EOL education. 78% of all survey responses suggested that training regarding the dying process and EOL care is needed. There was not a well-defined response when answering "yes or no" to personal comfort in communicating with the family and offering support during comfort care or withdrawal of care. **Conclusions:** Further analysis is warranted on this subject, but preliminary research indicates a need for ongoing education on the ethics of end of life care, education about death and dying.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: Analysis of a Bedside #6 Shiley Tracheostomy; Cost, Age, Size, and the
Impact on Passing/Failing a Swallow Test

Student Author(s): Pamela Holly

Faculty Advisor: Dr. Brian Ring

Department: Kinesiology

Background: Annually there are approximately 100,000 tracheostomies performed nationwide. While a common practice with critically ill patients, tracheostomy placement does not come without significant potential for risk. This retrospective data analysis was developed to analyze the practice of bedside versus operating room (OR) with respect to cost effectiveness and progression to potential decannulation. Methods: Data were analyzed for 75 patients that were admitted to Atrium Health Main with either the diagnosis of traumatic brain injury (TBI) or spinal cord injury (SCI) and had received a tracheostomy. A #6 tracheostomy tube was used on all patients unless otherwise specified by referring physician. Age, tracheostomy size, and time-to-tracheostomy were compared to initial pass rates of a swallow test via Mann-Whitney U analysis (IBM® SPSS® version 26). Results: From 2016-2017, 75 tracheostomies were performed; 36 of which were placed at bedside with 11 placed in the OR. In 2017, 35 tracheostomies were performed; 26 were placed at bedside and nine in the OR; all were size #6. There was not a statistically significant finding within the analyzed domains regarding impact on swallow test pass/fail ($p > .05$ for all domains). On average the cost for an OR tracheostomy is \$4600.00 and bedside approximate cost is \$500.00. We had a total cost savings of \$251,600.00. Conclusion: Comparing the cost of bedside versus OR tracheostomy procedure, it was concluded that it is more cost effective to perform bedside tracheostomies. Age, time-to-tracheostomy and tracheostomy size did not have a significant impact on passing a swallow test.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: Continuous Albuterol in Pediatric Patients

Student Author(s): Diontay Isaac

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Pediatric patients in status asthmaticus are treated and managed differently at each facility. Some facilities treat patients with continuous albuterol while others do not have access to continuous albuterol and therefore treat the asthma exacerbation with standard breathing treatments. This project focuses on the length of pediatric intensive care unit (PICU) stay associated with using continuous albuterol versus traditional breathing treatments as well as the methods for delivering continuous albuterol. **Methods:** To determine PICU length of stay, this project focused on the length of stay until the pediatric patient was either discharged home or moved to the children's general floor. Surveys evaluated which facilities used continuous albuterol, how they delivered the medication, as well as the starting dose amount. A literature review was used to supplement survey data and interviews regarding length of stay in the PICU. **Results:** Results showed that starting a pediatric patient with status asthmaticus on continuous albuterol decreased the length of stay in the PICU as well as the overall length of stay in the hospital setting. Patients who received continuous albuterol at a higher dose had less care interventions performed. The surveys also showed that most facilities use large volume nebulizers to deliver continuous albuterol, the most common starting dose is 10mg/hr and most participants felt that the large volume nebulizer was the most effective medication device. **Conclusion:** Continuous albuterol, when used efficiently, decreases the length of stay in the PICU compared to standard scheduled albuterol treatments.

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Health Sciences

Title: Employee Engagement... Does It Affect Overall Organizational Performance?

Student Author(s): Rayna Jessup

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: This study was conducted to determine if employee engagement rates have an impact on and drive overall improvements in organizational performance? Do organizations with “happier” employees perform better than those with employees that are not engaged in their work? **Methods:** An Interview was done with the director of 2 Pulmonary Rehabs, 2 Free standing Emergency Departments and a Respiratory Care department. 2019 Press Ganey Survey results were analyzed from those departments, and information was gathered from several evidence-based studies done on Employment Engagement in the workplace. **Results:** Employee Engagement is made up of several factors such as work/life balance, employee satisfaction, and employee commitment, each of these factors were studied. Drivers of employee engagement such as leadership styles, opportunities to grow, and manager support were also considered. Finally, measurements of employee engagement such as questionnaire and survey results were collected to help answer the general purpose. **Conclusion:** Employee engagement helps build a harmonious relationship between employees and their organizations. It is assumed that if an employee feels appreciated, they will appear more motivated and perform more efficiently, thus improving the overall performance of the organization.

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Health Sciences

Title: Influence of Balance Shoes on Plantar Pressure in
Individuals with Chronic Ankle Instability

Student Author(s): Allie Knuckles, Danielle Torp, and Tricia Hubbard-Turner

Faculty Advisor(s): Dr. Abbey Thomas Fenwick and Dr. Luke Donovan

Department: Kinesiology

Individuals with chronic ankle instability (CAI) walk with increased lateral plantar pressure, predisposing patients to future ankle sprains. Gait retraining to medially shift plantar pressure may be beneficial to these patients. This study determined if walking in balance shoes can redistribute plantar pressure in patients with CAI. Twelve adults with CAI (20.83±1.7yrs; BMI: 26.7±4.6kg/m²) had contact time and peak plantar pressure recorded during treadmill walking. Walking trials (30s) were recorded at baseline with and without balance shoes, followed by 20 minutes of walking with balance shoes, and a follow-up trial without balance shoes. The middle 10 steps of each trial were extracted; contact time and peak pressure under the whole foot and 9 sub-regions of the foot were determined. Data were averaged across steps for each participant and repeated measures ANOVAs determined differences in contact time and peak pressure under each region of the foot between baseline, baseline with balance shoes, and follow-up ($P < 0.05$). Peak pressure was lower in balance shoes vs. baseline under the medial heel ($\Delta 17.2\text{kPa}$), lateral heel ($\Delta 19.7\text{kPa}$), lateral midfoot ($\Delta 25.5\text{kPa}$), lateral forefoot ($\Delta 31.7\text{kPa}$), and hallux ($\Delta 37.3\text{kPa}$) regions. Peak pressure was lower in balance shoes vs. follow-up under the lateral midfoot ($\Delta 20.4\text{kPa}$) and lateral forefoot ($\Delta 30.6\text{kPa}$). Total foot contact time was shorter with balance shoes compared to baseline ($\Delta 41.2\text{ms}$) and follow-up ($\Delta 43.7\text{ms}$); baseline medial midfoot contact time was lower than follow-up ($\Delta 30.3\text{ms}$). Balance shoes changed plantar pressure distribution while walking; therefore, balance shoes may be beneficial to gait retraining in patients with CAI.

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Health Sciences

Title: The Role of a Virtual Respiratory Therapist (VRT) for Mechanical Ventilation Protocol Compliance Related to Tidal Volumes in the Adult ICU Population

Student Author(s): Melissa Kroll

Faculty Advisor: Dr. Jhaymie Cappiello

Department: Kinesiology

Background: Intensive Care Unit patients that require mechanical ventilator support can develop pulmonary complications which substantially alter their outcome. The benefits of mechanical ventilation are well documented however, there is evidence from randomized clinical trials that establishes risk factors of mechanical ventilation. These risk factors have the potential to injure the lung. Risk factors include managing oxygen, pressure and volume delivery to avoid injurious conditions that have been linked to acute lung injury and acute respiratory distress syndrome. The application of a virtual respiratory therapist (VRT) assists in the monitoring and maintenance of safe mechanical ventilation. **Methods:** Our facility implemented a program in which a VRT assesses newly mechanically ventilated patients for delivered volume compliance of 6-8 ml/kg of ideal body weight (IBW) for the systems mechanical ventilation protocol. VRTs also modify all protocol initiated mechanical ventilation physician orders with the patient's IBW and tidal volume range per the system's mechanical ventilation protocol. **Results:** Patients without VRT intervention were found to be out of protocol compliance in 2018 and 2019 of 14.92% and 13.98%, but after VRT intervention, tidal volume compliance improved to 8.46% and 8.48%. After VRT intervention the total compliance for 2018 and 2019 increased to 91.5% each year. **Conclusions:** VRT intervention on mechanical ventilation tidal volume protocol compliance reveals a positive impact to improve patient care through evidence-based practice.

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Health Sciences

Title: Terminal Extubation and End-of-Life Care Impacts for the
Respiratory Therapist: A Qualitative Assessment

Student Author(s): Joyce Lanier

Faculty Advisor: Dr. Brian Ring

Department: Kinesiology

Background: A terminal extubation is the removal of the use of mechanical ventilator support from a dying patient. A mechanical ventilator is a life-sustaining therapy that is routinely managed by the respiratory therapist. When a mechanical ventilator is needed to support a patient's breathing efforts, the respiratory therapist is the healthcare professional that executes the use of it and likewise, the removal of it. This investigation is aimed to explore the implications of participating in end-of-life care situations for respiratory care practitioners. **Methods:** The qualitative data was obtained through the distribution of a 20-question survey. The survey was sent to respiratory care departments and multiple academic institutions with practicing respiratory therapists as students. The survey was designed to invoke reflections, perspectives and suggestions from the individual experiences of a respiratory therapist's participation in a terminal extubation. The data was analyzed through a summative content approach. **Results:** The anticipated results of this study are to identify beneficial investigational topics focused on educating, equipping and improving the professionals who role is to be involved with the end-of-life services of dying patients. Significant impacts revealed included the experience of internal emotions by respiratory professionals after performing a terminal extubation (68% of 142 survey respondents) and a lack of appropriate end-of-life care training (71% of 142 survey respondents). **Conclusion:** Avenues to increase the adeptness and well-being of the respiratory care professional who participates in end-of-life care should be considered and explored.

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Health Sciences

Title: Regulation of AP Endonuclease 1 Incision Activity by PARP1
in Nucleosomal Substrates

Student Author(s): Nikitha Lanka

Faculty Advisor: Dr. Yesenia Rodriguez

Department: National Institute of Environmental Health Sciences

DNA damage in cells occurs continuously due to factors such as spontaneous decay, replication errors, oxidative stress, environmental toxins, and radiation exposure. Failure to repair the resulting DNA lesions can lead to the accumulation of mutations, increasing the risk of carcinogenesis and aging. Base excision repair (BER) is a stepwise mechanism that corrects DNA lesions. The study of BER with relation to the DNA packaged in chromatin is of emerging interest and importance given that nucleosomal positioning influences mutation rates associated with several human diseases. The nucleosome core particle (NCP), the fundamental unit of chromatin, plays a critical role in regulating DNA-templated processes and can regulate BER intrinsically. However, the factors involved in BER coordination and efficiency in vivo are not well understood. PARP1 has been known to interact with BER factors such as APE1 and has been postulated to play a critical role in coordinating BER. Despite these observations, the role of PARP1 in APE1-mediated repair in nucleosomal substrates remains unknown. The goal of this study was to determine the effect of PARP1 on APE1-mediated repair. We predicted that PARP1 would enhance APE1 activity and may form more stable complexes with NCPs containing linker DNA. We performed APE1 incision steady-state kinetic analysis, PARP1 binding, and ADP-ribosylation characterization of two NCPs (147 and 197 bp). The results indicate that PARP1 preferentially binds to NCPs containing linker DNA (197 bp), PARP1 stimulates APE1 activity under steady-state conditions, and the presence of linker DNA enhances overall APE1 activity, independent of PARP1.

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Health Sciences

Title: Early Diagnosis of COPD in the Primary Care Office with Spirometry

Student Author(s): Jamie Larsen

Faculty Advisor: Dr. Jhaymie Cappiello

Department: Kinesiology

Chronic obstructive pulmonary disease (COPD) is a leading cause of death in the United States. The gold standard for diagnosing COPD is spirometry. Early detection of COPD in the primary care office can help physicians recommend smoking cessation and prescribe COPD-related pharmacological therapies. Therefore, reducing the financial burden on the healthcare system and improving patient's quality of life. Research suggests that early diagnosis of COPD has positive benefits for patients. After reviewing the literature through randomized control trials, cross-sectional studies, clinical studies, and cohort studies this systematic review reveals that there is growing evidence showing early diagnosis of COPD is both beneficial to patients and the health care system. The evidence-based literature I accessed will be used to educate primary care offices on the importance of spirometry for diagnosing COPD and creating an evidence-based protocol for testing patients with spirometry and complete pulmonary function tests. More research is needed to determine the significance of early diagnosis of COPD in the primary care office.

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Health Sciences

Title: Influence of Balance Shoes on Plantar Pressure
in Individuals with Chronic Ankle Instability

Student Author(s): Benny Le, Allie Knuckles, Danielle Torp, and Tricia Hubbard-Turner

Faculty Advisor(s): Dr. Abbey Thomas Fenwick and Dr. Luke Donovan

Department: Kinesiology

Individuals with chronic ankle instability (CAI) walk with greater lateral plantar pressure, which increases the potential for reinjury. Further, these patients experience impaired ankle muscle activation during walking. Poor activation of these muscles limits their ability to prevent ankle injury. Gait retraining to medially shift plantar pressure, while encouraging restoration of muscle activation, may be beneficial to these patients. This study will determine if walking in balance shoes can increase muscle activation in patients with CAI. Twelve adults with CAI (20.83±1.7yrs; BMI: 26.7±4.6kg/m²) completed a single session of treadmill walking. Electromyographic (EMG) electrodes recorded activity of the gluteus medius, soleus, tibialis anterior, and peroneus longus muscles during walking. Participants walked for 30s to record muscle activity during standard walking. Then, balance shoes were fitted over their tennis shoes and a 30s baseline with balance shoes was recorded. After 20 minutes of walking with balance shoes, participants removed the balance shoes and a follow-up 30s walking trial was recorded. Peak muscle activity during the middle 10 steps of every 30s bout of walking will be extracted for each muscle. These values will be normalized to a quiet stance trial and averaged across steps for each time point. Data will then be analyzed statistically using repeated measures ANOVAs ($\alpha < 0.05$). We anticipate that activity in all muscles will be higher when participants walk in balance shoes compared to baseline and follow-up without balance shoes. This finding would suggest that balance shoes are useful adjunct to rehabilitation to increase muscle activation.

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Health Sciences

Title: Impact of CPAP Compliance on Pulmonary Rehabilitation Outcomes in
Patients Diagnosed with Overlap Syndrome (COPD & OSA)

Student Author(s): Tashia Locklear

Faculty Advisor: Dr. Brian Ring

Department: Kinesiology

Background: Patients diagnosed with chronic obstructive pulmonary disease (COPD) and obstructive sleep apnea (OSA) often exacerbate their cardiopulmonary disorder due to poor OSA management. Patient's with both COPD and OSA have a higher incidence of recurrent exacerbations, hospitalizations, and higher mortality rates. Continuous positive airway pressure therapy (CPAP) is a proven treatment modality for COPD and OSA to improve survival, increase oxygen content, and decrease hospitalizations/readmissions. Methods: Data were analyzed for the diagnosis, prescribed therapy compliance, diagnostic test results, and hospital readmissions rates for patients participating in a pulmonary rehabilitation program in Fayetteville, North Carolina. Scores for Epworth Sleepiness Scale (ESS), Forced Expiratory Volume (FEV1), and nocturnal desaturations were recorded. Results: Thirty patients with overlap syndrome were monitored with the use of CPAP therapy and 15 overlap patients with no therapy prescribed. Patients compliant with CPAP therapy of >5 hours per night had an increase in their forced expiratory volume (FEV1) by at least 10%, had less nocturnal desaturations; their Epworth Sleepiness Scale (ESS) improved. Overlap patients with no CPAP therapy had no change in their FEV1, had more nocturnal desaturations, and had a higher ESS than patients that were compliant with CPAP therapy. Conclusions: Patients with overlap syndrome who use their CPAP device as prescribed will discover an improvement in their quality of life, have an increase in their FEV1, improvement in oxygen saturation, and will experience less daytime sleepiness compared to those who are not prescribed CPAP therapy.

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Health Sciences

Title: In Vitro Transcriptomic Analysis of Plasmodium Vivax in Ethiopia

Student Author(s): Miriam Magana and Eugenia Hill

Faculty Advisor: Dr. Eugenia Lo

Department: Biological Sciences

Malaria is a significant global health problem with a substantial disease burden worldwide caused by the protozoan parasite Plasmodium. In 2017, there were approximately 219 million diagnosed cases of malaria resulting in 435,000 deaths with 92% of cases occurring on the African continent. Ethiopia contributes to 6% of the 212 million malaria cases annually. *P. falciparum* and *P. vivax* are the primary source of malaria in Ethiopia, with *P. vivax* accounting for 40% of malaria cases in the country. *P. vivax* uses the Duffy antigen/chemokine receptor (Fy glycoprotein, or CD234) as a receptor to enter human erythrocytes. The absence of Duffy expression among most Africans explains the rarity of *P. vivax* malaria in Africa. However, recent studies reported several cases of *P. vivax* infection in Duffy-negative individuals in Africa, suggesting Duffy-negative individuals are no longer resistant to *P. vivax*. This phenomenon raises the questions of how *P. vivax* invades Duffy-negative human erythrocytes and questions the role of DBP in Duffy-negative erythrocyte invasions. This research aims to establish multiple short-term *P. vivax* culture lines and examine mRNA sequences of various erythrocyte binding gene candidates. Blood samples that were microscopically-positive with *P. vivax* were immediately processed for cryopreservation and cultured to majority schizont stage. Schizonts were isolated for RNA extraction in TRIzol. Libraries were constructed using direct-zol RNA Miniprep Plus. Direct RNA sequencing will be performed by Illumina Hi-Seq system. These results will identify key gene transcripts that are upregulated, providing a baseline gene expression profile of *P. vivax* in Duffy-positive patients.

