



## **Summer Research Symposium**

**Friday, July 26, 2019**

**Barnhardt Student Activity Center**

**Abstract Book**



# Welcome

Welcome to the 2019 UNC Charlotte Summer Research Symposium. This is a special year for the summer symposium as it is the inaugural year for UNC Charlotte's Office of Undergraduate Research (OUR). The Office of Undergraduate Research mission is to support undergraduate students through undergraduate research grants and opportunities to communicate their research to others through multiple research symposiums, funding to national conferences to present their research, and research exploration events. We would like to thank Academic Affairs, The National Science Foundation Research Experiences for Undergraduate Programs and other campus and community partners for working with the OUR this summer and providing students with a rewarding summer research experience.

The Summer Research Symposium would not be possible without the commitment of our UNC Charlotte faculty. The symposium has a strong representation from faculty members who participate as research advisors, and mentors. A big thank you to faculty for your service and dedication to undergraduate research and scholarship at UNC Charlotte. I would especially like to recognize the OUR Faculty Fellows and the staff in the Office of Undergraduate Research, all of whom played integral parts in the planning for today's event. Most of all, please join us in congratulating our Undergraduate Researchers for their hard work and efforts.

Now engage in the symposium presentations, take pictures, and use the #49erSummer2019 to share your symposium moments on social media. At the end of today's event, we ask that you complete the 2019 Summer Research Experience Evaluation and Feedback form which can be located at this link: [UNC Charlotte- OUR Summer Research Program Evaluation](#)

Enjoy your day!

Dr. Erin Banks

Assistant Dean of the Office of Undergraduate Research

# **2019 Summer Research Symposium Schedule of Events**

**Friday, July 26, 2019**

## **9:00 AM:**

Registration opens in the James H. Barnhardt Student Activity Center (SAC).

Presenters arrive to register. A light, continental style breakfast is provided.

Poster session A presenters should register their poster between 9:00 AM – 9:45 AM.

## **10:00 AM – 11:00 AM: Poster Session A**

Presenters please stand next to your poster during the entire session time.

Poster session B presenters should register their poster between 10:30 AM – 11 AM.

## **11:00 AM – 11:45: Poster Session A break down posters/ Set-up for Poster Session B**

## **12:00 noon – 1:00 PM: Poster Session B**

Please stand next to your poster during the entire session time.

At the end of the session, please fold up your presentation easel and foam board and place it on the floor next to where you presented.

## **1:00 PM – 2:30 PM: Student Luncheon**

Introductory Remarks: Dr. Erin Banks, Assistant Dean, Office of Undergraduate Research

Presentation of Certificates: Program Faculty Fellows and Program Directors

# Charlotte Community Scholars

Abstract #: 800

Title: Social Impact of the Arts Study

Student Author: Elianet Hernandez Santana

Faculty Mentor (s): Dr. Meg Whalen

College: Belk College of Business

The purpose of this research is to investigate the relationship between art programs and social well-being in the Charlotte region. This study intends to collect information on the current art programs in the Charlotte region and evaluate their effectiveness to highlight the significance and positive influence art programs exert on the community. To initiate this process, a survey was constructed and will be distributed. The survey is inclusive of art organizations, independent artists, and community service organizations that implement art programs. Once the results are collected, a selection process will commence, in which a certain amount of art programs will be chosen for further evaluation. We will also review models from across the U.S both as case studies of social impact and as methods of evaluation. A literature review will also be created to further the review of models from across the country. In addition to the research methods previously described, this study counts with the co-operation of an advisory group consisting of 20 members from the community. As well as the direction of Meg Whalen and the collaboration of a small consulting group, the project is also being supported by the Arts and Science Council. These collaborations all come together with the Charlotte community to unveil the effects art programs have on the community and evaluate the effectiveness and the value of those effects. The goal of this study is to demonstrate that art programs have a positive impact on the community and can, therefore, bring positive change.

Abstract #: 819

Title: Assessing the Influence of High-Quality Arts Education and Experiences on Low-Income Youth in West Charlotte

Student Author: Madison Harris

Faculty Mentor (s): Dr. Vaughn Schmutz

College: College of Liberal Arts and Sciences

Lorien Academy of the Arts is a nonprofit organization located in Charlotte, NC. The goal of this organization is to provide an opportunity for low-income youth to participate in a high-quality visual arts enrichment program throughout the summer. This program includes 8-weeks of drawing, painting, sculpting, and photography courses. Returning students take an advanced version of the same courses. The goal of this study is to assess how participation in Lorien Academy impacts the creativity, confidence, and critical thinking of adolescents. Data for this study include classroom observations, interviews with students, and video blogs (students filming themselves answering prompts). Data from all students who participate in the weekly video blog will be analyzed. Preliminary analysis suggests that participating students' confidence increases as the program continues.

Abstract #: 831

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

Student Author: Betsabe Graciela Rojas Gonzalez

Faculty Mentor (s): Dr. Claire Schuch

College: College of Liberal Arts and 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.

Abstract #: 835

Title: Teacher Attitudes Toward Race

Student Author: Dan Rhodes

Faculty Mentor (s): Dr. Tehia Glass

College: College of Education

Despite decades of progress in the fight for racial equality, the opportunity gap between students of color and their white peers remains. Previous research has demonstrated a significant connection between a teacher's expectations of a child, and a child's academic performance. The purpose of this project was to promote equity in education in collaboration with the Community School of Davidson. While the problem of racism is broad and pervasive in our society, targeting the crucial teacher-student relationship is a promising avenue for promoting positive social change. The Community School of Davidson had already begun engaging in the process of becoming an effective anti-racist institution by implementing an anti-racist curriculum in the 2018-2019 school year. The research team constructed a survey in order to assess the success of that effort by measuring the teaching staff's attitude towards race, racism, and multicultural education. We used a Likert-type scale, as well as several open-ended response questions in order to capture important qualitative data about the experiences of the teachers. Preliminary data analysis reflected the need for more instructional support for the teaching staff. In order to meet that need, the team will create a proposal for next steps that will optimally support the teaching staff in their effort to create an inclusive learning environment.



Abstract #: 837

Title: Investigating the Leading Health Indicators of African American/ Black Women and Girls in Charlotte, NC

Student Author: Chania Witherspoon

Faculty Mentor (s): Dr. Janaka Lewis

College: College of Liberal Arts and Sciences

The purpose of this research is to investigate and report the health indicators of African American/ Black women and girls in the city of Charlotte, North Carolina. Statistically significant results from prior research suggests that African American/ Black women are more likely to die from heart disease and breast cancer than any other demographic in America. This study examines: 1. What health indicators are currently being collected on African American/ Black girls and women? 2. What are the significant trends of specific health indicators that are currently affecting African American/Black women? I collect secondary data of indicators for African American/ Black women within a 5-year time frame to investigate these research questions and use systematic review of extant literature to support my investigation. Early findings conclude that there is/may be an impact of socioeconomic status on health for Black women and girls that advocacy and community education can help.

Abstract #: 840

Title: Identifying Characteristics of Food Pantry Clients and Their Utilization of Other Resources Provided by the University

Student Author: Safiya Rann

Faculty Mentor (s): Dr. Kim Buch

College: College of Liberal Arts and Sciences

Food insecurity is an issue that has become more prevalent in recent years. The USDA defines food insecurity as not having adequate food to maintain a healthy lifestyle. The purpose of this research is to understand the issue of food insecurity among college students through a literature review and through data collected from the Jamil Niner Student Pantry at UNCC.

The Jamil Niner Student Pantry, opened in 2014, serves all students who self-identify as food insecure. Through this research we sought to learn more about 1) the shopping patterns of pantry clients and 2) how clients use other campus resources. First, a literature review was conducted to determine the extent of the problem of food insecurity among college students nationally and what institutions are doing to address the problem. Next, data, in the form of client records was analyzed in order to learn the shopping patterns of clients. Surveys were distributed to previous clients to determine the usage of other University provided resources such as Attire For Hire, Swipe Out Hunger, and more. Analysis from client data aids in understanding the population that the pantry serves. Preliminary findings suggest that results have the potential to be significant in guiding future research and endeavors. Future research directions will be to figure out why first-time shoppers do not return and how to prevent it.