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Health Sciences

Title: Extubation to High-flow Nasal Cannula in the Cardiothoracic Patient Population

Student Author(s): Victoria McCue

Faculty Advisor: Dr. Brian Ring

Department: Kinesiology

Extubation to High-flow Nasal Cannula in the Cardiothoracic Patient Population Background: Extubation to high flow nasal cannula (HFNC) has been well researched in both high and low-risk patients in intensive care settings; decreased reintubation rates have been identified in both groups. In patients undergoing cardiac surgery, extubation to bi-level positive airway pressure (BiPAP) therapy has been shown to decrease reintubation rates in the cohort. With these positive findings, it can be hypothesized that the development of extubation protocols centered around HFNC or BiPAP therapy would prove beneficial for postoperative cardiac surgery patients. Methods: A retrospective analysis of a pre and post HFNC protocol implementation was conducted. The data was abstracted manually by two abstractors in the analysis department through the EPIC electronic medical record for patients undergoing cardiothoracic surgical procedures extubated to HFNC; the data loaded to Lumedx software. Categorical data for the participation of subjects in pre or post data were analyzed for independence from patient reintubation via chi-square analysis (IBM® SPSS® version 26). Results: Reintubation rates decreased from 3.5% to 3.1% after HFNC protocol implementation for all subjects included in this analysis; reintubation rates for cardiothoracic surgical patients were not dependent on the post-extubation protocol implementation with HFNC, $\chi^2(1, N=1238) = 0.21, p=.884$. When looking specifically at CABG patients, reintubation rates decreased by 3.5% to 2.5%. Conclusion: Based on the evidence that was collected it shows that extubation to HFNC decreases reintubation occurrences in post-op cardiothoracic patients, this will decrease length of stay in the ICU.

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Health Sciences

Title: Transition to Practice for the New Graduate Respiratory Therapist

Student Author(s): Nicole Miller

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Healthcare orientation plays an important role in the process of starting in one's career within any facility. Effective healthcare programs play a big role in the new teammate's competency, satisfaction, and retention. With evolving changes and complexity in healthcare and the shortage of healthcare workers, respiratory therapists and nurses are in high demand and are often expected to be self-sufficient healthcare professionals. Such rigorous work can be even more stressful for new graduates. The goals of a transition to practice orientation program focus on healthcare competency, continuing education and employee mentorships. **Methods:** Surveys were conducted on active respiratory therapists within one of the biggest healthcare systems in North Carolina. Questions included the length of their orientation programs, their comfortability level as a new healthcare graduate, and the ranking of importance of various components included in healthcare orientation programs. A literature review analyzed the impact of effective healthcare orientation programs. **Results:** Survey results showed the most healthcare orientation programs were less than 6 weeks in length. Additionally, the majority of new graduates did not feel fully comfortable following orientation and believed they would see an increase in competency with a proper orientation program. **Conclusion:** The results of the survey conducted was intended to provide an overview of what orientation length averages are throughout the system. What others feel are the most important parts of orientation and what outcome they anticipate with the proper orientation.

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Health Sciences

Title: Going Viral with Anemones

Student Author(s): Rachel Nguyen **H**

Faculty Advisor: Dr. Adam Reitzel

Department: Biological Sciences

My research utilizes a model cnidarian species, *Nematostella vectensis* (starlet sea anemone), to determine the mechanisms of innate immunity in response to viruses. Specifically, I am interested in identifying genetic responses these organisms exhibit due to historical differences in exposure to different viral populations, including but not limited to bacteriophages and animal-specific viruses. Viruses are associated with anemones as part of the holobiont, where they may live in a mutual, commensal, or parasitic relationship. Thus, the viral community can potentially become an integral part of this sea anemone. Although previous research has shown what viruses are associated with anemones, there is currently a lack of insights why individuals have different compositions of viruses, and if individuals may be adapted to particular viral communities. Through a survey of genes hypothesized to be involved in mediating a response to viruses, I selected five genes involved in the innate immune system, including those involved in the detection and elimination of viruses. Gene amplification followed by DNA sequencing was utilized to compare the degree of variation between the genetic sequences from individuals throughout their geographical range in North America. For ongoing research, we will identify regions of the sea anemone's genome that has evolved in response to viral exposures. Furthermore, my research will assist in understanding how the impact of the viral community contributes toward the process of natural selection, especially in areas with different viral communities.

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Health Sciences

Title: The Use of Interdisciplinary Communication to Improve Extubation Times in the
Cardiothoracic Intensive Care Unit

Student Author(s): Jessica Overcash **NC, U**

Faculty Advisor: Dr. Jhaymie Cappiello

Department: Kinesiology

Fast Track Extubation (FTE), post-operative liberation from mechanical ventilation within 6 hours, has become a standard of practice for many cardiothoracic surgical patients. Clinical studies have demonstrated that FTE decreases ventilation times, promotes proper resource allocation, and reduces the ICU length of stay. The Society of Thoracic Surgeons (STS) has established a guideline for unacceptable practice if FTE is not achieved in the “Absence of Major Morbidity”. Published rankings of cardiothoracic surgeries by the STS have motivated our unit to achieve early post-operative extubation. A successful FTE requires multiple disciplines to work together to ensure a safe, timely extubation. At Carolinas Medical Center, a new interdisciplinary communication approach has been implemented to improve communication between the disciplines for this quality initiative. Post-operative extubation times at the 6-hour and 24-hour mark post ICU admission are reviewed. The use of scheduled huddle times at the 1-hour, 3-hour, and 5-hours post ICU admission are being conducted as well as an 18-hour huddle between all members of the ICU team. The use of a communication survey and extubation times are reviewed to determine the efficiency of this new interdisciplinary communication approach. The Society of Thoracic Surgeons Database will be reviewed quarterly to ensure the percentage for the “Absence of Major Morbidity” is improving or remaining above the average. Interdisciplinary communication is expected to improve, resulting in more patients meeting the STS guidelines for the “Absence of Major Morbidity” by being extubated within the expected time. The implementation of huddle times has improved staff communication and enriched the already implemented patient-centered care model in our cardiothoracic intensive care unit.

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Health Sciences

Title: Implementation of a Compliant Standardized Method of Medication Administration
Documentation in the Electronic Medical Record for the Respiratory Care Department

Student Author(s): Sabrina Piccolo **NC**

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: The compliance rate of medication administration documentation is an important factor in meeting the standards of compliance for the Joint Commission (TJC). Audits uncovering the lack of proper documentation within the electronic medical records (EMR) for patients receiving medications administered by respiratory therapists (RTs) were at the core of this investigation. Concern for meeting organizational and TJC compliance as well as patient safety factors made this a compelling project topic. **Methods:** Following a thorough department analysis, incomplete, absent, or erroneous documentation was evident. The main causes identified were medication scanning insufficiencies due to EMR technical or barcode limitations, inappropriate completion of pre and post administration data by staff, and the lack of a standardized data entering method into the Medication Administration Record (MAR). Scanning insufficiencies were eliminated prior to any implementation of change. A standardized documentation method was created as well as the implementation of re-education or training of clinical respiratory therapy staff in this area. **Results:** Approximately 50% of all inhaled respiratory medications were not compliant with organizational and TJC compliance standards at the beginning of this project. After the implementation of a standardized documentation method, greater than 90% of medication documentation was found to be compliant. **Conclusions:** This project not only improved TJC and organizational compliance, but contributed to improved patient safety with regard to inhaled medication administration hospital-wide.

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Health Sciences

Title: Bringing Awareness, Impacting the Future:
Recognizing the Need for Lung Cancer Screening

Student Author(s): Lisa Powell **NC**

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Late stage lung cancer diagnoses are most common; when treatment options are limited. However, smokers who meet specific screening criteria may be eligible for lung cancer screening. A lung cancer screening program may provide a means of early monitoring for lung cancer. Lung cancer screening involves an exam that searches for pulmonary nodules prior to lung cancer symptoms and is based on age and smoking history. Methods: A retrospective analysis was conducted on the lung cancer screening program at Catawba Valley Health System, through retrieval of programmatic data from 2014-2019. Two interviews were conducted, one with the Cancer Program Director and the other with a Radiologist at Catawba Radiology Associates. Results: Results revealed that an average of 57% of smokers diagnosed with lung cancer, could have potentially benefitted from lung cancer screening. In 2014, 23% of lung cancer diagnoses were made at stages I & II. As the lung cancer screening program continued to progress; 2018 indicated a 40% shift in stages I & II lung cancer diagnoses. Conclusions: With lung cancer being the leading cause of death amongst men and women, lung cancer screenings can assist in early detection. Healthcare providers should advocate to screen all high-risk smokers, provide continued education to medical staff, and bring awareness to communities. Early detection of lung cancer can permit optimal treatment options with improved survival rates. Such changes will create the most impactful shift of lung cancer mortality within communities.

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Health Sciences

Title: Investigating Methods we use Effectively against Chronic Insomnia:

Primary and Secondary the Silent Killer

Student Author(s): Omar Powell

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Insomnia has dire health consequences, that oftentimes goes undiagnosed or missed. People have different symptoms that may present throughout their lifetime. Several symptoms can affect sleeping patterns. Individuals working in the medical field may experience chronic insomnia following only a few years in the profession. It is how you handle the events that will affect your sleep. People learn to handle stress starting on the day you are born. It is how these symptoms are managed that affect sleep outcomes. Methods: Clinician surveys evaluate common sleeping problems, prescribed medications, and devices used to help employees sleep. Health care professional interviews were conducted asking certain questions concerning sleeping problems and helpful interventions. Results: I will use the data I received from the surveys and questions to see how people are with health and sleep. This will help determine if people are getting the proper rest and sleep. Conclusion: This will show how hospital workers suffer from chronic insomnia. This will help guide health care professionals to a better version of themselves. Sleep is a very important factor in your life. The way you handle stress can save your life in the long run.

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Health Sciences

Title: Engineering Hyperactive Hsp70 Mutants to Counter the Toxic Effects of FUS and TDP-43 Proteins in Amyotrophic Lateral Sclerosis (ALS)

Student Author(s): Lizbeth Saa and Laura E. Knighton

Faculty Advisor: Dr. Andrew Truman

Department: Biological Sciences

Neurodegenerative diseases such as Amyotrophic Lateral Sclerosis (ALS) and Frontal Temporal Dementia (FTD) are all caused by protein misfolding. In these illnesses, the RNA-binding proteins FUS and TDP-43 aggregate in neurons causing cell death. Restoring normal FUS and TDP-43 in cells is a potential strategy for curing these illnesses. Heat shock protein 70 (Hsp70) is a molecular chaperone that plays a role in both the folding and disaggregation of proteins. In this study, our aim was to examine the possibility of activating Hsp70 through mutation to remove the toxic forms of FUS and TDP-43. We have created a yeast model of ALS-FTD by expressing FUS and TDP-43 proteins on regulatable promoters. In our system, when yeast are placed on galactose media they are killed by toxic expression of FUS and TDP-43. We mutated Hsp70 via high-saturation mutagenesis and expressed this in our model system, looking for any cells where mutant Hsp70 reversed the effects of toxic FUS and TDP-43. Through this strategy, we intend to obtain novel hyperactive Hsp70 mutations that have therapeutic utility. Going forward, we will use the information from our yeast screen to create and express equivalent Hsp70 mutants in human cells to examine their ability to disaggregate FUS and TDP-43.

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Health Sciences

Title: Chronic Lung Disease Care and Prevention: Education and Care Plans

Student Author(s): Mindy Street

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: Neonatal patients born <29 weeks' gestation and weighing <1500 grams are at risk for developing chronic lung disease (CLD) requiring mechanical ventilation (MV). Prolonged MV increases risk of CLD due to pressure and volutrauma occurrences. Timely extubation of these patients is crucial in minimizing CLD. The Vermont-Oxford Network defines CLD as the use of oxygen after 36 weeks post maternal age. Developing protocolized care plans for these neonates will reduce the average length of stay on MV and allow this patient population better quality of life after discharge from the hospital. **Methods:** A literature review was performed to establish best practice evidence for protocolizing a care plan for extremely low birth weight infants. An interview with a neonatologist was also conducted to gather information about the current care plan and to discuss creation of an educational program. Staff surveys were performed to evaluate the general knowledge of CLD and prevention strategies in the unit. Continuing education was provided to improve clinician-based care. **Results:** Staff surveys found that basic knowledge about CLD and ventilatory care for infants was understood. The findings conveyed that inconsistency of care for the infants was the focus for improvement. With the help of neonatal clinical care team members, a new care plan was designed to ensure consistent best practice is received by all infants. **Conclusion:** A standardized care plan and educational program were developed to ensure consistent ventilation care with a goal of timely extubation. Post-implementation analysis is needed.

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Health Sciences

Title: Tracheostomy Education

Student Author(s): Larina Vega

Faculty Advisor: Dr. Jhaymie Cappiello

Department: Kinesiology

Background: Good tracheostomy care consists of regular suctioning, daily stoma care and recognition of tracheostomy complications such as a blockage, bleeding and accidental decannulation. Nurses are the primary care providers for tracheostomy patients with support coming from Respiratory Care Practitioners. Despite this, care practices continue to be an issue. Reasons for this are that nurses may care for tracheostomy patients on an infrequent basis with limited tracheostomy education and lack of confidence to provide quality care.

Method: Forty nurses were surveyed; twenty acute care and twenty intensive care. A nursing clinical educator was interviewed on tracheostomy care training and education practices. A literature search was performed on tracheostomy care practices and training. **Results:** 37/40 received with a 93% completion rate. Results indicated that ICU nurses were more comfortable caring for tracheostomy patients than their acute care colleagues were. Both groups felt that additional training would be a benefit. An interview with a nurse educator on tracheostomy education was completed and some of the main contributions for the nurses becoming well educated on tracheostomies are decreased ICU and mechanical ventilation length of stay, decreasing patient anxiety, ensuring continuity of care and overall optimizing patient care and education. The literature review criteria pertained to tracheostomy care in adult patients. **Conclusion:** Tracheostomy care by nursing is not routinely expressed as a comfortable skill. Attention to this deficit through training can positively impact the nursing perceptions on their skill, improve their work environment and improve tracheostomy care.

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Health Sciences

Title: When Hunger Strikes: An Analysis of Community Intervention Programs and their Ability to Reach School-Established Nutrition Requirements.

Student Author(s): Brittany Walker **CE, NC, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The Kids Eat Free Program (KEF) at Atrium Health University is a program dedicated to serving hot meals to children during the summer right after school has ended. This program was designed to bridge the gap for underserved, low income families who receive free or reduced lunch at school to also receive a free meal during the summer. With this goal in mind of providing children with a nutritional meal, they strive to equate to the nutritional values of Charlotte Mecklenburg Schools (CMS). There is significant evidence to support an association between a nutritionally balanced meal and child development. This present study is attempting to evaluate just how true this is by comparing the nutritional values in Atrium Health's KEF program to those in CMS schools. The sample will include children (N=6,196) from the KEF program summer 2019 who were between the ages of 1-18 (M = 9.5). The data of food nutritional values was collected from the nutritionist at Atrium Health, as well as from the CMS website on the cafeteria's food nutritional values. The expected experimental results are that, nutritiously, the meals served at Atrium Health in the KEF program are equally as good or better than the meals served at CMS. While these findings have not been reached yet, the results of this study should provide a basis of how important nutrition is on the growth and development of children under the age of 18.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Health Sciences

Title: Education Will Reduce Vaping among American Teens and Young Adults

Student Author(s): Cynthia Williams-Alexander

Faculty Advisor: Dr. Amanda Dexter

Department: Kinesiology

Background: As a result of the alarming increase in teen vaping, the American healthcare community is turning its attention to candid education warning about the dangers and outcomes of vaping. In the Charlotte community, structured information from surveys, interviews and literary reviews is necessary to combat increasing numbers of reported use. The purpose of this project is to evaluate whether proper education will reduce vaping incidents among American teens and young adults. **Methods:** Interviews with critical care pulmonologists and brain injury experts gave insight to the issues that underscore health concerns and the potential impact that vaping could have in the United States. A literature search as well as clinician surveys provided data to support educational design. **Results:** Survey results from respiratory therapists show there are no readily available proper educational tools, specifically designed for teens in regards to vaping. Interviews with clinical social workers confirmed that education is needed in the home and school environment. **Conclusion:** Proper education can reduce the use of e-cigarettes/vapes amongst American youth and young adults. Through structured education, clinicians can inform young decision makers and prepare them to make appropriate personal choices. Using other outlets such as social media, peer pressure and mass communication advertising to the youth will create an effective educational blitz.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Humanities

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Humanities

Title: Brunswick Stew: A Critical Analysis

Student Author(s): Logan Clark **H, NC**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

The origin of Brunswick stew is subject to much debate. While the most detailed origin story comes from Brunswick County, Virginia, both Brunswick County, North Carolina and the city of Brunswick, Georgia claim it originated there. The recipe differs slightly in each region, but all three have the same staple vegetables: tomatoes, lima beans, and corn. Historically, the stew is made out of game meat like squirrel, opossum, or rabbit. However, now it is made with chicken, pork, and/or beef. Modern recipes call for varying styles of these meats from leftover pulled pork to a freshly cooked shredded chicken. The recipe I looked at calls for fresh cooked pork and chicken. It delves into the back story, like all other modern Brunswick stew recipes. While the tone is informative and unopinionated, the author favors a Virginia style stew by giving a more enthusiastic and extensive history of its background and modern traditions. Like many other recipes of Brunswick stew, this one glosses over the implications of racism in the Old South, despite including the knowledge that in Virginia it was first prepared for a slave owner by one of his slaves. It is worth studying the rhetoric used in these recipes to further acknowledge the selective history of racism that can lead to negative and misinformed reception of the dish. I intend to look deeper into the devices used in this version of a Brunswick stew to analyze the narrative of an innocent and positive southern recipe.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Humanities

Title: The Values Hidden in Shrimp and Grits

Student Author(s): Austin Crockett **H, NC**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

The southern dish of “Shrimp and grits” has a complex history and even more complex evolution. It originates in the low-country marshes of the southern coast, but it is widely debated how the combination was first brought together. The most popular theory is that Native Americans passed the dish on to southern colonists by using “hominy” (an early form of grits) as a currency with them. The colonists would then combine it with the readily available shrimp found in nearby coasts. Another theory states that the dish was originally from West Africa and was brought to the low-country marshes by slaves. The dish formed a staple breakfast food in the south that would eventually be re-popularized in 1982 by the restaurant “Crook’s Corner” in Chapel Hill, North Carolina. Bill Neal, the chef, created a version of shrimp and grits that was eventually published in the New York Times. Neal’s recipe roared through the south. Different regions added their own twists: New Orleans added barbecue sauce, Charleston added Cajun flavoring, and many more locations added other, unique flavors. Though it is often not perceived as a “southern” food, it is an incredibly important one. Shrimp and grits are worth studying because its history mirrors the development of the south and provides insight into the culture of each region within it. Each variation of Neal’s recipe sends the message of what is important to the region that modified it.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Humanities

Title: Mama's Pecan Pie - Critical Recipe Assignment

Student Author(s): Kaley Davis **H, NC**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Pecan pie is a dessert that is widely known across the south. Pecan pie became known in the early 1800s, but that was milk and custard-based pie. It was not until the 1930s when the syrup-based Pecan Pie we all know so well became popular. Pecan pie is highly associated as a Thanksgiving or Christmas dessert, but in the South, it is a dessert eaten year-round. Pecan pie is a dessert you can find at almost any southern restaurant. This paper will critically analyze the importance of Pecan Pie, its history, and the stories that may be attached to the southern dessert. The recipe under analysis is called "Mama's Pecan Pie". It is a simple recipe intended for anyone and everyone to use and it has been passed down 4 generations of women, which connects it to the history of women in the South. It is a recipe for a basic, authentic, Pecan Pie. It is short and to the point. It is handwritten on a 3 by 5 index card. Since the recipe is short, I think that the tone can either be inviting or intimidating. It could be inviting to one who is comfortable with baking, and it could be intimidating to someone who is not so comfortable baking. The instructions are simple which can make it easy to follow but also leaves room for mistakes.