Abstract #: 845

Title: Examining English as a Second Language (ESL) Teachers' Curriculum: Engaging Students through Charlotte Teachers Institute

Student Author: Rosibel Reyes

Faculty Mentor (s): Dr. Scott Gartlan

College: College of Liberal Arts and Sciences

Research on university-school professional development found positive outcomes among teachers who teach English as a Second Language (ESL) students on teacher knowledge, language acquisition, and collaboration. The purpose of the study is to conduct a product evaluation of ESL teachers who participated in content-rich professional development aimed at creating new curricula for their students. The program goals are threefold: (1) to empower teachers through a professor-led seminar model, (2) deepen teachers' subject knowledge, and (3) create and implement new curricula for students. University professors mentored teachers over the course of seven months in a collaborative seminar model to support their curriculum develop and growth in knowledge and confidence. Teachers then taught their curriculum to their students within 6 months of writing curricula. A multi-case study design was used to analyze data collected from four ESL teachers, using three methods: curriculum units written by teachers, surveys completed following curriculum implementation, and semi-structured interviews with teachers. Data was analyzed through an open coding process to identify emergent themes related to program goals. Preliminary themes include culture, identity, and involving teachers from different subjects. Findings from the preliminary analysis of curriculum units and surveys suggest CTI seminars increase teachers' subject knowledge and methods. These findings suggest ESL teachers find culture and involvement of other teachers important to student learning. Additionally analysis will include individual case examination in order to identify common themes. A limitation was only bilingual ESL teachers participated in current study. Future research should examine the role of non-bilingual ESL teachers.

Abstract #: 850

Title: Determining the Impact of Greenway Advocacy Strategies that Lead to Successful Greenway Systems

Student Author: Cristine Quach

Faculty Mentor (s): Dr. Brett Tempest

College: College of Engineering

The purpose of this project is to identify, describe, and categorize the advocacy strategies used to motivate the construction of greenways in urban areas of the United States. The goal of conducting this research is to enhance the advocacy plan and strategies of the Charlotte-based nonprofit organization, Greenways for Mecklenburg. Their purpose is to collaboratively work with community partners, engage and inform the public's involvement, and encourage funding to support the building of greenways. The objectives of this research are to identify successful greenway systems that have demographics similar to Mecklenburg County and find advocacy groups that share the goal of constructing urban trails. Once the organizations are identified, the research team will seek to understand the strategies that are used to accomplish greenway advocacy and to classify the different advocacy methods so that there is understanding of why they are effective at encouraging the construction of greenways. Qualitative methods will include querying online and finding archival literature related to greenway planning in urban and suburban towns in the United States, interviewing experts, and interviewing leaders of several advocacy organizations. This research will shed light on the factor that encourages greenway construction from the community, including grassroots, bottom-up movements, as well as the work of professional foundations and organizations. The findings will support the efforts of residents who are passionate about having greenways in their communities.

Abstract #: 859

Title: Addressing Issues Facing the Lockwood Community During Economic Change

Student Author: Sarah Woolley

Faculty Mentor (s): Dr. Nicole Peterson

College: College of Liberal Arts and Sciences

The purpose of this project was to come up with potential solutions to issues in the Lockwood community in Charlotte, North Carolina in order to help the community come together during economic change. The three questions looked at for this project were: What issues are most prevalent in the Lockwood community, what are the solutions for these issues that have worked in the past, and could those solutions be successfully implemented in Lockwood. To determine what issues the community cares about the most, data in the form of recorded oral histories were collected to develop a holistic picture of the history of the Lockwood neighborhood. The transcripts of these oral recordings were then looked over and coded for how many times a topic or issue was mentioned. Using the results from this, literature reviews were conducted using articles and reports where similar issues were dealt with to come up with potential solutions for the Lockwood community. Then those solutions were analyzed for financial as well as situational practicality. Preliminary findings suggest that some of the most prevalent issues in the Lockwood community are a lack of community unity and housing issue caused by economic change. However further studies may result in more meaningful insights. Not only does this project provide the ability for the Lockwood community to overcome challenges and grow together. It has the potential to influence the entire Charlotte area and other similar communities.

Abstract #: 862

Title: Creating a Database for the Charlotte Center for Legal Advocacy:  
A Source that Helps an Under-Served Population

Student Author: Destiny Lowman

Faculty Mentor (s): Dr. Kathleen Nicolaides, J.D.

College: College of Liberal Arts and Sciences

The purpose of this project is to create an electronic database of non-profit and other organizations in the greater Charlotte area, to be used by The Charlotte Center for Legal Advocacy in advising clients and others who need legal services. The Charlotte Center for Legal Advocacy is a nonprofit organization whose work is important to underrepresented and low-income populations because it provides court representation and counseling to citizens who might not otherwise be able to afford legal help. However, on occasion, The Center cannot take on a client's case and must outsource the work and request assistance from other organizations. It is these other organizations that is the focus of this research. Our goal is to better understand the process of case selection and how to properly match case needs with outside resources. Three factors will be examined. The first being the types of cases the center primarily accepts. For example, if they take on more veteran's cases, immigration cases, homeless cases, cases with disabilities or others. Second, we will set out the criteria for case acceptance such as residency and income. Third, and most importantly, we will set out the non-profit church-based, government-based, and other organizations in the database that can provide assistance to those who need legal or other assistance. Both quantitative and qualitative data in the form of interviews and surveys will be collected to analyze factors that will contribute to the development of a more efficient community partner database. In the end The Charlotte Center for Legal Advocacy will have a complete database of community resources to refer their clients, allowing them to be better represented and supported.

Abstract #: 867

Title: Takes Two to Tango: Establishing Sustainable Community Partnerships and Programming

Student Author: Alexander Gomes

Faculty Mentor (s): Dr. Tamara Williams

College: College of Art and Architecture

Community partnerships are vital for the overall health of a community. By forming partnerships, organizations are able to use two separate forms of resources to provide a specific type of service for the community. The Aldersgate Retirement Community is a nonprofit organization that caters to the needs of senior citizens, meanwhile, OurBRIDGE for KIDS is an organization that focuses on the needs of refugee and immigrant children. These two organizations have been partnered to have dance classes primarily offered to the children of Aldersgate employees as well as towards the children within OurBRIDGE. This outcome follows 10 weeks of qualitative research focusing on how to establish sustainable community partnerships and how to facilitate programming within various communities. There are three primary points that guide my research throughout the 10 weeks. The first is overall class attendance, the second is my personal observations of responses during class, and the last is general questions to the class as a whole. The results are ongoing but preliminary findings suggest that establishing community partnerships that are sustainable relies on providing services to the community that they wouldn't normally receive due to lack of resources and/or knowledge.

Abstract #: 873

Title: Machine Learning Application in Identifying Children at Risk for an Immunization Delay

Student Author: Thao Tran

Faculty Mentor (s): Dr. Maren Coffman

College: College of Health and Human Services

According to the Centers for Disease Control and Prevention (CDC), only 70.7% of children aged 19-35 months are fully immunized. Following vaccine schedules is influenced by various factors, including social determinants of health (SDoH). Although risk factors for under-immunization have been well documented, the ability to predict which child fall behind on immunizations is limited. Efforts to improve immunization rates could be facilitated by identifying children at risk for a delay. The application of machine learning and data analytics tools can fill this knowledge and practice gap. Our study uses the 2017 National Immunization Survey, a publicly available, nationally representative dataset available from the CDC to build a predictive model that identifies individual children at risk for an immunization delay. The NIS uses a 2-stage data collection process; stage 1 is household interviews, and stage 2 is corresponding provider interviews. The dataset has 28,465 children with household interviews, and 15,333 children with both household and provider interview data. Predictors will include SDoH risk factors, such as race, ethnicity, and insurance status, as well as maternal factors, such as education and income. Our methods will include both predictive analytics using machine learning models and visualization of results through geographic mapping. The results will provide a foundation for future application to county-level data that will inform local efforts to address immunization rates. With the insights and models built, we can better address vaccination trends, barriers, and solutions. Our ultimate goal is to make data-informed decisions to improve timely vaccinations among underprivileged populations.