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Humanities

Title: Critical Recipe Abstract – A Recipe of Southern Fried Catfish

Student Author(s): Jordyne Dixon **H**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Fried catfish has a history as old as the south itself. The dish was originally solely for slaves. Fried catfish was one of the few dishes slaves could eat in their downtime. African Americans have taken the dish and made it into a symbol of community and fellowship. Fried catfish is served at fish fries in black communities all over the country. Each region adapting the recipe to reflect where African Americans migrated to in the 1900s. This food deep ties to black southern culture creates strong senses of kinship, togetherness, and family. This paper rhetorically analyzes a recipe in order to understand the messages that it sends about the south and the controversial history of tensions between the white and black communities in the south. The recipe shows a new way to make this southern food that adapts to new food trends. This recipe shows how one can recreate a meal so that it can be eaten by those that cannot eat gluten for a variety of reasons. The tone of this recipe is upbeat and lively though there is a slight tone of professionalism when talking about how to fry the fish. The recipe shows the way that such an old dish can be reinvented to cater to a whole new generation. The rhetorical analysis shows that while the recipe is revitalized a classic African American southern food. The recipe shows how a dish can evolve not only from region to region but also from generation to generation.

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Humanities

Title: Ripples Down the Line

Student Author(s): Christopher Melo-Pelaez

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The effects that mentoring programs have on both the mentee and mentor and how it is beneficial to both sides of the coin.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Humanities

Title: Hummingbird Cake

Student Author(s): Lauren Ostrea **H**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Tradition is typically a belief or custom passed down from generation to generation within a certain group due to the belief or custom's historical significance. Likewise, the concept of traditional cooking and how foods become a part of culture arise in the same way. For example, upon hearing the phrase "traditional southern food," one immediately thinks about fried chicken, grits, sweet potato, or pecan pie because of their historical significance to the Southern United States. Therefore, in order for a recipe to be a part of tradition, it must be first adopted, adapted, then finally integrated into a group's culture. Hummingbird Cake proves to be exactly this: a twist on traditional southern cooking, where its adoption and integration into the South began with Jamaican immigrant L.H. Wiggins, who submitted the recipe to Southern Living in 1978. The flexible nature of Hummingbird Cake was aimed towards lower middle class cooks where the cake can be made without pricy ingredients and can even be consumed without icing while holding its tasty integrity. In appreciation of the low cost to produce the cake, the recipe quickly rose to popularity, where Southerners began to use the spelling "Byrd" when writing the recipe's name. This adaptation proves the welcome adoption into the Southern culture as well as the increasing acceptance of Jamaican immigrants in the Southern states of Georgia and Florida. Therefore, becoming a well-integrated adoption into the traditions of Southern cooking.

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Humanities

Title: A Recipe for the Classic Brunswick Stew

Student Author(s): Courtney Poole **H**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Brunswick stew is an iconic staple in the book of classic southern dishes, and the earliest forms of the meal have been traced back to colonial times when the dish was prepared by Native Americans. The food is deeply ingrained in southern culture, however it's not a dish for the faint of heart. Depending on your preference, Brunswick stew begins as a pot of chicken or pork that will have to be smoked for hours before it's ready. Just as essential to the dish as the meats, Brunswick stew is also reliant on its well-seasoned and tender vegetables to add to the flavor and texture of this dish. It's the creation and cooking of this dish, rather than the presentation of the meal itself, that inspires this recipe analysis. Brunswick stew became a Southern food culture icon after it was adapted from the Native Americans version to a dish commonly cooked by African American slaves during the civil war era. It represented communal forms of cooking, because an authentic Brunswick stew is intended to feed as many people as it can. It represented a time when people could come together around the open fire and spend time together as a community or a family. Brunswick stew is proof that sometimes all you need is a good pot of stew, and a family to share it with.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Humanities

Title: The Rise, Fall, and “Resurgence” of Collard Greens - A Critical Analysis of a Recipe for
Southern Style Collard Greens

Student Author(s): Courtney Pratt **H, G**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Collard greens are a dish that have long been regarded as a trademark of the South and are often a staple found during holidays, family gatherings and at classic “meat and three” restaurants in the region, where you’re sure to find no shortage of traditional southern favorites. However, despite its current popularity, collard greens weren’t always so well-received by the public, especially when they first arrived in the Americas. While the plant originated in Europe and was first brought to the Americas by British settlers, they didn’t become a popular dish among Southerners until long after they had been used by African slaves for decades. Although uncooked collards tend to have a tougher and more bitter taste, slaves were able to use their knowledge about other similar greens native to Africa and transform the plant into the savory dish we all know and love today. This paper rhetorically analyzes a Northerner’s take on “southern style collard greens”, the deep-rooted history behind them, and how something as simple as a recipe can tell a story about the way you were raised. The tone of the recipe is very welcoming and easy to follow as it provides a simple and traditional method of preparing collard greens, yet it is unique in that it also tells the story of how this recipe came to be. Rhetorical analysis of this recipe shows just how deeply a dish can come to define a region while also serving as a unifier in bringing different groups together.

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Humanities

Title: A Cultural Analysis of the South through a Recipe for an

Authentic Shrimp Po' Boy with Rémoulade Sauce

Student Author(s): Ethan Rhodes **H**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Poor Boys or more commonly known as Po' Boy sandwiches have served as a staple of regional Southern cuisine for nearly a hundred years. The dish has its roots in the culturally diverse port city of New Orleans, where in the late 1800s fried oysters and shrimp on French loaves were called "Peacemakers". However, the modern version and name of the sandwich have only been around since the 1920s. The history of the Po' Boy has been closely related to class and racial issues of the South. Despite its difficult past Po' Boys have become deeply ingrained into Southern restaurant cuisine, even so far as having a festival dedicated to the dish in New Orleans. Po' Boys are often associated with the traditions, variety, and resiliency of the South. This paper will rhetorically analyze an authentic recipe for Shrimp Po' Boys and Rémoulade Sauce, in order to understand the messages that the dish conveys about the South and the identity of its inhabitants. The recipe being analyzed seeks to educate someone from a region other than New Orleans, including other Southerners, on a way to make the most "delicious and authentic Po' Boy". The tone of the recipe simultaneously gives off accommodating and distingué impressions, which is reflective of the common notion of Southern values of hospitality and allows for the recipe to be followed by those willing to put in effort in making Po' Boys from scratch.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Humanities

Title: A Recipe for Macaroni and Cheese

Student Author(s): Nolan Wagoner **G, H**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Macaroni and cheese has long been a staple food at almost any southern gathering. The roots of this dish in southern America fall back to enslaved Africans that cooked the dish on special occasions or weekends. Thomas Jefferson was also thought to have brought the dish from Italy, with an arguably failed attempt at recreating the dish. Since the emergence of Macaroni and cheese in the American south it has been prevalent at many church events, family gatherings, and holidays. The presence of macaroni and cheese at these events shows the unifying capability of the dish and the importance it has to southern culture. This paper rhetorically analyses a macaroni and cheese recipe found in a 1986 church cookbook from Kannapolis, North Carolina in order to better understand the southern messages it portrays. This recipe uses simple, brief terms to quickly show the reader how to make the dish regardless of their cooking experience. The tone is more didactic but seems to have swiftness in mind which could dissuade some readers due to the carelessness that could be portrayed. Rhetorical analysis of this recipe reveals the pride in cooking by displaying the author's name directly beside it. This shows how this one specific person has created their own unique take on the popular dish as the reader may compare it to their own personal experiences with the dish.

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Humanities

Title: Deviled Eggs: The Talk of Any Party

Student Author(s): Olivia Warner **H**

Faculty Advisor: Dr. Ashli Stokes

Department: Communication Studies

Deviled or stuffed eggs are a common potluck dish that has been a favorite at many church picnics, family reunions, and other large gatherings for generations. The term “deviled” originates from England in the mid-1800s and refers to the spices used in its filling along with the process of boiling the eggs to prepare them. In the South, it is common to have communal gatherings after church, suppers with extended family and friends, or even block parties in the neighborhood at which you would find at least one deviled egg recipe among the tables of food. The adaptability of deviled eggs allows for personalized variations to be found that include ingredients like pickle, crab, bacon, and even caviar. The taste you have for deviled eggs can often be linked to a family recipe or tell you something about your family history, allowing you to connect with the dish on a deeper level. Based on the unique personalization that is possible with the recipe and the communal sharing that is associated with eating them, deviled eggs are able to send messages about family, diversity, and inclusivity in the South. Deviled eggs are enjoyed by differing social and economic classes as the ingredients that are included can range from simple and frugal to complex and costly. Furthermore, the versatility of the dish allows it to be enjoyed outside of the South and can get people talking about family history, memorable eating experiences, and connect over a shared enjoyment of a delicious food.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Mathematics and Computer Sciences

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Mathematics and Computer Sciences

Title: Edge Computing and Machine Learning for Enhancement of Critical Professions

Student Author(s): Nicholas Osaka, Bonaventure Raj, and Ayman Ali **NC, U**

Faculty Advisor: Dr. Mohsen Dorodchi and Dr. Pu Wang

Department: Computer Science

Medical professionals have to act effectively and efficiently in a high-stress, high pressure environment. Many of these professionals deal with medications that can lead to adverse effects if administered improperly. In such situations there is a high chance of cognitive overload. Cognitive overload occurs when professionals cannot categorize incoming information quickly enough to act on. We are proposing to use edge computing to remedy this issue. By offloading particular cognitive tasks onto edge computing devices such as wearable glasses, it is hypothesized that erroneous actions resulting in adverse effects can be reduced. In our research, we develop a system which supplements professionals through contextually relevant information and verification of sensitive protocols such as verification of medication, dosage, and patient in critical conditions. Through the use of computer vision, we provide verification for all of these criteria. This will reduce accident related injuries and result in higher efficiency for medical professionals. For the first phase of analysis, we will collect data from simulation rooms for training nurses and measure the accuracy and efficiency of our algorithms. Medical professionals can equip the edge device and decrease time spent charting by up to 33% by employing the device. We address issues with edge devices for data-sensitive machine learning by utilizing state of the art Federated Learning and developed algorithms to solve computational limitations. In this research, we present a system that can increase the quality of care delivered by medical professionals based on user-inspired research utilizing edge devices through the use of machine learning.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Mathematics and Computer Sciences

Title: Early Intervention: Closing the Gap in Computer Science

Student Author(s): Brittaney Oxendine **CE**

Faculty Advisor: Dr. Lijuan Cao

Department: Software and Information Systems

Although there has been an increase in minorities' participation in the computer science field, they are still greatly underrepresented. Early intervention may be a key way to help increase involvement in minorities and help to close this gap in computer science. If minorities are introduced to computer science at an earlier age and receive the interaction positively, they may be more receptive to joining the computer science industry later in life. The study will be conducted by comparing two classes of 7th-grade students. The first class is composed of students who receive early intervention and the second class is composed of students that do not receive any early intervention. The duration of the study will be for one semester. The students will be surveyed at the beginning of the experiment to test their attitudes on computer science. After the first survey, there will be eight one-hour long lessons teaching the students in the intervention class how to code using Scratch. At the duration of the eight class, both classes will get the final survey. By comparing the two groups, we will be able to find if there is a significant difference between the attitudes of middle school students towards computer science based on if they received early intervention.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Mathematics and Computer Sciences

Title: Transformed Central Quantile Subspace

Student Author(s): Annabel Settle

Faculty Advisor: Dr. Eliana Christou

Department: Mathematics and Statistics

Quantile regression has received a considerable amount of attention as a means of capturing a more complete picture of the conditional distribution of a response and the predictors. However, this extra information can become a hindrance when working with high dimensional data, making dimension reduction techniques particularly useful. The ability to condense the number of predictors needed--while still retaining all relevant information of the relationship between the independent and dependent variables--allows for increased accuracy, efficiency and decreased computational costs. However, existing techniques focus on linear dimension reduction and assume the ability to replace the predictor variables with their linear combinations without loss of information. This focus on linearity, though, renders them unable to find important nonlinear features. Therefore, this work will consider nonlinear dimension reduction for conditional quantiles by utilizing the so-called 'kernel-trick'. This method entails transforming the data into a very high-dimensional feature reproducing kernel Hilbert space, allowing for a better encapsulation of the nonlinear data structure. Then, we look for low-dimensional projections by applying a linear algorithm. The performance of which will be evaluated in various real data applications including; visualization, classification, regression, and simulation studies. Preliminary results in visualization and simulation indicate a strong performance in comparison with existing linear quantile-based approaches that do not employ the kernel-trick.

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S - Sustainability **U** - Charlotte

Mathematics and Computer Sciences

Title: How to Conduct Research with Differential Privacy?

Student Author(s): Rohan Sitapara

Faculty Advisor: Dr. Liyue Fan

Department: Computer Science

Differential privacy offers a guaranteed bound on the loss of privacy after the release of query results. Many mechanisms have been proposed to analyze sensitive data with the guarantee; however, they fail to explain how to choose a value for the privacy level ϵ and provide a way of conducting analysis without sampling bias. Furthermore, another challenge in the differentially private analysis is to maintain accuracy and privacy. The analyst is anxious about learning as much as possible to get accurate results while the participant is interested in being compensated for their privacy loss. So, maintaining privacy, accuracy, while considering the budget for participant incentives poses a difficult problem. In this project, we aim to design a framework for collecting participants' data with the objectives of privacy, accuracy, and economy. Compared to existing studies, we consider two sources of errors for accuracy, i.e., sampling error and the differential privacy error. In addition, we will provide a practical solution for choosing the ϵ value and the sample size, in order to satisfy the requirements of accuracy and budget. Our project will generate tools for setting up privacy-preserving research studies. The outcome will encourage individuals to participate in research.

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Mathematics and Computer Sciences

Title: The Power of Representation:

Using Role Models to Improve Computer Science for Underrepresented Students

Student Author(s): Sarah Stanish **CE**

Faculty Advisor: Dr. Audrey Rorrer

Department: Computer Science

Across the computing workforce, there is underrepresentation of women and minorities such as African-Americans and Hispanic/Latinx. This project aims to study what factors impact underrepresented students' attitude towards computer science and whether their self-efficacy, identity, and role models in the field impact their decision to pursue computer science. In particular, this study will investigate the following questions: In what ways does underrepresented students' self-efficacy and identity impact their attitudes and interest in computer science? Can computer science curriculum combined with role modeling engage and interest underrepresented students in computer science activities? The study will focus on three groups of 6th to 8th grade students at Northridge Middle School. Group A is the control group, and students in this group do not receive interventions. Group B is an experiment group, and students in this group will receive computer science lessons and activities. Group C is also an experiment group, and students in this group receive the same computer science lessons as those in Group B, and receive lessons about role models in computer science that the students may relate to. The following data will be collected to address the research questions. Data on the students' background, personal views, and views about mathematics and computer science will be collected through surveys. Pre and Post surveys will be collected with Groups B and C before and after intervention and the survey for Group A will be collected once. Data about the teachers' views will be collected through interviews and classroom observation.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Mathematics and Computer Sciences

Title: Evaluation of Visitor Behavior using Computer Vision

Student Author(s): Joshua Sun **H**

Faculty Advisor: Dr. Min Shin

Department: Computer Science

One of the most important things that museums need to know in order to evaluate their product is the overall experience that the museum offers to visitors. However, currently it costs a significant amount of time, money, and manual efforts to collect the data needed to perform visitor studies. The existing methods conducting visitor studies have been relatively the same over the past 50 years and rely heavily on direct observation which is prone to human error and confirmation bias. On the contrary, object detection and tracking in computer vision have evolved tremendously in the past 30 years and has become faster and more accurate at detecting and tracking humans. Therefore, I will utilize existing computer vision algorithms, algorithms that gives computers the ability to make decisions based on images, to develop a method that will collect quantitative data on the number of people at a given time by detecting where people are at a specific exhibit. Using the data collected from this algorithm, we will visualize the data for our partner museum, Discovery Place, so that they can use data-driven results to evaluate visitor engagement and improve their exhibits, exhibit layout, and staffing. The benefits of this study will not only lead to automated data-collection, but cost-effective metrics for visitor engagement in museums, bringing state-of-the-art technologies to the field of visitor studies.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Mathematics and Computer Sciences

Title: Determining Users' Privacy Concerns for Smartphone Research

Student Author(s): Amanda Theobald

Faculty Advisor: Dr. Liyue Fan

Department: Computer Science

Mobile phones contain several sensors that can be used to collect behavioral data about users. Because of this, they have increasingly been used as data collection tools for research studies. However, users may have privacy concerns about sharing data with researchers; furthermore, existing studies on users' privacy concerns do not specifically target smartphone research. In this project, we aim to find out about users' perceptions regarding data collection from their smartphones, in order to gain insight into how privacy concerns may affect users' willingness to participate in smartphone research. We created a survey study asking our participants whether or not they would consent to their data being collected for research from each sensor, given certain conditions such as collection frequency, temporal aggregation of data, precision level, and privacy protections. The study includes 704 unique scenarios. We will administer the survey to 267 participants on Amazon Mechanical Turk. The collected data will be analyzed using cross-tabulation to understand how different conditions affect user responses. We expect results to be different for each type of sensor: sensors such as the accelerometer or battery logs are less identifying and are more likely to be accepted, whereas sensors that collect sensitive or identifying data, such as GPS or call logs, may cause users to be more hesitant to share data, even with privacy protections. The outcome of our project will not only reveal users' privacy concerns, but also provide valuable insight into how privacy protection could help encourage individual data contribution in behavioral research.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Mathematics and Computer Sciences

Title: SPOT: Students Parking on Time - Optimizing On-Campus Parking Based on
Student Preferences using Reinforcement Learning

Student Author(s): Thao Tran **CE, NC, S, U**

Faculty Advisor: Dr. Mohsen Dorodchi and Dr. Minwoo Lee

Department: Computer Science

Every day, students have to find parking in a short time to make it to class, especially during peak times. Allocating optimal spots for students and visitors based on their preferences (short walking distance to class, close to certain entrances) would contribute significantly towards a more welcoming university environment. Reinforcement Learning (RL), a modern AI approach, can solve such problems through reward/punishment algorithm and allocate spots in real-time. However, before having a functional system, simulation is needed to generate a model that fits the campus environment and students' preference. Our study aims at building a simulation with 3-month data of parking patterns, students' schedules, and weather condition from Spring 2019 semester at UNCC. A high-quality visual simulation is developed using MATSIM framework to observe a single car's behavior and provide a bird-eye view of the entire campus' movements. This environment can be made available for other researchers for their testing. Also, by applying Q-learning, a robust approach in Reinforcement Learning, our model proves that it is possible to provide both student's satisfaction and prevent campus parking overflow. A student can receive an optimal parking suggestion on a smartphone minutes before entering campus so he/she can park in less than 10 minutes upon entering campus. The total time of "near-full" and "full" status across lots is reduced by at least 20%. This optimization will prevent future problems of an ever-growing campus population and can be replicated to other common venues in North Carolina such as stadiums, concerts, and state fairs.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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Mathematics and Computer Sciences

Title: A Survey of Ethical Elements for Computer Science in the UNC School System

Student Author(s): Lorenzo Williams **CE, NC, S**

Faculty Advisor: Dr. Elizabeth Johnson

Department: Computer Science

The purpose of this research is to address pedagogical ethics delivery to students in the computer science programs in the North Carolina public university system. First how many professors in computer science are trained or have degrees in ethics? How many ethics classes are students required to take? Does the university culture display ethical materials like values statements or the ACM Code of Ethics? This research is extremely important for universities to view because employers and the industry as a whole (technology) are stakeholders in the future of computing professionals and I believe that computing professionals are not putting enough ethical weight on decisions that are made. I hypothesize that the reason this is the case is due to the lack of ethical knowledge which should be formed early and become second nature. I expect this research to yield the following: how many professors have a background that includes ethics, how many ethics classes are required by the computer science students to graduate, and with the pre-test and post-test on the ACM Code of Ethics I hope to find that students are indeed learning enough in the ethics classroom to make sound decisions in a professional workspace. Hopefully, this research once published will raise awareness that lack of ethical knowledge is a problem and the remedy is to teach students how to make sound ethical decisions just as much as we teach them the technical side. Additionally, from this research I will make a recommendation, on what could be improved upon in teaching ethics to students and creating an ethical environment.

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Science, Technology, and Engineering

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

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U - Charlotte

Science, Technology, and Engineering

Title: Mechanical Weathering over time in the McMurdo Dry Valleys, Antarctica

Student Author(s): Carsen Adams, Ryan Carter, Veronica Gore, and Maxwell Dahlquist **G**

Faculty Advisor: Dr. Martha Eppes

Department: Geography and Earth Sciences

Mechanical weathering is the process of breaking rocks into smaller pieces. Geologic processes ranging from mass wasting to groundwater flow depend on mechanical weathering. Previous research has primarily focused on mechanisms that facilitate mechanical weathering. Recent work has shown that environmental stresses far weaker than the failure strength of a rock still generate fractures by the process of subcritical cracking. Furthermore, this subcritical cracking may be one of the most contributors to mechanical weathering overall. However, little research has been conducted on quantifying mechanical weathering through time. The present study aims to quantify mechanical weathering via mapping subcritical cracking using high-resolution photomicrographs of rocks from the McMurdo Dry Valleys of Antarctica. Multiple rock samples were collected from several locations on a glacier within the Dry Valleys. Thin sections were produced from each sample at equal depth from the rock surface, and fractures were identified, measured, and characterized using FracPaQ software. The rocks collected from just below the headwall of the glacier have had a shorter subaerial exposure duration compared to rocks collected from the foot of the glacier and are considered younger. We hypothesize that rocks collected from the glacier foot will exhibit higher crack densities than rocks from the glacier head. The climate has been extremely cold and dry throughout the full duration of these rocks' exposure at the surface. By producing a novel chronosequence of microfracture characteristics through time, this study will provide new insight into mechanical weathering processes.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Synthesis of the First Silver Telone Complexes

Student Author(s): Sharmily Ambroise and Nicholas Yost

Faculty Advisor: Dr. Daniel Rabinovich

Department: Chemistry

In recent years, our research group has successfully prepared many complexes of silver(I) supported by N-heterocyclic thione (NHT) and selone (NHSe) ligands, some of which exhibit potential anticancer activity. These compounds contain unusual two-coordinate cationic complexes $[Ag(IArE)_2]^+$ ($E = S, Se$), the identity of which has been confirmed in several cases using single-crystal X-ray diffraction. We have now extended the scope of this project by preparing the corresponding tellurium analogues, namely the N-heterocyclic telone (NHTe) complexes $[Ag(IArTe)_2]X$ ($Ar = Xy, Mes, Dipp; X = NO_3, BF_4, ClO_4$). Significantly, these compounds are the first telone complexes of silver to ever be isolated. This presentation will describe all the characterization data obtained so far for them, including nuclear magnetic resonance (NMR) spectroscopy and X-ray crystallography and, where available, comparisons with the corresponding sulfur and selenium analogues.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Is the Metabolic Adaptation of Estuarine *Crassostrea Virginica*
Influenced by Tidal Zone Gradient Conditions?

Student Author(s): Robert Atwell, Karina Gurdyumov, and Denise Furr **NC, S**

Faculty Advisor and Co-Author: Dr. Adam Reitzel

Department: Biological Sciences

Crassostrea virginica, the eastern oyster, has long been recognized as a model of metabolic stress tolerance. Since *C. virginica* live under certain environmental stressors, including non-ideal salinity levels, it is considered that these specimens would store large amounts of potential energy in tissues in an attempt to maintain energy levels. Although it is well documented that energy storage plays a critical role in the metabolic adaptations of *C. virginica*, it has never before been documented as to whether variant microhabitats in the tidal zones influence the metabolic behavior of this animal. Energy storage from lipids, proteins, and carbohydrates of the estuarine bivalve, *C. virginica* was analyzed along three different locations of different salinities in the coastal region of North Carolina. In our study, we conducted a series of biochemical assays which determined the amount of protein, lipid, and carbohydrate energy stores in samples of dissected storage tissue. The physiological assays such as NADP colorimetric assay for carbohydrates, Bradford dye assay for proteins, and standard lipid determination show salinity to have a greater effect on energy storage than habitat. With respect to the economic impacts, this resulting data would most likely prove beneficial to oyster farmers deciding on what conditions would produce an ideal range in crop yields. Most importantly, the results of these findings aim to reinforce conservation efforts in marine and estuarine ecosystems.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Air Quality Study:

Intercomparisons of Three Collocated Purple Air Devices

Student Author(s): Evan Blomquist **CE, NC, S, U**

Faculty Advisor and Co-Author: Dr. Brian Magi

Department: Geography and Earth Sciences

The use of low-cost air quality sensors has increased over the past decade. With low-cost sensors, communities can record air quality to help understand which type of pollution they are exposed to, and the concentration in their area. This also helps citizens determine whether there are any potential health risks due to long-term exposure. An important part of low-cost air quality data, however, is evaluating the data quality. Our study aims to address data quality and stability. The Purple Air II (PA-II) is a low-cost monitor that detects 0.3-10 micron diameter particles. A fan draws air into the PA-II, shines a laser on the sampled air, and relates the scattered laser-light to the number of microscopic particles in the sampled volume of air. For this study, three PA-IIs were placed in a close proximity in an outdoor environment to collect co-located data for comparison. Two years of data were evaluated using exploratory statistics, and bivariate comparisons via linear regressions. Our preliminary findings show that correlation ranges from 0.80-0.90, but that the regression statistics change over the course of the two year sample period. The high correlation shows that the co-located sensors responded similarly to changes in outdoor air quality, but the changing regression suggests that PA-IIs degrade in quality within about two years. Our final analysis will quantify the lifetime of the sensors with a more detailed study of the regressions, helping to understand how long a low-cost sensor can operate before needing to be replaced.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Organic Materials for OLEDs and Solar Cells

Student Author(s): Kevin Boyle and Margaret Kocherga

Faculty Advisor: Dr. Michael Walter

Department: Chemistry

Organic electronic devices have become very important in our lives over the past decade. As smart phone technology and the need for solar energy has grown, the material demands have changed too. For example, organic light emitting diodes (OLEDs) are a popular choice in electronic displays due to their light weight and higher quality images. However, modern devices are composed of rare earth elements that are less abundant, more expensive, toxic and non-recyclable. Thus, safer, longer lasting, and more efficient materials need to be developed to create better devices. New organic, all Earth-abundant based materials are being investigated as a low cost, high efficiency, alternatives to current materials in OLEDs and solar cells. In this work, OLEDs and solar cells have been fabricated with a library of organic materials, using vacuum deposition and solution processing, making it compatible with commercially used manufacturing processes.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Electrochromic Slime:

Thiazolothiazole Derivatives in Polyvinyl Alcohol and Borax Polymer

Student Author(s): Andrew Brotherton, Tyler Adams, Jordana Molai, and Natasha Parmar **S**

Faculty Advisor and Co-Author: Dr. Michael Walter

Department: Chemistry

The aim of the research is to create an organic, easily and cheaply manufactured system that is both electrochromic and photochromic. Electrochromics are currently used for rearview mirrors, sunglasses, and window applications. Thiazolothiazoles have been previously studied for solar energy conversion and redox flow batteries, showing promising results, however, their electrochromic properties have not been extensively researched. The thiazolothiazole derivatives have two reductions that make it more tuneable for multiple applications. The reductions, gaining of electrons, can be facilitated using a redox reaction and selecting a redox complementary component, ferrocyanide or dimethanol ferrocene. The TTz derivatives are being tested in a polymer slime using polyvinyl alcohol and borax. This slime is beneficial because it's cheap value and water based, making it safer and easy to manipulate for applications. This study is testing for low activation voltage, fast reversibility, and color intensity as well as long term cyclability.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Explore the New Roles of Catalysts in the Growth of

Si-based Two-dimensional Nanostructures

Student Author(s): Samuel Bultman **H**

Faculty Advisor: Dr. Haitao Zhang

Department: Mechanical Engineering and Engineering Science

The discovery of two-dimensional (2D) nanomaterials has attracted extensive research attention recently, following the great success of 2D few-layer (2DFL) structures of graphene. Compared to their bulk counterparts, the 2D nanomaterials have exceptional properties of tailorable band structure by thickness control, as well as strong light absorption, large in-plane carrier mobility, and short carrier transport distance. One of these materials, 2D silicon telluride (Si_2Te_3), holds great promise due to its unique compatibility with current semiconductor processing technology. While recent research efforts have focused on new 2D materials ranging from graphene to layered chalcogenides, growth methods of Si_2Te_3 have not been thoroughly explored. Conventionally, the vapor-liquid-solid (VLS) process is the most popular method to grow one-dimensional (1D) nanostructures. However, preliminary results from this study have shown the growth of both 1D Si nanowires and 2D Si_2Te_3 nanoplates by using different metal catalysts. In this research project, the effects of different metal catalysts (e.g., Cu and Au) on the control of composition and morphology of Si-based nanostructures will be explored using the chemical vapor deposition (CVD) method. This work will reveal the new roles of the catalysts and the growth mechanism during the formation of Si_2Te_3 2D nanostructures through controlled experiments, as well as structure characterization using scanning electron microscopy (SEM) and energy-dispersive x-ray spectroscopy (EDS).

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Science, Technology, and Engineering

Title: Metal Complexes of a New Saturated Diazepine Thione Ligand

Student Author(s): Thomas Cole and Johnathan D. Moore **NC, U**

Faculty Advisor: Dr. Daniel Rabinovich

Department: Chemistry

This presentation describes the synthesis of the first silver(I) complexes supported by bis(mercaptoimidazolyl)xylene and bis(selenoimidazolyl)xylene ligands that we have previously used to prepare compounds of other main group and transition metals. Although we set out to prepare mononuclear complexes $[AgL_2]X$ ($X = NO_3, BF_4, ClO_4$), where L is one of the aforementioned ligands o-BmxMe or o-BsexMe, results obtained so far suggest the unexpected formation of dinuclear complexes with a 2:3 metal-to-ligand stoichiometry, $[Ag_2L_3]X_2$. This presentation will outline the two-step synthesis of the ligands, describe the preparation and characterization of their corresponding silver complexes, and summarize future directions of research, including biological studies of their potential anticancer properties.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: MUC1 Confers Sensitivity to STAT-3 Inhibitor Napabucasin in

Pancreatic Ductal Adenocarcinoma Cells

Student Author(s): Taylor Colleton, Mukulika Bose, and Aabha Vora **NC, U**

Faculty Advisor: Dr. Pinku Mukherjee

Department: Biological Sciences

Introduction: Pancreatic cancer (PC) is the 3rd leading cause of cancer-related deaths in US. 95% of PCs are Pancreatic-Ductal-Adenocarcinomas (PDACs). Napabucasin is a drug targeting the signal transducer and activator of transcription 3 (STAT-3) pathway in cancer stem cells. Napabucasin in combination with nab-paclitaxel and gemcitabine, was under phase III clinical trials for PC. The trials were stopped recently due to futility. Therefore, it is important to find subpopulations of tumor that are likely to respond better to Napabucasin treatment. Mucin1 or MUC1 is a transmembrane glycoprotein found in most epithelial cells, and is overexpressed and aberrantly glycosylated in >80% of PDACs. MUC1 is critical for oncogenic signaling. Phosphorylated STAT-3 regulates MUC1-expression. Thus, we hypothesize that 1) STAT-3-MUC1 survival pathway is constitutively activated in MUC1-high PDAC cells and 2) Napabucasin will be more effective in MUC1-high compared to MUC1-low PDACs. Methods: Human PDAC cell lines with varying levels of MUC1 were treated with increasing doses of Napabucasin (0.05 uM, to 25.6uM) for 72 hours. MTT assays were performed to determine survival. Results: High-MUC1 cells, CFPAC, Capan 1, KCM showed increased susceptibility to Napabucasin at lower doses compared to low-MUC1 cells namely Capan 2, KCKO, HS766T. The Inhibitory Concentration or IC50 of Napabucasin was significantly lower for KCM (3.250 uM) compared to KCKO cells (10.82 uM). Conclusion: MUC1 induces susceptibility to Napabucasin in PDACs. It could be incorporated in future clinical trials as a specific biomarker to help identify patient subpopulations that are likely to benefit from combination therapies with Napabucasin.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Genetic Variation in Heat Shock Proteins as an Adaptation to Climate Change

Student Author(s): Sarah Estvander

Faculty Advisor: Dr. Adam Reitzel

Department: Biological Sciences

Heat shock proteins (HSPs) are a class of highly conserved chaperone molecules that are expressed in response to environmental variation, such as climate change. HSPs perform important protective functions for cells, such as stabilizing, re-folding, and maintaining the activity of damaged proteins. *Nematostella vectensis* (Nv) is a marine invertebrate that has been used to study the diversity and expression of HSPs, as this species is exposed to a wide range of stressors in its natural habitat. Previous studies have found that three HSP70s in *Nematostella* (NvHsp70A, B, and D) had unique molecular functions as a co-chaperone for different proteins. The chaperone specificity for HSP70 is determined by the C-terminal region of the protein, and previous research shows that NvHsp70s are especially divergent from each other in this area. Here, my study expands upon previous research by examining sequence variance in the C-terminal domain of NvHsp70A, B, and D across six populations *Nematostella vectensis* living along the Atlantic coast from Florida to Nova Scotia. I amplified ~500 base pairs of each gene using polymerase chain reaction (PCR) and then sequenced each piece. Through comparisons of DNA sequence variation, my results will reveal how individuals from different populations may have unique HSP70 functions, which may be a mechanism for adapting to the large differences in environmental temperature influenced by climate change across their geographic range.

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Science, Technology, and Engineering

Title: Resistance of Oysters to Oxidative Stress

Student Author(s): Karina Gurdyumov, Robert Atwell, and Denise Furr

Faculty Advisor: Dr. Adam Reitzel

Department: Biological Sciences

Oxidative stress has been linked to many human diseases and metabolic processes that affect human health. Research studying oxidation tolerant organisms has great potential to expand our knowledge on the mechanisms to prevent cell and tissue damage. Fortunately, the Eastern Oyster is a great model organism with extreme stress tolerant metabolisms that can provide valuable insight. Their ability to survive habitats that range greatly in salinity, temperatures and amount of air exposure they receive, yet retain a healthy metabolism that would otherwise be wrecked by oxidative compounds makes them a great model organism. The intertidal oysters battle harsh temperatures and air exposure while the subtidal have their own stressors. This study is the first of its kind that studies the oxidative stress of oysters in different tidal zones and from difference sites. Biochemical assays were performed to determine oxidation stress by calculating the amount of carbonyls, HNE and MDA concentrations and DNA damage. We found no significant difference in damage between the tidal zones, but did find difference in damage caused by salinity levels. Further research into the physiology of the mollusks can provide alternative metabolisms that can be applied to human health and aid in native oyster bed restoration.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Optimizing the Stability of Silver Nanoclusters with RNA Nanorings

Student Author(s): Caroline Hill and Lewis Rolband **NC, U**

Faculty Advisor(s): Dr. Joanna Krueger and Dr. Kirill Afonin

Department: Chemistry

Fluorophores are chemical groups that emit light when excited and can be attached to other molecules for detection purposes. Silver nanoclusters (AgNCs) are a type of fluorophores that are commonly used with nucleic acids such as RNA nanorings. One challenge facing AgNCs has been a lack of photostability, where they initially emit red fluorescence, but undergo unfavorable oxidation causing them to emit green fluorescence instead. To address this problem, this project utilized AgNC templating region consisting of 12 cytosines (dC12) positioned at the 3' and 5' position of the templating DNA strand attached to an RNA nanoring and compared their photostability to oxidation. Putting the dC12 in the 5' position created a ring with outward facing AgNC which was more prone to oxidation, shown by a green shift in fluorescence. However, placing the dC12 in the 3' position resulted in an inward facing ring which protected the AgNC and stabilized the red emittance. The next step of this project is to create a ring that has the silver both facing out and in, for a total of 12 AgNCs, and to compare its stability to the ring with silver just on the inside. Tuning the AgNCs to have optimized red emittance can improve its utilization in healthcare and research for nucleic acid and protein detection as well as in diagnostic applications, by ensuring a stable fluorescence signal in complex, biologically relevant solutions. Follow-up experiments on this system include more advanced structural characterization with transmission electron microscopy and small-angle x-ray scattering.