Abstract #: 878

Title: The Helping Hand Project Video Game: Getting a Grip on User Abandonment of 3D-Printed Prosthetic Devices

Student Author: Irvin Naylor

Faculty Mentor (s): Dr. Richard Chi

College: College of Computing and Informatics

The purpose of this research is to explore a new method to address the 30-40% user abandonment of upper-limb prosthetic devices that is observed nationwide. Working closely with The Helping Hand Project, a regional non-profit organization dedicated to providing upper-limb 3D printed prosthetic devices to children at no cost, we have identified a major concern from their recipients that we believe contribute to prosthetic rejection. Recipients found the initial training for the prosthetic device to be challenging and can lead to abandonment, especially for congenital limb difference children that are not use to new mechanical movements. We hypothesize a computer game designed for and integrated into the mechanical movements of the prosthetic devices will aid in the training and allow the process to become more engaging and effortless, thereby reducing device abandonment. This summer, we plan to development both the hardware to serve as a computer input from the device and a simple 2D computer game in which the mechanical movements of the prosthetic device controls the in-game character. The game would be designed to engage and train the user to develop critical muscle movements over time. Following the initial testing and implementation, a series of interviews will be conducted, allowing users to express feedback on the design and game training and suggest potential features for the final design. Results from this study will have implications for future research in the area of the mental and emotional health resulting from increased confidence due to prosthetic usage.

Abstract #: 892

Title: Enhancing Multi-Functionality of Force

Student Author: Jackson Poulcott

Faculty Mentor (s): Dr. Richard Chi

College: College of Liberal Arts and Sciences

In collaboration with The Helping Hand Project, a non-profit organization that provides low cost prosthetics to children with upper limb differences, we have identified critical design improvements to their most commonly distributed 3D printed prosthetic device- the phoenix hand-, a wrist-driven hand that grasps upon wrist articulation. In a survey to recipients of their devices, there were two major designed improvements that were requested: (1) Independent functionality amongst the fingers and (2) better cosmetic features on the fingers. The purpose of this research is to investigate, report, modify, and prototype currently open-sourced designs to add both cosmetic features and improved mechanical functionality. Cosmetic features such as interchangeable fingernails will be designed to allow the users to change colors as desired. Additionally, we will improve the mechanical functionality by designing individual finger tensioners that will work on basic mechanical machine principles and allow the user to operate each finger individually. The design will be optimized to be simple enough for the children to build, assemble, and operate. Upon completing these new designs, they will be released to open-sourced platforms such as Thingiverse and readily available to all Helping Hand Project Chapters world-wide.

Abstract #: 898

Title: ourBRIDGE for KIDS: Building the Bridge to East Charlotte Immigrant and Refugee Elementary Schoolers

Student Author: Amilia Keomuongchanh

Faculty Mentor (s): Dr. Lan Kolano

College: College of Education

With over 20,000 immigrant enrolled students, the Charlotte-Mecklenburg school system is seeing a significant increase in English Learners (ELs). As the population continues to grow, the needs of this community continue to become more complex. This study is a part of a larger multi-year longitudinal evaluation of ourBRIDGE for KIDS, an after school program that supports the academic and socio-emotional development of 150 East Charlotte immigrant, refugee, and first generation American K-8 students. Specifically, this project examines one classroom in the after school program. The study highlights the interactions between the lead tutors and the children in one elementary case study. This data study showcases the qualitative results from year two of a multi-three year longitudinal program evaluation. Primary data collected from field observations, surveys, and individual interviews were analyzed to document the dynamics between the tutor's beliefs and approaches to teaching ELs. The study also highlights the academic and socio-emotional and the growth of the ourBRIDGE for KIDS participants in 2nd and 3rd grade. Field notes were conducted in all of the after school classrooms at ourBRIDGE for KIDS from September 2018 to June 2019. The research team spent over 250 hours collectively engaged in field work and gathering participant observation data. Preliminary data suggests that the beliefs and understanding of immigrant communities of the tutor played a significant role in the experiences of the ourBRIDGE for KIDS student participants.

# Charlotte Research Scholars

Abstract #: 801

Title: Determining PTEN's Physical Interaction with DNA

Student Author: Adam Dignan

Faculty Mentor (s): Dr. Shan Yan

College: College of Liberal Arts and Sciences

The major objective of this research is to determine if the phosphatase and tensin homolog (PTEN) protein binds to DNA and if so what domain of the protein is important for the DNA interaction. It is widely known that PTEN is a tumor suppressor and found to be missing or mutated in cancerous cells. Recent evidence suggests that PTEN participates in DNA metabolism directly. However, it remains unclear whether PTEN directly interacts with DNA. My major hypothesis is that PTEN will bind to a unique DNA structure and that the C-Terminal end will be important for the binding. There are three questions to guide this research: 1. First, the most important question is asked, does PTEN bind to DNA? 2. The second question is what DNA structure does it bind to? Is it double-strand, single strand, 3'-recessed, or another structure type? 3. The third question is what domain within the PTEN protein is responsible for binding to DNA? Using protein-DNA interaction approaches with purified protein and various defined DNA structures, I will determine the distinct aspect of PTEN's DNA interactions.

Abstract #: 802

Title: Fatigue Properties of Historic Wrought Iron Wire

Student Author: Marc Duemmler

Faculty Mentor (s): Dr. Ron Smelser

College: College of Engineering

This research project investigates the fatigue properties of historic wrought iron wire obtained from the Wheeling Suspension Bridge in West Virginia. The Wheeling Suspension Bridge was originally constructed in 1849 and was the only bridge to cross the Ohio River at that time. It was rebuilt five years later after being destroyed by a tornado. Several changes and additions occurred to the bridge throughout the years, but in 1956 it was completely overhauled. The wire to be tested for this project was collected during this refurbishment. Due to the age and the non-standard size of the wire, a methodology to accurately test the fatigue properties of the wire must be developed. Because the wire is smaller than the recommended standard size for testing wire, new grips must be developed to hold the wire. The cross-sectional area at the desired location of the wire's break must be smaller than the gripping area to ensure that the wire fails at the proper location. It is desirable that the cross-sectional area be uniform for all wires that are to be tested. Therefore, the cross-section of each wire must be reduced to a known size or an accurate measurement of the size must be made. To develop the testing methodology, initially 1018 steel wire of a similar size will be tested to ensure that the data collection method is accurate. Once the data from the steel wire yields accurate results, the fatigue properties of the historic wrought iron wire will be tested.

Abstract #: 803

Title: The Relationship Between Black Women and Water

Student Author: Taylor Lindsay

Faculty Mentor (s): Dr. Jordan-Zachery

College: College of Liberal Arts and Sciences

The basis of this research is to analyze how African-American women use water or water metaphors to heal or cope with racial and social issues across time. It is predicted that water practices or water metaphors heal or serve as coping mechanisms that surpasses standard behavioral and social practices. Throughout the 17th and 18th century, African women, along with the African people, were captured and forced into American Colonies. Today, America has integrated and progressed. However, African-American women continue to experience racial and social issues that are not easily perceived or understood by others or even themselves. From the 17th to the 21st century, the use of water metaphors is evident throughout the work of Black feminist speakers, writers, and scholars. Water or water metaphors were used to heal or cope with the severe abuse of slavery. Additionally, they were, and still are used to portray or understand African-American women's experiences, emotions, sexuality, and identity. Questions that are at the foundation of my research are: 1) What does the speaker or writer describe as what the black woman, women, or community need to heal from? 2) How does the speaker or writer describe the abuse or healing through water metaphors? 3) Is the work concerning a historical or every-day context? 4) Finally, is the work concerning a real, imaginary, or mythical context? These questions will help guide me so that I may summarize, interpret, compare, and contrast each source I analyze for an annotated bibliography. This research is to inform individuals of the presence and benefits of water metaphors throughout Black women's lives across time and space.