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Science, Technology, and Engineering

Title: Identifying Collateral Sensitivity Networks and Associated
Genetic Markers in Burkholderia Species

Student Author(s): Enosh Ishman **CE, NC, U**

Faculty Advisor: Dr. Todd Steck

Department: Biological Sciences

Antibiotic collateral sensitivity, seen when a drug-resistant organism becomes sensitive to an alternate drug, might be used to develop therapies to treat chronic bacterial lung infections in cystic fibrosis patients. Our purpose is to characterize how common this phenomenon is and to identify genes or specific mutations involved in collateral sensitivity (CS) in the study organism *Burkholderia multivorans*. Methods involve each strain being swabbed onto growth agar to create a lawn of bacteria, then adding antibiotic disks to the center of the Petri plate. After incubation to promote bacterial growth, the killing area caused by antibiotic diffusing from the disk is measured. This zone reflects the resistance category of the plated bacteria. Resistant bacteria are then tested for collateral sensitivity. If tested positive, an Etest, a strip of paper containing a known gradient of antibiotic concentration, will be used to quantitate the degree of change in antibiotic resistance. The Etest strip is placed on a plate seeded with bacteria, which then grows up to the place on the strip corresponding to the killing of antibiotic concentration. This process of selecting for resistant mutants, and identifying those that exhibit CS, will continue for multiple generations. The ultimate goal is to identify mutations involved in CS, and confirm involvement of those genes by introducing that mutation into a wild type strain using gene editing techniques.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Sustainable Water Purification Systems

Student Author(s): Anna Jones and Abhispa Sahu **NC, S, U**

Faculty Advisor: Dr. Jordan Poler

Department: Chemistry

Water purification is a pertinent process in which toxic molecules and chemicals are removed from water. This process is enhanced by making it as green and sustainable a process as possible. Hence, an all-aqueous and regenerable process of water purification has been developed that uses a filter that has been functionalized with single-walled carbon nanotubes (SWCNTs) via vacuum filtration. Following the adsorption of the carbon nanotubes, a NanoResin film is generated. The functionality of the film can be tested using the analyte, sodium fluorescein (NaFL), which is a weakly basic, fluorescent molecule that absorbs visible light. The efficacy of the film can be analyzed by examining a breakthrough curve, which is a curve that measures adsorption as a function of effluent volume. The results of these breakthrough curves and their analyses using the Thomas model were examined, and it was found that the film efficaciously purified the analyte and was regenerable. Furthermore, the results were compared to regenerated films, and synthesis and purification data of novel nanomaterials for water purification were analyzed. Therefore, the objective of this research has been to assess the longevity, regeneration, and reuse of the NanoResin film through the analysis of sodium fluorescein breakthrough curves.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Thione Compounds of Silver with Potential Anticancer Activity

Student Author(s): Maria Kalogeromitros and Joanne Azar

Faculty Advisor: Dr. Daniel Rabinovich

Department: Chemistry

Silver compounds have been used for decades in the prevention and treatment of bacterial infections. For example, silver nitrate is routinely used to prevent eye infections in newborn babies and the management of skin wounds and burns. More recently, the potential application of silver compounds in cancer therapies is receiving increased attention. We describe in this poster presentation the synthesis of a series of new silver(I) complexes of general formula $[Ag(SDiazDippS)_2]X$ ($X = NO_3, BF_4, ClO_4$), where SDiazDippS is a sterically-demanding N-heterocyclic thione (NHT) ligand bearing 2,6-diisopropylphenyl (Dipp) substituents. The complete characterization of the three target silver(I) compounds, including the use of nuclear magnetic resonance (NMR) spectroscopy and elemental analysis to assess the purity of the isolated products, will be discussed in this presentation. Future work will be centered on testing the biological activity of these complexes, particularly against different cancer cell lines.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Synthesis and Reactivity of a New Bulky Thione Ligand

Student Author(s): Naya Kayali and Sophia Gucciardi

Faculty Advisor: Dr. Daniel Rabinovich

Department: Chemistry

Compounds of silver and other transition metals are frequently studied for the many benefits they can offer to human health, including the treatment of various diseases. This presentation describes the synthesis and our initial survey of the coordination chemistry of a new N-heterocyclic thione (NHT) ligand with bulky 2,6-dimethylphenyl (Xy) substituents on the nitrogen atoms, which we abbreviate SDiazXyS. Our reactivity studies have led so far to the isolation of an iodine derivative (SDiazXyS)I₂ and the silver nitrate complex [Ag(SDiazXyS)₂]NO₃, both of which have been fully characterized by a variety of analytical and spectroscopic techniques. Interestingly, our attempts to prepare simple mercury(II) complexes (SDiazXyS)HgX₂ (X = Cl, Br, I), resulted instead in the unexpected formation of species with a 3:2 metal-to-ligand stoichiometry, namely [Hg(SDiazXyS)₂](Hg₂X₆), as confirmed by X-ray crystallography. This presentation will describe the preparation of these compounds as well as their characterization using nuclear magnetic resonance (NMR) spectroscopy and elemental analysis, among other techniques. Furthermore, comparisons with their selenium analogues, containing the SDiazXySe ligand, will be made.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Evaluating the Role of ENSO Variability in North American Regional Weather

Student Author(s): Gabrielle Keaton and Eric Webb

Faculty Advisor: Dr. Brian Magi

Department: Geography and Earth Sciences

The El Niño-Southern Oscillation (ENSO) is a key component of tropical meteorology, climate sciences and climate dynamics. It forces large scale weather patterns that play an important role in weather for the United States. Many studies have explored the correlation between ENSO and weather patterns. This research uses new data to examine how monthly surface temperature and precipitation anomalies vary with ENSO in Western North America (WNA) and Eastern North America (ENA). We are using surface temperature and precipitation data from the NOAA Reanalysis Version 3 (NOAA V3), which is available from 1836 to 2015, and a new, and as yet unpublished, ENSO index called the “Extended Multivariate ENSO Index version 2” (MEI.ext V2), which is available from 1865 to 2019. The NOAA V3 times series shows a similar correlation between WNA and ENA temperatures, whilst the time series for WNA and ENA temperature have a different relationship. The difference between the time series will help us better analyze how they compare to one another and to the MEI.ext V2 values. Through the MEI.ext V2 dataset, a story can be told on whether an El Nino or La Nina is happening within that given year. Since 1865, 71% of the El Nino months show a warm anomaly (MEI.extV2 >1) and 79% of the La Nina months had a cold anomaly (MEI.extV2 <1). Through this analysis, I intend to study not only the annual weather patterns, but the seasonal anomalies in WNA and ENA in terms of temperature and precipitation and how they are related to seasonal MEI.ext V2 values. .

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: The Synthesis and Applications of Didecloxyphenyl Thiazolothiazol

Student Author(s): Carly Kwiatkowski **NC, S, U**

Faculty Advisor: Dr. Michael Walter

Department: Chemistry

All high-end smart phones and TVs utilize OLED (organic light emitting diode) technology in order to create crisp and bright visual quality. The use of OLEDs relies on the harvesting of iridium, the rarest naturally occurring element on Earth. The creation of the color blue has proven to be the most difficult, as the blue OLED has a short lifetime, the bonds between the blue molecules tend to break down, and blue molecules require more electricity than green and red molecules to energize them. Additionally, the mining of iridium is extremely cost heavy and takes a serious environmental and energy toll. In Walter research group, we have created a specific type of molecule under the branch of molecules known as thiazolothiazoles (TTz). Our molecule, Didecloxyphenyl TTz shines bright blue as a solid under UV light. It is made out of easily accessible elements such as carbon, nitrogen, oxygen, and sulfur. It is nontoxic and environmentally friendly. Didecloxyphenyl TTz can be easily synthesized using cheap starting materials. Additionally, it is thermally stable. This molecule has the potential to be a state-of-the-art emitter and we expect it to make high efficiency OLEDs. We hope to expand upon the knowledge we have gained with the creation of this molecule to understand more about thiazolothiazoles in general and their applications in technology and in energy.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Triglycol Cyanoesters as Precursors for [3]radialene Aqueous Catholytes

Student Author(s): Wai Lam and Nicholas A. Turner **NC, S, U**

Faculty Advisor: Dr. Christopher Bejger

Department: Chemistry

The need for efficient grid-scale energy storage is critical as the demand for renewables steadily increases. Redox flow batteries (RFBs) have emerged as capable electrochemical energy storage devices to mediate the void between power generation and consumption. Traditional RFBs rely on expensive vanadium-based materials and corrosive electrolytes. Aqueous organic RFBs are becoming more economically feasible and systems that operate at neutral pH are particularly desirable from a cost and safety perspective. However, few organic compounds can function as efficient redox couples in neutral pH aqueous solutions. Our group has been investigating radialene compounds for use as organic catholytes in aqueous RFBs. Polyethylene glycol (PEG)-like cyanoacetates can be prepared under Fischer esterification conditions on a large scale. These can be converted to the desired C₆(CN)₅-hydroxyethyl ester catholytes through treatment with base and Fukunaga's zwitterion. A water miscible anthraquinone with PEG-based solubilizing groups was recently introduced as an anolyte for aqueous RFBs – exhibiting the highest volumetric capacity among aqueous organic anolytes. In fact, we have recently synthesized a glycol-modified [3]radialene and found it to be almost 10x more soluble than the methyl ester congener previously described. This poster will describe the progress towards a series of asymmetry PEG-modified radialene derivatives. All new compounds will be characterized using mass spectrometry, NMR spectroscopy, X-ray crystallography, and cyclic voltammetry.

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Science, Technology, and Engineering

Title: Assessing the Effect of Tau Aggregation on Viral Replication in a Primary
Neuron Culture Model of West Nile Virus

Student Author(s): Sarah Lotz

Faculty Advisor: Dr. Kristen Funk

Department: Biological Sciences

Alzheimer's disease (AD)—an irreversible and progressive neurodegenerative disorder—prevails as the sixth-leading cause of death in the United States. The exact causes of this disease are not fully understood, however, the aggregation of two proteins— β -amyloid and Tau—pathologically define the disease. Within the brains of people with AD, Tau protein self-aggregates intracellularly into a pathology called neurofibrillary tangles, while β -amyloid aggregates extracellularly to form senile plaques. It is hypothesized that the formation of neurofibrillary tangles ultimately results in the death of neurons and in turn, causes AD. Though age is the greatest risk factor for AD, recent studies have suggested infections may heighten inflammation, increasing risk for the disease. Previous research shows that β -amyloid can protect against microbial infections by inhibiting viral replication. In this study, we will use murine models with a mutated Tau protein in order to determine whether Tau aggregation may similarly inhibit viral replication. First, we will culture primary neurons from prenatal mouse pups that express wild type Tau, a mutant pro-aggregate form of Tau, or are Tau-deficient. We will then infect neurons in vitro with various strains of West Nile virus and measure viral replication using a plaque assay. We predict lower levels of virus will be present in neurons expressing mutant Tau and higher levels of virus in neurons lacking Tau protein. This study will determine if the levels of Tau aggregation affect viral replication and whether viral infection could incite the deposition of AD-related pathology.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Variations in Mechanical Weathering Between Rock Types in Beacon Valley, Antarctica

Student Author(s): Jordan Lontai, Mai Vang, and Alexander Barnum **G**

Faculty Advisor: Dr. Martha Eppes

Department: Geography and Earth Sciences

Mechanical weathering is the process responsible for the breakdown of rocks on Earth and is important because it plays a key role in the rock cycle. There are many factors that can influence mechanical weathering but understanding the rate at which subcritical fracture growth occurs based on rock type, exposure condition, and duration is understudied (e.g. Eppes and Keanini, 2017). This study investigates microfracture variations on different rock types on the same area of Mullins Glacier in Beacon Valley. We hypothesize that crack density and length will increase with increasing grain size in the rocks. We will analyze rock fractures visible in photomicrographs of thin sections of samples of four different rock types collected from different locations on the glacier. The data from this experiment will provide one of the first detailed examinations of microfractures created by thermal stress weathering. It is hoped that this study will assist in determining how variations in rock type affect rates of weathering.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Evaluating the Biodiversity of Macroinvertebrates in Newly-Restored Marshes

Student Author(s): Rebecca Lucero, Sherry Dijkstra, and Jack Morin **CE, S**

Faculty Advisor: Dr. Paola López-Duarte

Department: Biological Sciences

Rising sea levels contribute to salt marsh loss and erosion. This is an essential habitat for many estuarine species, including fish and invertebrates. Within the US, this loss is most dramatic in southern Louisiana. The area equivalent to 16 football fields was lost every day in 2017, but this rate has declined due to ongoing mitigation efforts. Preventative efforts to slow marsh loss include the construction of tidal marshes and the use of river diversions to rebuild wetlands by reconnecting major, leveed rivers to adjacent estuaries. One way to assess the effectiveness of these restoration efforts is to compare the biodiversity of the macroinvertebrate community (animals <5 cm) to that of natural marshes. In this study, we evaluate the biodiversity of restored marshes in the Lake Hermitage Marsh Creation Project (LHMCP) in Louisiana. Our sites include two restored marshes and one natural (control) marsh that differ in elevation, but are similar in vegetation (dominated by the cordgrass, *Spartina alterniflora*). To collect benthic macroinvertebrates at these sites, we deployed meshed bags made of nylon and filled with dried cordgrass for 2 months (May-July). In the first year (2018) of a three year project, these bags were deployed at each site at distances of 1, 10, 25, 50, and 100 meters from the marsh edge. The contents of the bags were sorted and identified to the lowest possible taxon. We hypothesize that biodiversity and species abundance in restored marshes will be less because they are more recently established habitats.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: The Great Gate Keeper:

Annotating the Phage Genome “Portcullis”

Student Author(s): Jonathan Martin **CE, G**

Faculty Advisor: Dr. Ellen Wisner

Department: Biological Sciences

Works of art like the cinematic masterpiece *Jaws* (1975), Anne Lemanski’s sculpture *Impala* (2015) and paintings created by animals in zoos and aquariums worldwide serve as tools that aid in the furtherance of public education about wildlife conservation. While *Jaws* initially struck a chord of fear in the hearts of moviegoers across America, it sparked the flame of a shark conservation movement that has yet to be extinguished. Lemanski’s *Impala* brings her audience up-close to a common African bovid that few will encounter in the wild while spreading a message of conservation about this creature and others. In similar ways, zoos and aquariums use paintings created by resident animals as educational talking-points and fundraising items. Considering these examples in more detail, it is evident the efficacy with which art, in its many forms, serves as an effective worldwide wildlife conservation tool.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Trends of Building Integrated Wind Turbines

Student Author(s): Abby McConnell **H, S, U**

Faculty Advisor: Dr. Navid Goudarzi

Department: Engineering Technology and Construction Management

Building-integrated wind turbines (BIWTs) are becoming more popular as the renewable energy sector continues to grow, urban energy demands increase, and climate change continues to be a concern. Currently, there is a need to understand the trends of BIWTs, particularly in an urban setting. The aim of this research is to better understand the utilization of BIWTs in urban environments. A literature review on BIWTs that addressed past (1300BC-1900), present (1901-2010), and ongoing efforts was conducted to identify the key design parameters and their acceptable operational ranges. Performance metrics for three main categories of wind energy harnessing technologies including vertical axis turbines (VAWTs), horizontal axis turbines (HAWTs), and unconventional turbines (particularly ducted turbines), were compared against each other, specifically in their application to building integration. Findings showed that, based on the key identified design parameters, VAWTs are better suited for building integration. The results also highlighted the rapid improvement of BIWT designs in recent years and identified future design opportunities to fill research gaps in the integration of renewable energy resources within the built environment. These findings are particularly useful in determining the type of wind turbine to use for various building designs and requirements. The next step in this research is to obtain a conceptual design of an optimal building-integrated VAWT.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Understanding Singlet Exciton Diffusion using Zinc Porphyrin

Derivatives for Organic Solar Cells

Student Author(s): Camilla Middleton **NC, S, U**

Faculty Advisor: Dr. Michael Walter

Department: Chemistry

The organic photovoltaic (OPV) is an organic solar cell that uses semiconducting properties of organic materials. In prospect to produce an efficient inexpensive solar cell. Porphyrins which are heterocyclic macrocycle compounds can be used to mimic the light-induced energy transport system. We are synthesizing and examining four zinc porphyrin derivatives for their absorption, molecular orientation, emission, and photoluminescent lifetimes to understand their singlet exciton diffusion properties in thin films.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Electrochemical Characterization of Water-Soluble Fluorescent

Dyes used in Electrochromic Devices

Student Author(s): Jordana Molai, Andrew Brotherton, Natasha Parmar,

and Tyler Adams **NC, U**

Faculty Advisor: Dr. Michael Walter

Department: Chemistry

Electrochromic devices are growing in popularity and demand as these devices possess properties that allow for reversible color change once electrochemical oxidation or reduction is induced. Electrochromic devices are able to filter out light and can be applied in a variety of ways; this can range from transition lenses in eyewear, rearview mirrors, and windows. The light modulating properties of electrochromic devices also provide a solution to indoor climate control costs. This study aims to create organic, inexpensive, and easily processable electrochromic devices using an aqueous gel-based system. The electron donors and acceptors used were varied to measure properties of reversibility, cyclability, and intensity of color change to create the most efficient device. In the past, Thiazolothiazole (TTz) compounds have been researched, showing promising properties for solar energy conversion, redox flow batteries, and electrochromic devices. A variety of TTz viologen derivatives will serve as the electron acceptor. These TTz derivatives have shown two observable color changes when voltage is applied; as the color transitions from colorless to purple to blue, two reductions are observed. This 2-reduction system improves tunability and control. Despite the efficiency of electrochromic devices, they require an aqueous electrolyte between the electrodes, therefore, a PVA/Borax slime mixture was applied to the electrochromic device to serve as a more consistent electrolyte while holding its shape better, which offers the benefit of easy application and optimal conductivity within the device. The TTz and PVA/Borax system shows promising results for cyclability, reversibility, and light absorbance within electrochromic devices.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Water Soluble Cobalt Sulfide Cubanes Stabilized with N-Heterocyclic Carbene Ligands

Student Author(s): Connor Moore

Faculty Advisor: Dr. Christopher Bejger

Department: Chemistry

Transition metal chalcogenides (TMCs) are ubiquitous in nature and exist in many phases and stoichiometries. Naturally occurring minerals, such as covelite (Co_3S_4), molybdenite (MoS_2), melonite (NiTe_2) and numerous additional examples are found all over the world. Biologically, proteins containing iron-sulfide clusters, such as FeMoco, play a significant role in the redox mediated metabolic pathways of many organisms. In this study, we propose a new class of synthetic porous frameworks comprised of metal chalcogenide molecular clusters. These cluster building blocks are effectively small, soluble, metal-chalcogenide particles with comparable composition and structure to naturally occurring TMCs. We plan to use functionalized N-heterocyclic carbene (NHC) ligands to coordinate these metal-chalcogenide particles and crosslink them to form a new class of metal organic frameworks (MOFs). This poster will detail our progress toward the synthesis of cubane-like Co_4S_4 clusters stabilized with benzoate-functionalized NHC ligands. All new monomeric compounds will be characterized using mass spectrometry, NMR spectroscopy, X-ray crystallography, and cyclic voltammetry (CV). The resulting framework solids will be studied using gas adsorption and BET analysis. Modified glass carbon electrodes will be fabricated to investigate the electrochemical behavior of polymeric materials in the solid state. The frameworks are expected to be electron rich in the neutral state and undergo successive oxidations. Thus, they have potential to serve as high surface area supercapacitors.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Homoleptic Silver(I) Complexes with Selone Ligands

Student Author(s): Muhammad Nasir and Keri Dowling

Faculty Advisor: Dr. Dan Rabinovich

Department: Chemistry

This poster describes the synthesis and characterization of silver(I) complexes containing new N-heterocyclic selone ligands based on fully saturated 1,3-diazepine rings (SDiaz) and bulky aryl substituents (Ar) on the nitrogen atoms. More specifically, the first examples of cationic homoleptic complexes of general formula $[Ag(SDiazArSe)_2]X$ ($X = NO_3, BF_4, ClO_4$), where Ar is 2,6-dimethylphenyl (Xy), 2,4,6-trimethylphenyl (Mes), or 2,6-diisopropylphenyl (Dipp), have been isolated. These complexes have been characterized by a combination of analytical and spectroscopic techniques, and will be compared with their analogues containing five- and six-membered ring systems, and also their sulfur (thione) counterparts.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Synthesis of Hexacoordinate Si(bzimpy)₂ Complex Analogs for Application within
Organic Electronic Devices

Student Author(s): Katherine Norman and Margaret Kocherga **H, S**

Faculty Advisor: Dr. Thomas Schmedake

Department: Chemistry

Hexacoordinate silicon complexes have been shown to represent a promising new class of material for organic electronic devices, such as organic light emitting diodes and solar cells. With excellent electron transport properties and electroluminescence properties, these complexes are also determined to be more efficient and renewable than those previously used. The goals of this research project were (1) to create synthetic variants of a class of hexacoordinate silicon complex based off of the initial Si(bzimpy)₂ and test the optical and electronic properties of the different materials, (2) to determine the effect of substituent modification on these properties, and (3) to compare computer modeling properties to that of those synthesized experimentally. A series of complexes were developed containing two modified 2,6-bis(benzimidazol-2'-yl)pyridine ligands (bzimpy), each attached to a neutral silicon molecule in the center. The complexes synthesized for this research were Si(bzimpy)₂, Si(MeObzimpy)₂, Si(Me₄bzimpy)₂, and Si(MeOMe₄bzimpy)₂. The electron mobility of the complexes were measured to determine how the synthetic variations might impact organic devices. Optoelectronic properties such as ultraviolet-visible spectrum and fluorescence spectroscopy were also analyzed to determine the emission and excitation of the four analog complexes. Additionally, thermally deposited films were also studied to determine solid-state properties of each material. Prototype devices containing the hexacoordinate silicon complexes are currently being developed.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: In Vitro Polymerization of the Enterobacterial Common Antigen

Student Author(s): Cassidy Oliverio

Faculty Advisor: Dr. Jerry Troutman

Department: Chemistry

The enterobacterial common antigen (ECA) is a complex sugar that is found on the outer membrane of bacteria in the Enterobacteriaceae family which is speculated to contribute to bacterial virulence. The ECA is assembled on a bactoprenyl phosphate (BP) anchor in the inner membrane, and consists of the following polymerized trisaccharide unit: [N-acetyl-D-glucosamine (α -D-GlcNAc)]-(4 \rightarrow 1)-[N-acetyl-D-mannosaminurinic acid (β -D-ManNAcA)]-(4 \rightarrow 1)-[4-acetamido-4,6-dideoxy-D-galactose (α -D-Fuc4NAc)]. After assembly of the BP-linked trisaccharide in the inner membrane, a flippase enzyme, WzxE, flips the sugar unit into the periplasm. From there, the enzyme WzyE polymerizes the trisaccharide, and the enzyme WzzE acts as a molecular ruler to determine how long the polysaccharide will be. How these two enzymes interact with one another to determine the length of the polymerized ECA has yet to be characterized. To accomplish this, E. coli cells that are designed to overproduce the enzymes WzyE and WzzE are grown and lysed to extract and purify the proteins via nickel affinity chromatography. Native BP-linked trisaccharide was then obtained from mutant E. coli cells which do not produce WzyE or WzzE. The trisaccharide unit and the enzymes are used together in vitro to form a polymerized ECA, which can be analyzed using a variety of techniques such as LC-MS and HPLC. These data provide the opportunity to study the ECA pathway more in-depth, and can lead to experiments that can answer more questions about the ECA regarding its structure and purpose.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Highly Cyclable and Electrochemically Stable Water Soluble Thiazolothiazole

Derivatives for Electrochromic Applications.

Student Author(s): Natasha Parmar, Jordana Molai, Andrew Brotherton, and Tyler Adams **U**

Faculty Advisor: Dr. Michael Walter

Department: Chemistry

Electrochromic materials have many applications in today's world. It is used in airplane windows, rearview mirrors, and buildings. Glass with electrochromic film is known as smart glass and when voltage is applied, the electrochromic material changes color. Buildings and airplanes that do not prefer blinds or curtains use electrochromic films on windows to block sunlight. It is better than tinted windows that always remain dark and cannot adjust to light. Most electrochromic materials have toxic compounds and are expensive which is why variations of water soluble thiazolothiazole (TTz) compounds are used in a polyvinyl alcohol (PVA)/ Borax slime. Similar TTzs have been used to dye cell membranes and have reported low levels of cytotoxicity. The PVA/Borax slime is water based which also contributes to low levels of toxicity and low cost. The TTzs have promising voltage sensitivity, which is seen through the different color changes from colorless to purple to blue, because of its ability to gain 2 electrons. Color changes are reversible once voltage goes back to zero. The goal is to create and test different TTz compounds in PVA/Borax slimes that give good transmittance, color intensity, cyclability, and durability.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Nanoparticles Modulate the J774 Macrophage Phenotype and
Inflammatory Cytokine Secretions

Student Author(s): Bryn Philotis and Morgan Chandler **NC, U**

Faculty Advisor(s) and Co-Author(s): Dr. Didier Dréau and Dr. Kirill Afonin

Department: Biological Sciences

The potential of nanoparticles (NPs) in drug delivery for multiple debilitating or lethal conditions including cancer is the object of many explorations. In particular, the physical nature and chemical properties of the NPs have been shown to alter biological cell activities. Chiefly, NPs will especially encounter macrophages and whether specific NPs promote inflammatory cytokine secretions or alter macrophage phenotype is unclear. Here, we investigated the effects of increasing concentrations of two nanoparticles (NP1 and NP2) on the secretions of the pro-inflammatory cytokines IL1 β and IL18 by the J774 monocyte/macrophages in vitro. In addition, changes in the phenotype of macrophages post-treatment were evaluated.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Synthesis of Silver Nanorods without the Use of Surfactants

Student Author(s): Bhavana Reddy, Logan Hamm, and Allison Stadick

Faculty Advisor: Dr. Pali de Silva Indrasekara

Department: Chemistry

Silver nanorods have been demonstrated as well-suited materials for biosensing in humans and photothermal treatment and irradiation of various pathogenic bacteria. However, for the synthesis of silver nanorods it requires the use of surfactants mostly cetyltrimethylammonium bromide (CTAB), which is known to have cytotoxic effects. An excessive amount of concentrations of surfactants has shown to cause internal damage to organs as well as many other side effects. The purpose of this project is to determine whether or not silver nanorods can be synthesized without using toxic surfactants. This study includes the use of sodium bromide as a growth director rather than using CTAB, as well as different concentrations of tannic acid, reducing agent, to be able to produce viable nanorods. The formation of silver nanoparticles and their optical properties are evaluated by using transmission of electron microscopy and absorption spectroscopy.

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S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Synthesis, Characterization, and Electrochromic Properties of Highly Fluorescent

N,N'-Dibenzylated Thiazolothiazole Viologens for use in Electrochromic Applications

Student Author(s): Kristin Sandor, Alexis Woodward,

Joshua Chabeda, and Tyler Adams **NC, S, U**

Faculty Advisor: Dr. Michael Walter

Department: Chemistry

The synthesis, electrochromic, and photochemical characterization of a group of highly fluorescent, N,N'-dibenzylated dipyridinium thiazolo[5,4-d]thiazole derivatives are reported. Benzylolation was completed through the heating of the parent dipyridial TTz compound in the appropriate substituted benzyl bromide. Counter ion exchange with ammonium hexafluorophosphate provided the pertinent derivative for electrochemical analyses. Electrochemical measurements display two closely spaced, reductions at potentials sensitive to the benzyl group substituent. Significant electrochemical variations were seen with proximity of the fluorinated benzyl groups to the TTz core. During two-electron reductions, solutions of the TTz derivatives exhibited strong and reversible electrochromism developing from clear to dark blue. The dibenzylated derivatives display intense fluorescence and exhibit quantum yields as high as $\Phi = 0.96$. The unique electrochromic and optical properties displayed by these compounds make them favorable candidates for a wide range of electrochemical and photochemical applications. Including use in a slime-type electrochromic device. These devices utilize an electrochromic mixture, based on PVA- borax slime, with the dibenzylated TTz viologens to allow for easy to make devices. Assembly of the electrochromic device included the dibenzylated TTz viologen slime mixture sandwiched between two pieces of FTO glass. A color change from light yellow to dark purple was witnessed when a voltage was applied.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Metal Complexes of a New Saturated Diazepine Thione Ligand

Student Author(s): Marjan Shahani and Wendy Vo

Faculty Advisor: Dr. Daniel Rabinovich

Department: Chemistry

Diazepines are seven-membered heterocyclic compounds with two nitrogen and five carbon atoms. In particular, saturated 1,3-diazepines that incorporate large substituents on both nitrogen atoms and feature an exocyclic carbon-sulfur double bond, can be used to prepare versatile ligands for coordination chemistry studies. In this regard, this project involves the synthesis and reactivity of a thione ligand with 2,4,6-trimethylphenyl (mesityl) substituents, which we abbreviate SDiazMesS. Reactivity of this sulfur-donor ligand towards closed-shell metal ions has led to the isolation of several new coordination complexes, including the mercury(II) compounds (SDiazMesS)HgX₂ (X = Cl, Br, I) and the silver(I) derivative [Ag(SDiazXyS)₂]NO₃. The characterization of these species relies on the use of elemental analysis to verify their purity and other techniques like nuclear magnetic resonance (NMR) spectroscopy to fully establish their identity. In addition, the similarities and differences of these compounds with the corresponding analogues obtained from the N-heterocyclic selone ligand SDiazMesSe will be outlined in this presentation.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Understanding Hsp70 Isoform-specific Regulation of the
Ribonucleotide Reductase Complex

Student Author(s): Courtney Shrader and Laura E. Knighton

Faculty Advisor: Dr. Andrew W. Truman

Department: Biological Sciences

Understanding Hsp70 isoform-specific regulation of the ribonucleotide reductase complex. Courtney M. Shrader, Laura E. Knighton, and Andrew W. Truman Department of Biological Sciences, University of North Carolina, Charlotte, NC, USA. Ribonucleotide reductase (RNR) is an important protein required for the synthesis of new DNA. RNR can become mutated and overexpressed in a variety of cancers. Several small RNR inhibitors have been developed and used in the clinic for decades. These include hydroxyurea (HU), gemcitabine and triapine (3-AP). It remains highly desirable to create more potent anti-RNR therapies. Recent work from our lab has uncovered a role for the Hsp70 chaperone system in stabilizing the RNR complex. Humans express two highly related Hsp70s (Hsp70 and Hsc70) and the model organism *Saccharomyces cerevisiae* (yeast) express four Hsp70 versions (Ssa1, 2, 3 and 4). It remains currently unknown why organisms express multiple variants of essentially the same protein. Our working hypothesis is that each Hsp70 variant (“isoform”) binds and regulates a specific set of “client” proteins. To test this hypothesis, we are currently studying the role of each Ssa protein on regulating RNR activity in yeast. Yeast strains expressing one of the four Ssa isoforms as the sole Ssa in the cell were screened for HU resistance. Interestingly, yeast expressing only Ssa2 were highly resistant to HU, whereas Ssa4 expressing cells were sensitized. We are now investigating the molecular cause of this resistance by quantifying RNR subunit levels in these cells and how Hsp70-RNR complex interactions varies depending on Ssa isoform.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Biomechanical Motion Analysis of Posterior-Stabilized TKA Implants

Student Author(s): Maxwell Stott, Chang Shu, Fangjian Chen, and Hannah Stokes **NC, S, U**

Faculty Advisor: Dr. Nigel Zheng

Department: Mechanical Engineering and Engineering Science

The purpose of this project is to conduct a mechanical investigation of two models of total knee implant to analytically determine their respective effects on patient wellness. Note that previous research, including the use of computer simulations, collected data and findings that speak to the performance of available knee implants. However, there is still much the medical community does not know about the ability of different knee implants to replicate healthy motion. Further analysis can help surgeons select the knee implant with the best chances of satisfactory patient outcomes. What makes the current study unique is that the data are collected from real patients pre- and post- TKA. An OSS (motion capture system) was used to collect kinematic data of patients' motion before and after total knee replacement surgery. Other mechanical data were collected from EMGs and force plates before being analyzed on Vicon Nexus Software and MATLAB. At the time of the writing of this abstract, preliminary conclusion are not yet ready for reporting. This research is important because the effectiveness of total knee replacement affects so many patients; according to the American Joint Replacement Registry's 2019 Annual Report, there were at least 828,999 total knee replacements between 2012 and 2018. Furthermore, there is significant room for improvement in patient satisfaction. The same report also found that of those who receive a total knee implant, only 88.5% "achieved a meaningful improvement" according to patient reported outcomes.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Effects of Dimer Interface Mutants on Heat Shock Response

Student Author(s): Jade Takakuwa and Nitika

Faculty Advisor: Dr. Andrew Truman

Department: Biological Sciences

Heat Shock Protein 70 (Hsp70) is an evolutionarily well-conserved molecular chaperone involved in several cellular processes such as folding of proteins, modulating protein-protein interactions and transport of proteins across membranes. While several studies have indicated that Hsp70 molecules can bind together in pairs (dimerization), the majority of these studies have been performed on purified Hsp70 protein in non-biologically relevant conditions. Recent cross-linking mass spectrometry studies from our lab have shown that yeast Hsp70 (Ssa1) forms a homodimer, but the conditions under which the dimer is formed remains unknown. In this study, we introduced mutations that are known to interfere with the dimer interface of Ssa1. We tested various stressors such as UV exposure, caffeine, heat shock and DNA damaging agents such as hydroxyurea and found that the dimer interface mutants exhibited phenotypic effect under high temperature. In order to accurately follow the transcriptional pathway of the heat shock response, we utilized a destabilized reporter system and found that the dimer interface mutant was defective under heat shock. In understanding the conditions that promote Hsp70 dimerization, we hope to decipher the role of Hsp70 in its biological function. Understanding the function of dimerization in heat shock response could reveal important insights into the interaction of Hsp70 with co-chaperones and its effect on other transcriptional factors.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Solution-Processable Si(bzimpy)₂ Derivatives for OLED

Student Author(s): Krista Tang, Nickolas A. Sayresmith,

Margaret Kocherga, and Kevin Boyle

Faculty Advisor(s): Dr. Michael Walter and Dr. Thomas A. Schmedake

Department: Chemistry

Organic light emitting diodes (OLEDs). OLEDs have attracted attention for new development due to lower power consumption, higher flexibility, and wider color reproduction. The light emitting layer can be deposited in two ways: via vacuum evaporation or by solution processing. Today, a majority of OLED displays are produced via vacuum evaporation; however, vacuum evaporation is limited by its costly thermal deposition and high vacuum conditions. In contrast, solution processing is cheap and amenable to large-area applications; however, it suffers from uniformity issues and poor device performance. Therefore, there is a need to develop new light-emitting molecules for OLED applications which are cheap, solution processable, and efficient. In this regard, Si(bzimpy)₂ is being investigated as an inexpensive, thermally stable, organic charge carrier material for OLEDs. Compared to current materials (e.g. Alq₃), Si(bzimpy)₂ provides greater stability, lower molecular weights, more efficient electron injection, faster electron transfer rates, higher electron mobility, and greater redox and optical tunability. Synthetic work is ongoing to alkylate the Si(bzimpy)₂ to improve its solubility and, therefore, its processability. After synthesis, purification, and characterization, we will investigate film forming properties, solubilities, and optoelectronic characteristics. Solution processable Si(bzimpy)₂ derivative will be solution-casted onto prefabricated organic field effect transistors (OFET), and the devices will be used to measure charge mobility. We will also make OLEDs under low temperature processing and at atmospheric pressure.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Detection of Plasmodium Vivax Gametocytes and Their Role in Malaria Transmission.