Abstract #: 805

Title: Synthesis and Characterization of Si(bzimpy)<sub>2</sub> Analogs for Application Within Organic Light Emitting Diodes

Student Author: Katherine Norman

Faculty Mentor (s): Dr. Thomas A. Schmedake

College: College of Liberal Arts and Sciences

The growing electronics industry shows current demand for more efficient and renewable material for organic light emitting diodes (OLEDs) and solar cells. Recently, hexacoordinate silicon complexes were shown to represent a promising new class of material for organic electronic devices with excellent electron transport properties and electroluminescence properties. The goals of this research project were (1) to develop synthetic variants of a class of hexacoordinate silicon complex and test the optical and electronic properties of the new materials, (2) to determine the effect of synthetic modifications on these properties, and (3) to see how well the experimentally determined properties compare to properties predicted by computer modeling. A series of complexes were synthesized 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 study were Si(HO-bzimpy)<sub>2</sub>, Si(MeO-bzimpy)<sub>2</sub>, Si(Me<sub>4</sub>bzimpy)<sub>2</sub>, and Si(MeOMe<sub>4</sub>bzimpy)<sub>2</sub>. The electron mobility and optical properties of the complexes were measured to determine how the synthetic variations might impact organic devices. Cyclic voltammetry was used to determine the reduction potential for the materials and the stability of the molecules in the reduced state. X-ray crystallography was used to observe the crystal structure, and ultraviolet-visible and fluorescence spectroscopy were used to determine the optical properties of each of the four modified complexes. Additionally, thermally deposited films were also studied to determine solid-state properties of each of the materials. Prototype devices containing the hexacoordinate silicon complexes are being developed.



Abstract #: 806

Title: Errors in Optical Measuring

Student Author: Maegan Edwards

Faculty Mentor (s): Dr. Konstantinos Falaggis

College: College of Engineering

The purpose of this research is to investigate and solve the errors that occur with optical measuring. Starting this project, I have read many articles written on the research already performed by various scholars such as, Hausler and Haung, two very well-known optical scientists who have researched optics for years. However, since the field of optics is a new concept and the research is limited, there are still errors in the experimentation portion of the research that has not been corrected. There are a few questions that I am looking to guide me and answer during the course of the project. The first question would be where do the errors originate, do they stem from the setup and design of the project or is the way we are taking the measurements are what causes the errors. The second question would be, has there been research already performed on this problem and did the researcher find a way to solve the problem. And the last question would be, how would I go about fixing this problem. Do I need to build a different setup, try a different camera, or a different lens? I will use the articles and other literary works already published to begin researching this problem and try to implement these new discoveries in my design for the project. The outcome of this research will be improving the accuracy of optical measurement by eliminating as many errors as possible and building on the research already performed in this field of study.

Abstract #: 807

Title: Liberal Religion and Race in America

Student Author: Gabriella Goodall

Faculty Mentor (s): Dr. Christopher Cameron

College: College of Liberal Arts and Sciences

The purpose of this research is to explore and identify the intersection of liberal religion and race in American history. The research is focused specifically on the Unitarian Universalist church and African American ministers within the denomination throughout the twentieth century. The UU churches in the early twentieth century were segregated and denied the representation of African American ministers. Liberal ministers began responding to race relations efforts in order to create equality in the religious life for all. There are two research questions that guide my research: First I ask, how has the Unitarian church reacted to the racial issues throughout American twentieth century history? Secondly, I inquire, if the involvement of the Unitarian Universalists religious ministers were impactful on society outside the church? I use document analysis research ethnography to discover key themes of the UU denomination ministers in twentieth century America. I use primary sources found in archives from Meadville Lombard Theological School, state newspapers, and interviews with key Unitarian Universalist ministers to support my research. The research conducted has narrowed the findings into two key themes. First, it was the African American liberal religion ministers who brought forward the discussion of racial issues within the denomination and society. These leaders and ministers were opening discussions through sermons and through the creation of a caucus or group meetings. Second, I analyze the acknowledgment of liberal religion efforts in American society in the twentieth century.

Abstract #: 808

Title: Do Beaver Impoundments Have Hydrological Impacts to a Developing Piedmont Watershed?

Student Author: Emily Henderson

Faculty Mentor (s): Dr. Craig Allan

College: College of Liberal Arts and Sciences

The purpose of this research is to quantify how beaver colonization has affected a McDowell Creek tributary (MC5) watershed. The study watershed is located in the town of Huntersville of Mecklenburg County in the Piedmont region of North Carolina. Maintaining water quality of MC5 and the larger McDowell Creek is important because the stream flows into Mountain Island Lake which is a drinking source for the county and the city of Charlotte. Previously, most of the watershed was rural and raised open pasture beef. In this pasture, the livestock had direct access to the creek and the stream was channelized. In 2012, the MC5 watershed was subject to stream restoration efforts which excluded livestock from the creek, modified the channel pattern, created a riparian buffer 50 ft on both sides, created wetlands and was replanted with native vegetation. In 2016, the eastern portion of the MC5 watershed was cleared and construction for subdivision housing started which still continues today. In early 2018, beavers built an impoundment that blocked the flow of the main channel of the MC5 watershed. How has the water balance and floodplain changed since beavers colonized in the MC5 watershed? Within the water budget model we will use a log of data that starts in March 2013 to find differences in stream flow, evapotranspiration, soil moisture, precipitation, and the water table. Field work will refine groundwater and soil moisture values. We would expect to see reduced streamflow and an increased flood plain during the post impoundment period.

Abstract #: 809

Title: Synthesis of the First Telone Complexes of Silver and Mercury

Student Author: Kirk Arcena

Faculty Mentor (s): Dr. Daniel Rabinovich

College: College of Liberal Arts and Sciences

We have prepared in the past several complexes of silver(I) supported by N-heterocyclic thione (NHT) and selone (NHSe) ligands, some of which exhibit potent 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) ligands IArTe (Ar = Xy, Mes, Dipp). Initial reactivity studies have led to the isolation of several silver(I) and mercury(II) complexes of general formulas  $[Ag(IArTe)_2]X$  (X = NO<sub>3</sub>, BF<sub>4</sub>, ClO<sub>4</sub>) and  $(IArTe)HgX_2$  (X = Cl, Br, I), respectively. Not surprisingly, the telone derivatives appear to be more thermally sensitive than their sulfur and selenium analogues. Significantly, these compounds are the first telone complexes of silver and mercury to be ever isolated and this presentation will also include a comparison of these recent results with previous work completed for the thione and selone analogues.

Abstract #: 811

Title: Investigating the Impact of Student Engagement in Service Learning

Student Author: Ashley Rankin

Faculty Mentor (s): Dr. Kim Buch

College: College of Liberal Arts and Sciences

The purpose of this research was to employ quantitative and qualitative research methods to investigate the impact of the Jamil Niner Student Pantry (JNSP) on student engagement in service learning. The JNSP is a university-wide initiative that serves UNC Charlotte students facing temporary or ongoing food insecurity. From its opening in September 2014, the JNSP has since expanded to include an on-site professional clothing closet and a community garden to further serve UNC Charlotte students in need. With the pantry's goals to serve food insecurity needs of students, raise awareness about hunger and food insecurity among college students, and provide an on-campus site for service learning and student engagement, this project was an empirical investigation of the third goal and examined the impact of having an on-campus service learning site for students to engage in prosocial behaviors. Student engagement was measured by the rates, types, and effects of volunteering at the pantry. The findings of this research will assist the JNSP in providing staff and future volunteers an explanation for the influence that the JNSP as a resource has on students, as well as support the development for more effective opportunities for service learning.