Student Author(s): Rahmatulla Tawkaliyar and Kareen Pestana **G**

Faculty Advisor: Dr. Eugenia Lo

Department: Biological Sciences

Malaria is one of the leading causes of death and infection in many developing countries, with mortality rates reaching up to millions annually. Plasmodium consists of two different life cycles, which occur in the human hosts and the vector mosquitoes (female Anopheles). Malaria parasites replicate asexually in the human host and, in each replication cycle, a proportion of asexual stages develops into sexual gametocytes. The proportion of infections that carries gametocytes and the gametocyte density are proxies for human-to-mosquito transmission potential. This research examines the potential of *P. vivax* transmission among infected individuals in malaria-endemic areas of Ethiopia. We will estimate the parasitemia in clinical *P. vivax* samples from Jimma and Bonga, Ethiopia, as well as the Duffy blood group of the infected samples. TaqMan and quantitative PCR assays are utilized to screen for the DARC genotype of the infected patient and 18S rRNA of *P. vivax*. Duffy-null individuals were previously thought to be immune to *P. vivax*, but growing evidence indicates that the parasite can infiltrate the red blood cells without DARC expression. There is yet no data on whether infected Duffy-null individuals can produce gametocytes and transmit to the others via Anopheles. We will use qualitative and quantitative qPCR assays to screen for Pvs25 transcript that is highly expressed in female gametocytes of *P. vivax*. We will test the hypothesis that *P. vivax* in Duffy-null individuals produces gametocytes leading to transmission. We will also evaluate the specificity and sensitivity of various RNA transcripts for gametocyte detection.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Synthesis and Characterization of Symmetric Thiazolothiazole Fluorescent Dyes
for Use in Organic Light-Emitting Diodes

Student Author(s): Zachary Taylor, Cynthia Quan, and Kevin Boyle

Faculty Advisor: Dr. Michael Walter

Department: Chemistry

Symmetric diaryl thiazolothiazole (TTz) dyes were synthesized and characterized for their outstanding photochemical properties and fluorescence. TTz dyes are very thermally and oxidatively stable dyes that remain stable at high energy blue emissions. These properties make the TTz dye an especially promising candidate for use in organic light emitting diodes (OLEDs), as well as other photovoltaic devices. The symmetric dyes were synthesized using a double condensation of aryl aldehydes with dithiooxamide, and were characterized in solution using ¹H-NMR spectroscopy, MALDI TOF mass spectrometry, thin-layer liquid chromatography, and cyclic voltammetry. The UV-Vis absorption and fluorescence emission of the TTz dyes were also used to study their quantum yield, molar absorptivity, and fluorescence lifetimes. The dyes were then evaporated onto thin films for further characterization in the solid state and for use in organic light-emitting diodes.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Annotation of Gordonia Phage: Portcullis

Student Author(s): Amit Thota, Martia Thomas, and Faith McCain **CE, H**

Faculty Advisor and Co-Author(s): Dr. Tonya Bates, Dr. Sharon Bullock,

Dr. Ellen Wisner, and Michelle Pass

Department: Biological Sciences

Bacteriophages are viruses that infect bacteria and use bacterial cellular machinery to reproduce and lyse to continue their lifecycle. Bacteriophages can be used in gene therapy to deliver drugs to specific locations in the body or treat patients with infections of resistant bacteria and are starting to be used in cancer therapy to kill cancer cells. Due to the lacking knowledge of the bacteriophages, many students around the country have been annotating bacteriophage genomes with the help of the program SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science). Annotation is identifying and assigning function to different genes in a genome. We are annotating the genome of Portcullis, a Gordonia phage, that was discovered on a pepper plant farm on the campus of Calvin College using the phage isolation protocols and was sequenced at the Pittsburgh Bacteriophage Institute. The sequenced genome was then compared to previous phages using a multitude of bioinformatic tools to establish similarities and/or differences to determine the function of each gene in the genome. With the help of this growing community, more information about bacteriophages can be obtained and more programs can be created to sequence genomes more efficiently and proficiently. At the end of this research study, we expect to have a fully annotated genome, including the removal as well as addition of genes, with all the functions called.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Understanding Chaperone-Mediated Anti-Cancer

Drug Resistance Using Directed Evolution

Student Author(s): Megan Ward and Nitika

Faculty Advisor: Dr. Andrew Truman

Department: Biological Sciences

Ribonucleotide reductase (RNR) is an important protein complex involved in the synthesis of new DNA and is essential for cell growth and response to DNA damage. RNR can become upregulated in cancer, promoting tumorigenesis. The first small-molecule RNR inhibitor, hydroxyurea (HU), was approved in 1967. HU and other agents, including triapine, remain important agents in cancer chemotherapy. Interestingly, while some cancer patients respond to HU treatment, others do not. We have recently identified a role for the Hsp70 molecular chaperone in stabilizing the RNR complex in yeast and human cells. Hsp70 is mutated in cancer and it is possible that these mutations are responsible for the increased activity of RNR seen in cancer cells. We randomly mutagenized Hsp70 and expressed this pool of Hsp70 mutations in yeast. These cells were grown in increasing concentrations of HU, allowing resistant cells to outcompete the original cells. This was repeated several times to identify a fully HU-resistant yeast. We are currently sequencing the mutations in Hsp70 to understand how Hsp70 function has been impacted in relation to RNR. Our hope is that by understanding the evolution of HU-resistance cells in a yeast system will inform future studies in mammalian cancer cells.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Science, Technology, and Engineering

Title: Synthesis and Characterization of Hydrophylic Polyhedral Oligomeric

Silsesquioxane Porphyrin Molecules

Student Author(s): Zaneta Zhin and Paolo Siano **CE, NC, U**

Faculty Advisor: Dr. Juan Vivero-Escoto

Department: Chemistry

Polyhedral oligomeric silsesquioxane (POSS) is an organic-inorganic nanocomposite, widely used in various applications like biomedical and polymeric systems. These nanoclusters exhibit low toxicity, efficient cellular uptake, nanoscale size, and tunable solubility. Depending on the structure and reactivity of the bound moieties groups, POSS can be introduced into practically any existing polymer system. The reason to use different organic functional groups on POSS is to examine and tune their interaction with the biological systems like bacteria and human cells. Photosensitizers (PS) used in photobased therapies are insoluble in aqueous media which leads to aggregation, self-quenching and decreased phototoxicity. In order to combat the drawbacks related to photosensitizers, we have designed a POSS based system to incorporate PS. We have synthesized octaamino propyl POSS and octa-N-methyl propyl ammonium POSS. These POSS compounds were further conjugated with a porphyrin. The synthesized system was thoroughly characterized by structural and chemical properties. These hybrid POSS-Porphyrin materials will be used for photoinactivation of resistant bacteria and photodynamic therapy of cancer cells.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability

U - Charlotte

Social Sciences

Title: Relationship Satisfaction in the Ego- and Ecosystem

Student Author(s): Sarah Anwar

Faculty Advisor: Dr. Amy Canevello

Department: Psychological Sciences

Relationship satisfaction promotes well-being (Proulx, Helms, & Buehler, 2007). Crocker and Canevello (2015) suggest that egosystem and ecosystem motivation may result in differing flavors of relationship satisfaction. Relationship satisfaction in the egosystem is based on the extent to which partners satisfy people's needs and desires; relationship satisfaction in the ecosystem is based on the extent to which the relationship is meeting both partners' needs and desires. One hundred undergraduates will report their compassionate and self-image goals, relationship satisfaction in the egosystem and ecosystem, and hedonic and eudaimonic well-being. Essentially, self-image goals refer to protecting and maintaining the self, whereas compassionate goals refer to collaborating and supporting the self and others. We expect that relationship satisfaction in the egosystem will be related to self-image goals and hedonic well-being and that relationship satisfaction in the ecosystem will be related to compassionate goals and eudaimonic well-being.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Examining the Preservation of Optimist Park:

A Community Led Effort Against Gentrification

Student Author(s): Jasmine Betts and Uju Udemadu **CE, NC, U**

Faculty Advisor: Dr. Tamara Johnson

Department: Bonner Leaders Program

The Optimist Park neighborhood is experiencing expeditious growth and change as Charlotte's population trajectory continues. Among other factors, due to its proximity to the center city, the Lynx Blue Line (Parkwood Station in Optimist Park), and other completed and planned amenities, gentrification has accelerated. Although social capital networks and community involvement are growing in Optimist Park as a result of gentrification, many long-term lower-income residents are moving away despite improvement in the aforementioned determinants of upward mobility. Our goal is to identify and address the specific concerns of the residents of Optimist Park concerning the rapid growth of gentrification within the area. To identify the impacts of gentrification within Optimist Park, we studied the neighborhood through asset-based research, which approaches research by emphasizing the strengths of the community. We connected with the residents through listening circles, where we met with the neighborhood as well as community leaders weekly to discuss their thoughts on the changes they wanted to see. From these discussions, the beneficial plans to implement were financial literacy and tax alleviation workshops, establishing a meaningful relationship between local government officials and Optimist Park residents through a single community spokesperson, and developing an efficient way to distribute any information regarding the Optimist Park to minimize the generational gap between the residents. The study of how gentrification impacts the specific community within Charlotte provides relevant information on valuable solutions that need to be implemented to benefit Optimist Park and other communities that are similar.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: The Threat of Pollution and How Vietnam is Fighting Back

Student Author(s): Catherine Camp, Gabrielle Echanique, and Anh Romah **G, S**

Faculty Advisor: Dr. Vaughn Schmutz

Department: Sociology

The UN has identified pollution as the most important environmental threat and health concern in today's modern society, and it presents a specific danger on local levels in Vietnam. In recent decades, Vietnam has developed rapidly and become a growing presence in the global market, but an emphasis on sustainability has arguably been lost. In this project, we will focus on how pollution has affected Vietnam's air, earth, and water quality as well as how the country is responding to these consequential issues. In our research, we will examine the damages and effects of pollution on Vietnam's environment, and the actions the country has taken to counter these effects, and the effectiveness of their efforts to combat this force. Based on scholarly articles, news media stories in Vietnam, and official government reports and initiatives, we will address these questions. Our preliminary findings indicate that Vietnam has tried conventional ways to create a sustainable environment, such as the GetGreen initiative in which the government trained over one thousand consumers on environmentally friendly consumption and lifestyles. The project showed a positive impact as participants reported more engagement in sustainable actions following the intervention. In addition, the Vietnam government started a process in order to combat these pollution threats such as research on hydropower and solar power. In addition to its impact in Vietnam, our research will provide suggestions that may contribute to combating this global problem in other places around the world.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Effect of Tri Musical Learning (TML) Curriculum on
Overall Academic Performance in Children

Student Author(s): Sammy Chouffani El Fassi **CE, H, NC, U**

Faculty Advisor: Dr. Hannah Peach

Department: Psychological Sciences

Studies show disparity in access to music education for Americans of low socioeconomic status (SES) and minority races. Music participation is also correlated with higher academic performance, but few studies have explored a cause and effect relationship. Therefore, children of low SES may be lacking access to a very valuable resource. In response, this study was developed to understand how participation in Tri Musical Learning (TML) music classes, taught by university student mentors, impacted the academic performance of a group of children ages 7- 12 in an afterschool program. It was hypothesized that the children who participated in the music classes would perform better than children of the same age who did not. Academic performance was examined with a measure for scientific reasoning skills, called "The Scientific Reasoning Test". One of the two groups received three weeks of music instruction, then average scores on the exams were compared. The difference in performance between the groups was not large enough to be statistically significant, though the students in the music classes had slightly higher scores. This could imply that with more statistical power, replication, and extension, future studies may demonstrate a cause and effect relationship. For more information about Tri Musical Learning, visit:
<http://www.trimusicallearning.org/>

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Analyzing Factors Influencing Support for Pro-Democracy Candidates in
Hong Kong's District Council Elections on November 24th, 2019

Student Author(s): Scott Christensen **G, H, U**

Faculty Advisor: Dr. Cheryl Brown

Department: Political Science and Public Administration

Hong Kong reverted to Chinese rule as a Special Administrative Region of the People's Republic of China in 1997, but has still remained a financial gateway to the world's second-largest economy. Massive protests during 2019 - 2020, however, have threatened Hong Kong's status as an international business hub for China. Protests have targeted critical segments of the economy--transportation, tourism, and education--nearly bringing the \$341 billion economy to a standstill and affecting the population's livelihood and autonomy. The protests began in response to a proposed law to permit extraditions to the PRC but have morphed into demands for democratic reform in Hong Kong and outrage over China's increasing power. During the protests, Hong Kong held its District Council elections on November 24, 2019, with a record-breaking voter turnout and landslide victory for pro-democracy parties. In examining factors influencing support for pro-democracy candidates, this research affords a new perspective on Hong Kong's democracy movement and future. The paper uses a mixed-method approach to examine the effect of the protests on Hong Kong's elections. It analyzes five district-level variables--work status, educational attendance, immigration influx, age breakdown, and housing cost--to quantitatively determine factors influencing support for pro-democracy candidates. A qualitative content analysis of candidates will supplement the quantitative findings. Data sources are the 2016 Hong Kong Census for demographic and economic data, Electoral Affairs Commission of the Hong Kong Government for election data, and official biographies for candidate data. Results are discussed in terms of predicting democracy movements in Hong Kong.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Dogs in the Aztec World

Student Author(s): Sarah Dandurand **G, S**

Faculty Advisor: Dr. Catherine Fuentes

Department: Anthropology

The Aztec people were one of the largest empires in the New World before the colonization by the Spanish people. It stretched from the Gulf of Mexico to the Pacific Ocean and had a very unique culture set with a number of different traditions, rituals, and lifestyle. One of the biggest cities in the ancient Aztec world was the capital Tenochtitlan, where recently a team of archeologists uncovered a mass grave filled with twelve dog skeletons. This grave site is estimated to be over 500 years old dating back to 1350-1520 AD. It is widely accepted upon most archeologists that Aztecs domesticated dogs as a source of food, however after the discovery of this mass grave site some archaeologists are starting to believe that dogs may have had a more symbolic purpose in Aztec life as well. Due to the aura of mystery around this mass dog burial, there is no collective assumption that archeologists can give to explain why these dogs were buried in such a way. Some people believe it could be for symbolic reasons while others believe this may be a place where the Aztec people discarded their bones after finishing a meal. By further researching this burial, zooarchaeologists will be able to learn more about the relationship between the Aztecs and dogs.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Debt and the College Experience

Student Author(s): Samantha Floyd, Rebekah Carpenter, and Kristen Petrizzo

Faculty Advisor: Dr. Scott Fitzgerald

Department: Sociology

Debt is important to investigate because it impacts individual behavior and decision making. The purpose of this study is to investigate the effects of debt on the educational and career experiences of college students and young workers. In the study, we seek to determine the effects of debt on the academic and career choices of college students at a large public research university in the southeastern United States. We are interested in analyzing how college students make sense of debt because it can potentially provide insight into how debt is related to financial literacy and how these factors impact decisions such as college major choice, decisions to work while attending college, and the job search model prior and after graduation. The study targets college students from a large public research university in the southeastern United States who are of ages 18 to 24 years old. This study is aimed to understand these processes at the individual level, we employ the use of semi-structured qualitative interviews, as well as a paper-pencil survey that assesses financial literacy. The guiding research question for this phase of the study is: What are the effects of debt on the academic and career decisions of college students?