Abstract #: 813

Title: Examining Factors Influencing Suicide Attempts Among LGB High School Students in a Southeastern State

Student Author: Erin Meehan

Faculty Mentor (s): Sonyia Richardson, MSW

College: College of Health and Human Services

Suicide has remained the second leading cause of death among United States teenagers ages 15-19 since 2011. Preceding studies identify substance use, sexual violence, race, bullying and teen dating violence as compelling suicide risk factors among high school students. In addition, researchers suggest that identification as a sexual minority places adolescents at dramatically increased risk of suicide behaviors. However, broader literature indicates the need for a better understanding of factors that influence adolescent suicide attempts as suicide attempts are a strong indicator for suicide completion. The purpose of this quantitative exploratory study is to examine how substance use, sexual violence, race, bullying and teen dating violence influence suicide attempts among high school students who identify as sexual minorities. We conducted a multivariate analysis utilizing secondary data from a southeastern state's 2017 Youth Risk Behavior Surveillance Survey. Findings inform strategies for reducing suicide attempts among high school students and suggest directions for future research.

Abstract #: 814

Title: Investigating the Myth of “White Genocide” and the Self-Inflicted Social Death of Whiteness in the United States

Student Author: Savannah Brookins

Faculty Mentor (s): Dr. John Cox

College: College of Liberal Arts and Sciences

The purpose of this research is to uncover and investigate the delusion of “white genocide” that circulates within white supremacist groups, as well as to understand the historical and social circumstances that have led to this conspiratorial belief. In pursuing this, this project will help attain a larger comprehension of race and whiteness in the United by understanding the creation of “white” as a social class as well as a synonym for power through decades of immigration law, cultural rhetoric, and bad science. This research will also study current public sentiment around race in the United States and how demographic changes and political rhetoric are contributing to extreme conspiracy theories and myths formulated in these white supremacy echo chambers. There are three research questions that guide this study: 1.) How has the understanding of “whiteness” in U.S. opinion and culture morphed over time? 2.) What does this say about race and the ways in which the United States creates a racial-social hierarchy? 3.) Why do white supremacists believe they are being systematically destroyed, despite evidence proving otherwise? This research employs multiple methodologies beginning with reviewing published literature surrounding racism and violence, race history in the United States, and studies into far-right extremist groups which white supremacists are a part of. Beyond that, it will employ recent ethnographies into far-right groups, popular media and investigative journalism coverage, and a look into online websites like Gab, Reddit, and 4chan. It is hoped that this study will expand knowledge and give important insight on the issues of white supremacy and extremist violence which still grip the United States.

Abstract #: 815

Title: German Internment in the United States During World War I

Student Author: Parker Jeffreys

Faculty Mentor (s): Dr. Heather Perry

College: College of Liberal Arts and Sciences

The purpose of this research is to better understand the German experience in the United States during the early part of the 20th century by examining World War I internment camps in the United States. Many German citizens were held in the United States after the outbreak of war due to the circumstances of the war. Upon US. entry into the war in April of 1917 German-Americans and German citizens who happened to be in America, were put in a very strange situation. These people were not considered prisoners of war, but they also could not sail back to Germany, so they had to stay in America and were declared 'enemy aliens.' Our goal for this research is to understand these internees in their greater historical context, in doing so we will try to understand who was interned? Why they were interned? What did the internees do after the war was over? Did they stay in America? Did they return to Germany and support Nazism? Did they flee Nazism and come back to America? How were 'enemy aliens' handled by other countries around the globe? How did U.S citizens react to the internees? To begin our research, we will take a quantitative approach and develop a bibliography of all scholarly works that focus on WWI internment camps and prisoner of war camps. Then we will look at the local records surrounding these camps as well as immigration records to find out as much as we can about who was actually interned, so that we can begin to understand their experience. As with all historical research these answers will not be given to us directly; however, by understanding the greater context that surrounded these internees we will be able to flesh out their experiences and draw conclusions about effects that internment in the United States had on their lives.



Abstract #: 816

Title: The Identification of Molecular Structures in New, Unique Hydrocarbons Through the Use of X-ray Crystallography

Student Author: Austin Crockett

Faculty Mentor (s): Dr. Daniel Jones

College: College of Liberal Arts and Sciences

In the examination of new, unique hydrocarbons, no method is more powerful for the identification of bond lengths, bond angles, and stereochemistry than x-ray crystallography. X-ray crystallography is an examination method that utilizes properties of crystallized materials and electromagnetic radiation to identify structural elements of crystals and their comprising molecules. Similar to how light passing through a prism has its path deflected based on its wavelength, x-rays have their paths deflected when passing through crystalline structures. By taking exposures of x-ray radiation that is being diffracted by a chilled crystal with a radiation detector, a crystallographer can obtain a 2D representation of the radiation's diffraction pattern. Using various mathematical transformations and physical laws, the diffraction pattern can be manipulated to represent a crystal's lattice structure in such a way that one can identify stereochemistry, bond angles, and bond lengths down to an angstrom of certainty. Using this examination method, Dr. Daniel Jones's lab has identified the molecular structure of various hydrocarbons synthesized in an organic chemistry lab specialized in fluorine synthesis. Of the molecules, C<sub>11</sub>H<sub>12</sub>S<sub>2</sub> has been definitively analyzed and the results have an agreement factor (R<sub>1</sub>) much less than .05. Molecules C<sub>11</sub>H<sub>6</sub>F<sub>4</sub>O<sub>3</sub> and C<sub>13</sub>H<sub>10</sub>F<sub>4</sub>O<sub>4</sub> have been identified with an agreement factor approximately equal to .05. All the information was recorded with the crystals cooled to -173.5 C to maximize the precision and accuracy of bond length and angle measurements. The full diagrams and data tables of these molecule's structures will be presented in a research paper published by Dr. Daniel Jones and Dr. Markus Etzkorn.

Abstract #: 820

Title: Investigating the Distribution of Trehalose and Water in LAD Processed Samples Using Confocal Raman Spectroscopy

Student Author: Riley McKeough

Faculty Mentor (s): Dr. Susan Trammell

College: College of Liberal Arts and Sciences

Protein based therapeutics and diagnostics play an important role in modern medicine such as cancer treatment and disease detection. The current method for storage of proteins is freeze drying, which is expensive and difficult. Light assisted drying (LAD) provides a novel method of preservation with potential for room temperature storage. LAD 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. The storage temperature of the amorphous trehalose increases as the water content decreases. After processing, the amount of water present in the sample is calculated as the end moisture content (EMC). The samples processed in LAD were 0.49 mg/ml lysozyme in 0.2M trehalose and 0.33x Phosphate Buffered Saline (PBS). The samples were processed with a 5W 1064nm Laser for 1 hour, with a resulting average EMC of  $0.14 \pm 0.02$ . Since the average EMC determines storage temperature, it is important to ensure the sample is dried uniformly. Potential nonuniform distributions of trehalose and water can cause variations in the amorphous trehalose matrix. These variations can lead to instability of the amorphous structure at the storage temperature calculated from the average EMC. To detect water and trehalose, confocal Raman spectroscopy was used at five locations 20 $\mu$ m beneath the surface of each LAD processed sample. Peak analysis of the Raman spectroscopy data is used to detect any nonuniformity in water and trehalose content throughout the LAD processed samples.

Abstract #: 822

Title: Lyophilization for Stable Storage and Transportation of Nucleic Acid Nanoparticles

Student Author: Allison Tran

Faculty Mentor (s): Dr. Kirill Afonin

College: College of Liberal Arts and Sciences

RNA therapeutics are an emerging class of pharmaceuticals with an increasing amount of potential in clinical applications. Recent advances in nanotechnology have allowed for the methodical design of nucleic acid nanoparticles (NANPs) that have modulatory structures with tunable physicochemical properties, high uniformity, and reproducibility. These novel structures have the ability to carry several therapeutic moieties, allowing for synergistic and combinatorial therapy. Despite the efficacy and potential of the NANPs, maintenance of their structure during the packaging and shipping process remains a pressing issue due to their reduced stability at higher temperatures. Nucleic acids shipped in liquid phase require constant refrigeration, which greatly increases the cost of transportation. This project proposes a method of dehydrating NANPs via lyophilization for efficient storage and transportation. Lyophilization is the process of drying samples by freezing them and then allowing their contents to sublime in a pressure-lowering vacuum. The results indicate that this method is shown to successfully preserve the structure of the NANPs more effectively than dehydration via heat and infrared radiation or storage in solution. Overall, lyophilization can be potentially be utilized as an optimal method of dehydration for the stable storage and transportation of NANPs. This refinement in the preparation of the nucleic acid nanoparticles allows for more precise control over their structure and functionality, a forward advancement in the future development of their clinical application.

Abstract #: 825

Title: The Food Justice Project: Assessing the Needs of Food Insecure Latinx Individuals With Low Acculturation.

Student Author: Abigail Coffey

Faculty Mentor (s): Dr. Jim Dudley

College: College of Health and Human Services

According to the USDA, Latinx populations experience the second highest rates of food insecurity at 22.4% behind African Americans at 26.1% (Rabbit, Smith & Coleman-Jenson, 2016). There are many barriers to improving the situation of these people, including language differences, cultural differences, and a lack of education to name a few (Taverno Ross, Macia, Documét, Escribano, Naderi & Smith-Tapia, 2018). However, one limitation that is largely ignored in the literature is the duration and leadership of many interventions. Short term interventions do help increase food insecurity, but when the intervention is over, the community is left with no infrastructure of personal leadership or responsibility (Martin, Redelfs, Wu, Bogner & Whigham, 2019). This study suggests conducting semi-structured needs assessment based interviews with Latinx people in Cabarrus County, NC. These interviews will be guided by the use of the Seven Areas of Service model made by the Cabarrus County Farm and Food Council, which include the following areas: nutritious food, employment and schooling, community connections, preparing food, buying food, government assistance, and counseling and support. The goal of these interviews is to, 1) understand what services listed above could be provided to make the journey to food security a long term goal and 2) serve to identify community leaders who will serve to build a support network of local resources. With the community members directly benefiting in the research process and being involved in the work, this will serve to bridge the gap between many short term interventions and the effectiveness of them.

Abstract #: 826

Title: An Analysis of Utilizing IoT Devices to Supplement and Enhance Instructional Techniques

Student Author: Sandra Wiktor

Faculty Mentor (s): Dr. Mohsen Dorodchi

College: College of Computing and Informatics

Modern instructional techniques mandate the integration of contemporary technological solutions to aid such techniques. This research explores the possibility of utilizing the Internet of Things (IoT) devices to track quality of participation and collaboration in an active learning classroom. IoT, commonly defined as computing technology interleaved into common objects with the aim of enabling them to send and receive data, is a rapidly growing field proliferating the technological sphere. Research into the field of IoT is relevant toward a variety of subjects including safer mining production, healthcare service, the food supply chain, and countless others. A literature review reveals the influence of IoT elements, such as wireless sensor networks, barcodes, and cloud computing in modern industries. The necessity to explore this budding technological concept is evident.

The focus of this research proposes the use of an IoT device, a Raspberry Pi equipped with a sound capture card, to track the effectiveness of current learning techniques by gauging the level of engagement in response to the teaching techniques implemented. We explore the practicality of utilizing the Raspberry Pi to analyze the conversations in a table of an active learning classroom and produce real-time analysis. This research also delves into the best method of utilizing machine learning to track the engagement of students -- namely, we explore the contrasting results of utilizing supervised learning methods as opposed to the unsupervised learning method, which yields less accurate results. Essentially, this research explores the viability and potential benefits of introducing such a device to classrooms to help with a better understanding of the overall quality of collaborative activities.

Abstract #: 832

Title: Application of Hexacoordinate Silicon Complexes and Thiazolothiazoles in Organic Electronics

Student Author: Kevin Boyle

Faculty Mentor (s): Dr. Michael Walter

College: College of Liberal Arts and Sciences

Organic electronic devices such as Organic Light Emitting Diodes (OLEDs) and solar cells have become widely used in electronics over the past decade. For example, OLEDs have become widely used in electronic displays due to their light weight and higher quality images. Current devices, however, are composed of rare earth elements, that are less abundant, more expensive, and toxic. As a result, safer, longer lasting, and more efficient materials have become necessary to create better devices.

Two general systems of small molecule chromophores were investigated. The first of these systems are a group of hexacoordinate silicon materials that have applications in organic electronics such as OLEDs, solar cells and organic field-effect transistors (OFETs). These silicon materials show promise due to their fluorescence, general stability, and electron transport ability. The second general system investigated are a type of "rigid rod" chromophore called thiazolothiazoles (TTzs). These TTzs are easily synthesized in one reaction. Both systems show good initial electron mobility, fluorescence, and are thermooxidatively stable, which are important properties for electronic device operation. These materials have also been incorporated into basic devices using vacuum deposition, making it compatible with commercial technologies. However, there are aspects that must still be investigated, such as other processing methods and device stability. In this work, the free charge carrier mobilities of hexacoordinate silicon materials and TTzs were measured using Space Charge Limited Current (SCLC) and OFET device geometries.

Abstract #: 833

Title: Transfer Student Success: More Support for Learning Communities

Student Author: Brittany Carroll

Faculty Mentor (s): Dr. Charisse Coston

College: College of Liberal Arts and Sciences

Transfer students face an array of difficulties upon entering colleges and universities. As a result, many institutions have begun creating learning communities in order to help transfer students integrate and cope with the changes that come with enrolling in college or university. The purpose of this exploratory and descriptive cross-sectional study is to examine the efficacy of learning communities for transfer students entering a university. The literature seeks to answer the following 5 questions: 1) What is a learning community? 2) What is the scope of the use of learning communities? 3) What outcomes have been reached in previous research regarding learning communities? 4) What are some of the problems with learning communities? 5) What specific populations do the learning communities at these authors' institution, a large urban university in the south, target? This article seeks to answer these questions and discuss the importance of providing programs to address the specific needs of transfer students. This article will then present demographic, academic and social outcomes from data gathered from the participants in the Criminal Justice Learning Community (CJLC) at this institution as well as those of non-participants over a 10-year period. These data display the academic outcomes of students who participated in learning communities as opposed to those who did not participate. These data reveal that students who participate in learning communities have better academic outcomes than their non-participant peers. The academic outcomes measured in this research project of the students in learning communities include better overall grades and increased graduation rates than those who did not participate in the CJLC.

Abstract #: 834

Title: An Analysis of the Influence of Blended/Personalized Learning Programs on Elementary Students' Mathematical Understanding

Student Author: Calysta Castillo

Faculty Mentor (s): Dr. Drew Polly

College: College of Education

Personalized learning and blended learning are teaching methods that are becoming more popular in classrooms today. Online learning programs used in classrooms in blended and personalized learning settings intend to differentiate instruction for students. This study aims to examine the impact and potential impact of these programs. This is a qualitative study that looks at personalized learning mathematics programs used in elementary school classrooms. The study includes two components: 1) a critical analysis of data-based literature on the impact of these programs, and 2) an analysis of the types of mathematical tasks in these programs using a research-based framework (Smith & Stein, 1998). Preliminary findings about the data-based literature indicates that personalized and blended learning programs have potential to close achievement gaps for students who have not yet met grade level expectations, and to increase the percentage of students reaching the top percentiles of their grade in standardized tests. Preliminary findings about the types of mathematical tasks indicate that most programs are full of games that only require lower level demands. Implications of this study suggest that teachers supplement these programs with hands on materials and follow up questions such as where in the representation we see a certain number.