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Air Pollution in France: Impacts and Responses

Student Author(s): Hannah Gallo, Nico Campos Cruz, and Melody Kuai **G, S**

Faculty Advisor: Dr. Vaughn Schmutz

Department: Sociology

This issue of air pollution is a major problem that needs to be addressed and further researched, in order to maintain a healthy breathing environment for the citizens of France. Air pollution has been an ongoing sustainability issue in France for many years. In this project, we ask: what are the impacts of and responses to air pollution in France? We will focus on collecting data on the governmental response in France and Europe more broadly, the actions of non-governmental organizations (NGOs), and media coverage of the issue in France. Our preliminary findings focus on the impact on changing weather patterns in France, contributors to high levels of air pollution (e.g., carbon dioxide and particulate matter), and responses to these issues. In terms of the intergovernmental response in Europe, the European Commission adopted a set of clean air policies in 2013, including a clean air plan for Europe with targets for 2020 and 2030 as well as corresponding legislative measures. In 2018, the European Commission took further steps to provide tangible help to national, regional and local actors to improve air quality in Europe. As we further this research project, we will focus more on the response of NGOs and the public to air pollution in France. Air pollution in France is not only a national health problem but also a major international environmental problem. There are many actions that must be taken, in order to solve this detrimental issue of air pollution throughout France.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: The Impact of Stand for Animals Veterinary Clinic on
Community Cat Populations

Student Author(s): Candis Hoskins **CE, H, NC, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

This research project aims to answer the question “How has Stand for Animals veterinary clinic impacted the community cat population in Charlotte and surrounding areas using trap-neuter release methods?” The purpose of this community-engaged research project is to investigate the effect on community cat populations and to explore the factors that influence these populations such as lack of education and the impact on surrounding shelters. Stand For Animals veterinary clinic serves three locations: Charlotte, Pineville and Lake Norman. This research will be focused on surrounding shelters that bring in some of these community cats, the three locations, and a comparison among each of them. A review of the literature indicates that Charlotte is among the top three places nationally with the highest rates of community cats. The research portion of this project will look into the surrounding areas and compare if more rural versus more urban areas experience higher amounts of feral cats. The research will also explore why this may be the case and other identifying factors such as strategies that may have an influence on community cat populations. The service portion of this project will allow for an event that takes community cats from a high volume area, Concord, NC, and performing trap-neuter-release methods as well as general wellness checks. Concluding this project, I anticipate to find that Stand for Animals has had a significant impact on lowering the community cat population due to these methods and that this impact may be greater in certain communities.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Community-Engaged Research:

Lessons Learned from the Perspective of a Student Researcher

Student Author(s): Wyatt Jones **CE, H, U**

Faculty Advisor: Dr. Bridget Anderson

Department: Urban Institute

The researchers at UNC Charlotte Urban Institute have collaborated with community stakeholders (community members, non-profit organizations) to address local issues and questions. This project seeks to highlight the methods and tools used to conduct community-engaged research as well as the lessons learned, specifically referencing two studies. The advantages of community-engaged research are well documented. By engaging the community, researchers are able to gain more insight about their data; inform culturally appropriate interventions; and translate research findings more readily to real world settings, among other things. This project will examine two studies, detailing various aspects of community-engaged research. The first study is a mixed methods research study on arts and culture in Mecklenburg County, while the second study is a mixed methods evaluation of a youth-based experiential and outdoors education program. The project will highlight research methods, research tools, and lessons learned through engaging in community research. This project aims to increase understanding around community-engaged research and inform similar work that student researchers are doing in the community.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Nile Sustainability Threats in Egypt

Student Author(s): Nicole King, Alexis Higar, Kimber Miller, and Blake Edwards **G, S**

Faculty Advisor: Dr. Vaughn Schmutz

Department: Sociology

The Nile's importance on Egypt does not only support life, but also holds cultural significance and facilitates international food production. Over the past several decades, Egypt has suffered from domestic, industrial, and agricultural pollution. In absence of operationally functional water treatment facilities, the pollution from the river Nile has created a serious problem for canals and drains. In this project, we are addressing the question: What are the main threats to the sustainability of the Nile in Egypt? Our focal points are the political threats with Ethiopia regarding building a dam in the Nile, toxic waste pollution, and the political/environmental effect that building a dam will have on the country. In addition, we will focus on the geopolitical conflicts and environmental impacts such as groundwater subsidence and toxic waste pollution. In order to do this, we are using media reports, news articles, non-government organizations (NGOs), and scholarly articles. Preventing toxic pollution and waste is essential for the survival of Egypt. The country is attempting to achieve sustainable development and solve the water crisis centered around the Nile. The geopolitical and environmental sustainability consequences of the Egyptian water crisis are reaching dire levels. These problems have caused great tension between Egypt and its surrounding countries, affecting the region as a whole.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Natural Resources and Civil Conflict Intensity

Student Author(s): Bilal Laghari **H**

Faculty Advisor: Dr. Beth Whitaker

Department: Political Science and Public Administration

This project seeks to find a relationship between natural resources and battle death tolls. Natural resources are a common reason for two parties to go to war because of their high value. This results in parties fighting over zones rich in natural resources in hopes of making a profit. Such conflict has been the reason behind many civil and international wars. By using data on natural resource types and data on combat deaths, this article hopes to build upon existing research that aims to understand which specific natural resources are the cause of greater deaths. It aims to understand the motivations behind parties that incite political violence for monetary gain.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: The Extent to Which Forms of Advertisement are Effective in Raising Awareness of and Gaining In-Need Student Participation in Attire for Hire Events

Student Author(s): Jenna Lane **CE, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

College students today face a wide range of economic challenges, including being able to obtain professional attire for job interviews and internship opportunities. In response to this issue, Attire for Hire (AFH), a program created at the University of North Carolina at Charlotte, offers a career-readiness program that allows students to “shop” for free professional clothing. The purpose of this study was to examine the extent to which various forms of advertisement were effective in raising awareness of and gaining in-need student participation in UNC Charlotte’s AFH events. Forms of advertisement included flyers, emails, and social media in order to gain participants and increase student knowledge of the events. At the event, participants completed a survey that indicated how they found out about the event and whether they were aware of AFH prior to the beginning of this study. Upon data analysis, email communication was found to be the form of advertisement that attracted the most participants. Additionally, the number of participants at the event were slightly above the average number seen at previous events. These preliminary findings provide support for the importance of effective advertisement for increasing awareness as well as reaching the desired populations of Attire for Hire. More research is needed for determining the needs of these types of on-campus programs, and the best ways to provide students with successful transitions into their post-graduate endeavors.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Adolescent Perspectives of Career Readiness Programs to Influence Change

Student Author(s): Neariah Mandisa-Drummond **CE, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

Since 1981, Discovery Place has served the Charlotte community with its network of museums that promote science, nature and imaginative play. In its most recent strategic plan, the nonprofit has committed to “connecting students with their futures.” Through several youth development programs; the institution has made progress with this goal. Charlotte-Mecklenburg students in grades 9-12 are eligible to apply as STEM interns which provide exposure to various career fields and access to professional development workshops in hands-on, immersive roles. The service portion will include acting as a resource to students at a free professional clothing event and College 101 panel. Furthermore, relevant parties have identified the need to recruit high school students that attend Title One schools such as West Meck, Garinger, Vance and Harding. A review of the literature indicates that standardized testing scores and graduation rates are indicators of such schools. The purpose of this community-engaged research project is to analyze Title One high school student perceptions of work-based learning opportunities to promote skill building and professional competency achievement. The administration of surveys to students and interviews with faculty spotlight the barriers to participation. Notably, transportation, need for financial compensation, better communication are factors that prevent student involvement. This research will provide direction for administrators of after school programs and support diversity within participants in terms of socioeconomic status and race/ethnicity.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: How Waste Production Affects South Korean Society and Environment

Student Author(s): Sophia Marroqui, Anthony Vo, Charisse Balem, and Krupa Rupani **G, S**

Faculty Advisor: Dr. Vaughn Schmutz

Department: Sociology

The generation and destruction of waste is a worldwide issue that is being tackled globally. In South Korea, waste production is particularly an important issue due to the fact that 48,990 tons of waste are produced per day. In comparison to North America's and Europe's 95-115kg of food wasted per capita per day, South Korea has a significantly higher statistic of 130kg of food wasted per capita per day. South Korea's society and environment have been greatly impacted by their excessive waste production caused by the country's rapid economic growth. The objective of this research project is to identify possible solutions that limit and reduce the negative impact of waste production on public health in South Korea. Specifically, we will be examining the destruction of waste, the usage of plastic, and poor air quality. To reach a conclusion on the most effective ways to combat this issue, we will be collecting data from governmental sources, including the South Korean Ministry of Environment, academic journals, and non-governmental organizations (NGOs). Preliminary findings indicate that various governmental initiatives and NGOs, such as the Korean Federation for Environmental Movement, are working to limit the amount of waste being produced and to reduce its impact on public health. By understanding these efforts and assessing their effectiveness, this can provide lessons for achieving sustainability in South Korea and other places around the world.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: The Interconnectivity of Word Interpretation and Emotional State

Student Author(s): Melissa Martin **H**

Faculty Advisor: Dr. Linda Shanock

Department: Psychological Sciences

This study aimed to examine the potential relationship between emotional state and perception of neutral words. The research was governed by the hypothesis that when asked to rate the positivity of neutral words from a list, participants' ratings would mirror their levels of happiness. In other words, if a participant was in a good mood at the time of this study, then it was expected that they would rate neutral words more positively than a different participant would who was in a bad mood at the time of this study. Sixty-two undergraduate students from the University of North Carolina at Charlotte, aged 18-53, took part in the study. In an online survey, participants completed the Oxford Happiness Inventory quantifying their emotional state. They then rated the positivity of 25 neutral words on a scale where 1= extremely negative and 6 = extremely positive. A correlation was then conducted to determine if a relationship existed between emotional state and participants' perceived positivity of neutral words. This study found a significant, moderate positive correlation in the expected direction, supporting the hypothesis. Overall, participants' ratings of neutral words were moderately congruent with their emotional state.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Tracking the Development of a Beaver Pond Complex in the

Southeastern Piedmont, Charlotte NC

Student Author(s): Amber Millett **NC, U**

Faculty Advisor: Dr. Stephen Rachide

Department: Geography and Earth Sciences

Prior to the 1800's beaver were widespread and occupied most low order streams across the Southeastern Piedmont. The fur trade and agricultural practices lead to decreases and, in 1929, the extirpation of the Carolina beaver (*Castor carolinensis*). After introduction, the Canadian beaver (*Castor canadensis*) has rebounded and reoccupied niches once filled by *Castor carolinensis*. The development of beaver pond complexes (BPC) through time has been well studied primarily in the northern latitudes of North America, but few have focused on the Southeastern Piedmont. Furthermore, few studies focus on high-resolution spatiotemporal dynamics of re-occupied BPC sites. The aim of this research is to partially fill that gap in knowledge by documenting the spatiotemporal dynamics and impacts of beaver-induced fluvial alteration on a low-order Southeastern Piedmont stream. Data used to track the spatiotemporal development of the BPC were collected during field visits and aerial imagery. Data includes: spatial data for dams, ponds, and terrestrial activity; notation of alteration to vegetation; and evidence of dam/pond condition. GIS was used to map and calculate geomorphic alteration. The BPC has been a dynamic system, with periods of extreme growth and decline. The area has been continuously occupied and maintained since August 2012. After the initial pond was constructed, subsequent ponds were built in an upstream direction. In April 2018, at its maximum extent, the BPC comprised four ponds that inundated ~35,000m², beaver activity affected ~15 hectare. Although the area affected at the BPC generally increased, the complex has also experienced periods of decline.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Examining Adverse Childhood Experiences and Resilience Among Minority Children

Student Author(s): Imani Mitchell **H**

Faculty Advisor: Dr. Stephanie Potochnick

Department: Sociology

Adverse Childhood Experiences (ACEs) refers to any abuse or potentially traumatic event that happen to a person under the age of eighteen. Minority children are at greater risk of facing ACEs such as having a parent who is incarcerated, divorced, or being sexually assaulted. Resilience or protective factors are what enable these individuals to develop healthy behaviors and lowers the prevalence of negative outcomes in them. This study will use data from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) 2010-2011 conducted by the National Center for Educational Statistics (NCES). The current study focuses on a subset of the ECLS-K full sample: Black and Latinx children. This study will examine two different measures of mental health and well-being--depression and self-esteem—and how ACEs that occur in kindergarten influence depression in later childhood, 5th grade. These outcomes are selected because ACEs have been shown to increase the risk for poor mental health, including depression and lower self-esteem. This study will use both summary statistics and regression analysis to examine the prevalence of different types of ACEs (e.g., food insecurity, parental malevolence, parental abuse, and parental depression), how ACEs influence health and well-being, and how resilience factors (e.g., self-control, social support, and cognitive skills) may moderate this relationship.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: The Impact of Being an Active Member of the NC Catawba Riverkeeper Foundation.

Student Author(s): Wilbur Ospina **CE, NC, S, U**

Faculty Advisor: Dr. Susan Harden

Department: Middle, Secondary, and K-12 Education

The purpose of this community-engaged research project is to investigate or explore the impact as a contributing member of the Catawba Riverkeeper foundation by educating and advocating to protect the Catawba-Wateree River Basin of North Carolina for all who depend on and enjoy it. There will be several different settings of participation such as in advocating setting meetings during the week in which proposed plans are shared about on how to effectively engage and come forth with community engaged activities. Participants will vary and counties around Catawba county will participate. In a review of the literature, I have found that there has been a decrease in group participation of the organization in all kinds of platforms whether it be through donating to the organization, active member participating and even raising public awareness through advocacy. I plan to research the social and environmental impact of being an active member of this organization and how it pertains to achieving its mission. The service part of the project will be split in two forms one is actively attending an advocacy meeting which are held through the months of March and April and also attending their monthly cleanup engagements of actively cleaning up the Catawba River and its basin surroundings. I hope to learn how important /impact my service learning participating will be for the organization. My future plans are to continue being an active member of this great foundation and encourage awareness to others that it takes just a little time out of your week to cause a great positive contribution to society and the environment.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Impacts on Organic Carbon from Urban Stream Restoration

Student Author(s): Hannah Sofie Perrens **NC, S U**

Faculty Advisor(s) and Co-Authors: Dr. Sandra Clinton and Dr. David Vinsen

Department: Geography and Earth Sciences

Organic carbon enters streams from the surrounding environment and is transported downstream. Organic carbon affects water chemistry and light penetration in aquatic ecosystems, which impacts the dissolved oxygen in the stream. Organic carbon is a food source for aquatic organisms such as bacteria and invertebrates. Urbanization impacts stream hydrology and carbon cycles. Due to increases in impervious cover, urban areas have increased surface runoff resulting in increased temperatures and nutrient concentrations and decreased amounts of organic matter. The purpose of stream restoration is to mitigate urban impacts and improve the environmental health of the stream, which includes macroinvertebrate recovery and overall stream water quality. Stream restoration also stabilizes the channels in the stream and seeks to reduce erosion of channel beds and banks in order to reduce downstream sedimentation. The Reedy Creek Restoration Project is a watershed project that is focused on the impacts of restoration of a forested urban watershed. Water samples and environmental data were collected from Reedy Creek from pre and post restoration to understand the effects of restoration on organic carbon in both urban and forested areas. Reedy Creek pre restoration was shaded and surrounded by trees, while post restoration had more light, warmer temperatures and more algae. This project will look at how organic carbon is related to stream restoration and identify how the overall water quality of the stream is related to the physical changes from restoration.

CE - Community Engaged **G** - Global **H** - Honors **NC** - North Carolina

S - Sustainability **U** - Charlotte

Social Sciences

Title: Cognitive Performance Influenced by Trait Anxiety and Heart Rate Reactivity

Student Author(s): Michael Persin and Michael Moore

Faculty Advisor: Dr. Jeanette Bennett

Department: Psychological Sciences

Cognitive function is an essential part of daily life of all individuals. Individual differences, such as anxiety and physiological functioning, are thought to be responsible for changes in an individual's cognitive function but much remains unknown about the interactions of these factors and their effect on cognitive performance. We examined how the physiological response to a cognitive task interacted with trait anxiety to influence cognitive performance. Methods: UNCC undergraduate women (N=33; mean age = 21.0 + 1.9 yrs) came into the lab. After providing informed consent, they completed the Spielberger Trait Anxiety scale and the Stroop Task, while heart rate was continuously collected. Results: Using model 1 of the Process Macro extension in SPSS, we found that the heart rate response to the Stroop Task interacted with trait anxiety to explain a significant amount of the variance in Stroop Task performance ($b = -.002$, $R^2 = .176$, $p = .019$). Specifically, for those with lower trait anxiety, the greater the individual's heart rate increased to the Stroop Task, the poorer their cognitive performance, while those with higher trait anxiety, there was no effect of change in heart rate on performance. Conclusions: Cognitive tasks often are stressful, thus, individuals with a greater increase in heart rate may have found the task more stressful and this interfered with their cognitive abilities. We conclude that the difference in heart rate increase is due to perception of the Stroop Task as either stressful or a challenge.

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Social Sciences

Title: Student Learning in Sociology

Student Author(s): Jhazmine Smith **CE**

Faculty Advisor: Dr. Karen Singer-Freeman

Department: Office of Assessment and Accreditation

When students reflect on their learning, they become more curious, aware of learning gaps, and studious. Student perspectives on assessment data also helps institutions understand student learning. Identifying methods of collecting student input that are low-cost has been challenging. For this study, surveys were developed to collect students' opinions about their learning. The surveys explored student views of their own achievement and the value of the sociology student learning outcomes. Junior and senior sociology majors completed up to two surveys and one interview in which they rated the importance of each sociology learning outcome and reported: 1) their level of mastery of the outcome; 2) the classes in which the learning outcome was developed; and 3) the importance of the outcome for success in a future career. Open-ended questions were also included, serving as an outlet for students to share their opinions about the major. In response to the first survey (n = 31), we found that students reported lower levels of learning outcome mastery than faculty have reported in recent assessment data. We also found that students reported greater value in certain learning outcomes ("Understanding interactions among individuals, groups, social institutions, and demography in society," "Developing strong oral communication skills," and "Developing strong written communication skills") than others ("Critically assessing, and applying major sociological concepts," "Recognizing different theoretical perspectives in sociology," "Posing research questions, developing logical arguments, and evaluating evidence," and "Understanding research methods appropriate to sociological inquiry.")

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Social Sciences

Title: Sustainability of Whaling in Japan

Student Author(s): Marissa Wallace, Breeya Roberts, and Rachel Welch **G, S**

Faculty Advisor: Dr. Vaughn Schmutz

Department: Sociology

Commercial whaling grew in popularity in Japan following WWII, after American generals recommended it as a cheap food source. In current times, most of the world (including the USA) reprimands this behavior, but the Japanese government keeps a firm stance on whaling despite foreign pressure. In this project, we ask: how has the whaling industry impacted Japan socially, environmentally, and economically? To address this question, we are collecting information about whaling from non-governmental organizations (NGOs), government sources, scholarly journals, and newspaper articles. With regard to social impacts, we focus on the history of whaling as part of Japanese cultural identity, the importance of whaling to Japanese citizens, protests related to whaling, and responses of the government and citizens to these protests. In terms of economic impact, preliminary findings indicate that the whaling industry is at a rapid decline as whale meat sellers struggle to find lucrative markets and are dependent on government aid to make up for losses. Finally, the environmental impact whaling has on the food chain can negatively impact the fisheries. Additional findings show that the oceans and general inhabitants are negatively impacted by noise and waste coming from whaling ships. The goal of our research is to assess the sustainability of whaling in Japan from an economic/political, social/cultural, and environmental standpoint. From a broader view, it is important to learn about this issue because a disruption in the whale population could have a negative impact on the entire ocean's ecosystem.

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Social Sciences

Title: Psychopathy and Punishment Insensitivity in Society

Student Author(s): Elizabeth Walls

Faculty Advisor: Dr. Hannah Peach

Department: Psychological Sciences

This study examined correlations between levels of psychopathy and punishment sensitivity. The hypothesis was that those with higher levels of psychopathy would have lower levels of punishment sensitivity. This was grounded in research those with diagnosable psychopathy have trouble learning from punishment. Participants were recruited from a convenience sample and completed an online survey. Questions on the survey were taken from the Sensitivity to Punishment/Sensitivity to Reward Questionnaire (SPSRQ) (Torrubia et al. 2001) and the Hare Psychopathy Checklist-Revised (PCL-R). Results showed the opposite of expected, with participants with higher levels of psychopathy also showing higher levels of punishment sensitivity. More research must be done to find the reason for this. For now, one can speculate that the questions did not measure what they were meant to or there is a spurious variable unaccounted for.

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