Abstract #: 836

Title: Outstanding Universal Value in Relation to Adverse Cultural World Heritage

Student Author: Deja Stover

Faculty Mentor (s): Dr. Vaughn Schmutz

College: College of Liberal Arts and Sciences

UNESCO's World Heritage Convention is an international convention that focuses on identifying natural and cultural sites of wonder with "outstanding universal value" to humanity. To date, more than 1,000 sites are inscribed on the World Heritage List. Inscription is generally seen as a source of national pride as the overwhelming majority of inscribed cultural heritage sites have a positive memory or connotation. However, some cultural sites are associated with negative memories or events in a nation's past, which have recently been referred to as "sites of conscience." Previous research has looked into nations that cover up or try to hide negative memories from the past. In some nations we see the opposite. In this project, I explore how adverse heritage sites come to be seen as having "outstanding universal value" to humanity. Based on case studies of adverse heritage sites that have been inscribed on UNESCO's World Heritage List, I address this question, how do adverse heritage sites come to be seen as having "outstanding universal value to humanity"? More specifically, I use qualitative analysis of key documents including the nation's justification for inscription, the expert advisory bodies' assessment, the decisions of the World Heritage Committee, and so on.

Abstract #: 844

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

Student Author: R. Connor Wood

Faculty Mentor (s): Dr. Johanna Claire Schuch

College: College of Liberal Arts and 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 University of North Carolina at Charlotte is no different. As such, it is essential to understand changes in the housing supply and prices surrounding the university. This study investigates how UNC Charlotte off-campus student housing rents have changed since 2000, what factors are driving these potential changes, and what the implications of these changes are for students. I do this by examining rent price changes in comparison to UNC Charlotte enrollment changes and changes in overall Charlotte rent, and conducting a student survey to understand cost burden of students.

Abstract #: 846

Title: MamaView

Student Author: Lauren Reid

Faculty Mentor (s): Dr. Alicia Dahl

College: The College of Health and Human Services

The goal of this research study is to better understand the health related or risk factors that can impact the pregnancy experience of a woman from a lower socioeconomic status. It is important to understand the factors, such as food insecurity, that may play into a woman's pregnancy, to gain a deeper perspective of how to best cater to the pregnant woman's needs. The questions that will guide this research will be: 1. What is, if any, the correlation between women of a lower socioeconomic status and food insecurity during pregnancy? 2. What are the varying factors that may impact a woman's ability to be food secure? And finally, 3. How does food insecurity affect pregnant women based on their education level? I will analyze data from survey collection to reach a consensus on the correlation between women of a lower socioeconomic status and their susceptibility to being food insecure. I will explain the various challenges women from a lower socioeconomic status face during pregnancy then I will discuss how these challenges may correlate to food insecurity during pregnancy.

Abstract #: 849

Title: Race, Gender, and Sexuality: Examining Marginalized Voices in Négritude's History

Student Author: Shannon Williams

Faculty Mentor (s): Dr. Elizabeth Paquette

College: College of Liberal Arts and Sciences

The purpose of this research is to examine the Négritude movement in relation to gender and sexuality. In the book *Négritude Women* author T. Denean Sharpley-Whiting states the term Négritude was coined by poet Aimé Césaire in his work *Cahier d'un retour au pays natal* or *Notebook of a Return to Native Land* signaling the birth of a Pan-Africanist literature. Although Négritude is credited to Césaire the "inauguration of a black humanism, as a 'theory of black cultural importance and autonomy' remains in a panoply of critical works" (2002, 1). In other words, Césaire (along with Leopold Sedar Senghor and Leon Damas) is given credit yet Négritude as a theory exists in other works published before the "foundational" writings and term. While researching the history and particulars of Négritude there is an evident lack of research connecting women's writing to the movement. Négritude's history and research neglects some marginalized voices. Who are the women excluded from Négritude's history? What other marginalized voices are omitted? What gets lost in this idea of Black Humanism with these exclusions? Utilizing literature review of primary and secondary sources I narrow my goals to highlighting Négritude women writers in Interwar Paris including Paulette Nardal, Jane Nardal, and Suzanne Césaire. Also included is Black Marxist writer Claude McKay to connect Négritude, the Harlem Renaissance, and the LGBTQ community. Concerned with lack of representation of people and writings in Négritude research this project works to represent those authors and discuss the need of more inclusive research.

Abstract #: 851

Title: Associations Between Views of the Self and Goal-Directed Behavior in the Context of Emotional Distress

Student Author: Seena Koohestani

Faculty Mentor (s): Dr. Laura Marie Armstrong

College: College of Liberal Arts and Sciences

Personally meaningful goals are elaborated representations of what a person wishes to achieve in their life at a given moment. Goal-directed behavior that leads to the achievement of personally meaningful goals is important because it is associated with enhanced wellbeing, happiness, and life satisfaction. In contrast, difficulties engaging in goal-directed behavior and low goal attainment are associated with decreased life satisfaction and higher levels of depressive symptoms, including sadness and irritability. Prior work has demonstrated that having support from others and feeling in control over goal-relevant outcomes contributes to high goal achievement, whereas problems handling negative emotions (e.g., anxiety or anger) can interfere with one's ability to engage in goal-directed behavior. However, little is known about how one's view of the self influences goal-directed behavior, particularly within the context of emotional experiences. Therefore, the objective of this study is to examine the associations among negative views of the self (self-judgement, self-criticism, and low self-esteem), over-identification (unhealthy fixation) with one's emotions, and difficulties with goal-directed behavior when distressed. We hypothesize that negative views of the self will be associated with greater difficulties in goal-directed behavior through the over-identification with one's emotions. Participants will include 102 college students (aged 18-25 years old), who completed questionnaires assessing their views of the self, as well as difficulties with emotion regulation and goal-directed behavior. We will use mediation models to test our hypotheses. The findings from this study may have important clinical implications for fostering goal-directed behavior among those at risk for mental health problems.

Abstract #: 852

Title: Investigating Children's Literature as a Strategy for Teaching Elementary School Students a Historically and Developmentally Accurate Timeline of Indigenous People in the United States

Student Author: Isobel Bannon

Faculty Mentor (s): Dr. Tehia Glass

College: College of Education

Elementary education is a challenging field for many reasons, but one of the main challenges in this field is presenting young children with information on topics that are difficult to discuss. One of the most challenging discussions to have with elementary school students is about the history of indigenous people in the United States. Current social studies curriculum centers around Thanksgiving, sharing, and community between the Native Americans and colonial settlers. While it is positive that Native Americans are part of the current required curriculum, it is not required that these lessons be historically accurate or taught throughout the year. That being said, teaching social studies in elementary schools is a challenge in itself because it is a subject that often gets ignored or replaced with more prominent subjects such as math and literacy. Due to this current reality in elementary schools, many teachers are left unsure how to both find time for social studies and teach such a challenging topic to young children. This research focuses on using children's literature as a strategy that will ensure that teachers can find time to teach social studies lessons and gives them an outlet for beginning courageous conversations with their students. This research strives to investigate how effective children's literature can be in allowing teachers to explore and present topics about the history of indigenous people in the United States and provide teachers the time in their schedule for such discussions by integrating them into their daily literacy lessons.

Abstract #: 854

Title: Integrating Human Rights Education into K-12 Classrooms

Student Author: Elise Lyght

Faculty Mentor (s): Dr. Sarah Minslow

College: College of Liberal Arts and Sciences

The aims of this research are to assess the best practices in human rights education (HRE) and create learning resources for use in K-12 schools based on literature written for young audiences. This project involves four phases: researching what human rights education is and what the best practices are for teaching K-12 students about human rights; surveying K-12 educators about the resources that would be most useful for integrating HRE into their classrooms; collecting and analyzing Children's and Young Adult literature about human rights issues, and developing lesson plans that can be disseminated to and implemented by K-12 educators. For this project, we will focus our search and analysis of literature around a specific, urgent human rights issue, the refugee crisis. The analysis of Children's and YA literature about refugees and the refugee crisis will draw criteria from children's literature scholars with special attention on historical accuracy, distancing strategies to engage young readers without traumatizing them, and literary quality. The literature will be limited to works published in English within the last 20 years. The results of this project include a curriculum unit that better equips educators to include material focused on promoting human rights and acquiring knowledge of global issues in classroom settings. The curriculum plan will be informed by the ideological underpinnings of HRE with the goals of promoting global citizenship, peaceful coexistence, and social change to create a more rights-respecting society.

Abstract #: 856

Title: Investigating the Relationship Between Social Media Use, Alcohol Consumption, and Peer Attachment

Student Author: Jordan LoFaso

Faculty Mentor (s): Dr. Erika Montanaro

College: College of Liberal Arts and Sciences

The purpose of the current research project is to explore the relationship between social media use, peer attachment, and alcohol consumption. Since young adults are more exposed to risky drinking behaviors in college, it is important to understand what influences college students to participate in this behavior in order to minimize negative health risks. Social media use allows college students (1) to connect with peers, (2) provides them an outlet to disclose their own alcohol use, and (3) exposes them to alcohol-related content posted by their peers. Peer connection (e.g., peer attachment) has been separately linked to both internet/phone use and alcohol consumption, so it may play an important role in understanding how social media use and alcohol consumption are connected. Therefore, there are two broad research questions that guide my research: (1) What aspects of social media use predict alcohol consumption? (e.g., Does the number of times someone logs on or the number of followers/posts predict alcohol consumption rates?), and (2) What social factors influence this relationship? (e.g., What role does peer attachment play in the relationship between social media use and alcohol consumption?). Facebook, Instagram and Twitter posts from the past 6 months as well as survey data were collected from 68 young ethnic minority women ( $M= 19.88$ ,  $SD=1.81$ ) during a lab visit. Specifically, I will be investigating factors, such as peer attachment, that can influence or explain why increased use of social media leads to increased alcohol consumption by using the appropriate statistical tests.



Abstract #: 858

Title: An Exploration of Potential Flaws of Equilibrium-Based Employment Growth and Working Age Population Growth

Student Author: Stephen Burke

Faculty Mentor (s): Dr. William Graves

College: College of Liberal Arts and Sciences

Historically, the field of economics assumes that domestic migration is strongly correlated the availability of jobs (the assumption is that people always follow jobs). I am an exception to this because my migration decision was influenced by the amenities that the city offers instead of jobs offered. A corollary to the assumption that people follow jobs is that a lack of job growth will limit migration -- a city's labor force is not expected to grow to unsustainable levels. Recent studies have found evidence that this relationship is weakening due to perceived lack of opportunity in rural areas or smaller towns and more opportunity in larger cities. This study examines working age population to employment ratios for the 50 largest US metro areas from 1969 to 2017 to identify changes in these ratios in places where more people than jobs exist and places where fewer people than jobs exist. Working age, defined as ages 18 to 64, was used to filter out the effects of aging populations and distortions caused by college towns. Regression analysis was used to quantify the changes in the relationship between population and employment growth that have occurred over the past 48 years. Control variables were used to see if poverty, cost of living, and income influence these results. A group of "boom-towns" and "bust-towns" were found where the expectation of equilibrium failed. These findings have implications on city planners in "boomtowns" to anticipate population growth that may occur despite a sluggish job market.

Abstract #: 861

Title: Determining the Interaction Between Vps501 and the SEA Complex During Autophagy

Student Author: Aaron Stecher

Faculty Mentor (s): Dr. Richard Chi

College: College of Liberal Arts and Sciences

The endosomal system is the central distribution network for the sorting and export of cargos that are packaged and conveyed by tubular and vesicular carriers destined for plasma membrane recycling or Golgi retrograde transport pathways. One major family of proteins that is associated with the endosome membrane and is involved in sorting and transport of cargos is the sorting nexin (SNX) family. In particular, the SNX-BAR proteins, a sub-family of sorting nexins characterized by the presence of a C-terminus dimeric Bin/Amphiphysin/Rvs (BAR) lipid curvature domain, and by their ability to recognize phosphatidylinositol 3-phosphate through an evolutionarily conserved Phox-Homology domain, are of great interest. Defects in the sorting nexin family are implicated in several diseases, including Alzheimer's, Parkinson's, pathogen invasion, and cancer. In yeast, six SNX-BARs have been well studied, along with their homologs in higher eukaryotes. Our lab has recently begun characterizing the last SNX-BAR protein in yeast, we have named Vps501. Using mass spectrometry we have found Vps501 interacts with subunits of the SEA complex, an evolutionarily conserved TORC1 signaling complex. The SEA complex is composed of two subcomplexes; SEACAT and SEACIT, which work antagonistically with each other to regulate autophagy. Furthermore, cells lacking Vps501 display a deficiency in starvation induced, nonselective autophagy that is severely exacerbated by ablation of subunits of the SEACIT. The goal of my current project is to determine if the SEACAT also functions with Vps501 in autophagy.

Abstract #: 863

Title: Identifying Sex and Gender Dimensions of Tuberculosis in Tanzania

Student Author: Alexandria Belton

Faculty Mentor (s): Dr. Monika Sawhney

College: College of Health and Human Services

Tuberculosis (TB) dramatically impacts countries that experience economic disparity and social injustice. Globally, it is estimated that TB has caused 1.3 million deaths in 2017 (WHO, 2018). In Tanzania TB raises epidemiological concern, being it is a top TB burdened country (WHO, 2018). Women are predictably the vulnerable population however, in Tanzania this notion does not persist as true. Gender disparity affects how men and women utilize health resources. This project will use qualitative data to identify facets of the gender divide including demographic and cultural barriers in seeking care for TB. The proposed method for the larger study involves the evaluation of focus group discussion. Preliminary data shows that women are less vulnerable to TB due to their health seeking behavior. Women seek medical treatment for maternal/fetal health screenings leading to the detection of disease such as TB. Men have disproportionately higher rates of disease prevalence, treatment failure, and TB related mortality. They fail to utilize healthcare resources due to the inherent belief that men are less infected with TB. The project will encourage the evaluation of passive case findings in Tanzania. Study results will further employ methods to provide education, encourage treatment, and delay disease progression in men who are significantly burdened by TB in Tanzania

Abstract #: 865

Title: Rhythms in Locomotor Activity of Fiddler Crabs During the Reproductive Season

Student Author: Leyna Pence

Faculty Mentor (s): Dr. Paola López-Duarte

College: College of Liberal Arts and Sciences

Like many estuarine species, fiddler crabs time daily activities to the tidal cycle. A circatidal (circa = almost) clock allows them to track the environmental changes that occur throughout the tide (e.g., inundation). Fiddler crab adults engage in feeding and reproductive behaviors during low tide, but remain in their burrows during high tide. However, ovigerous (bearing eggs) females stay in the burrows for the entirety of embryonic development (~14 days). Our previous work indicates that it is during this incubation period that ovigerous females entrain the circatidal clock of developing embryos. We do not know how this information is transmitted to the embryos, but we know it is critical because once they hatch, larval swimming must be synchronized with tidal currents to favor their export to coastal areas, where they undergo development. To identify the behaviors that may entrain the clock, we will measure the activity (horizontal displacement and movement) of ovigerous females relative to male and non-ovigerous crabs of the sand fiddler crab (*Leptuca pugilator*) under constant conditions using Ethovision 14.0 software (Noldus Information Technology). We hypothesize that ovigerous females also exhibit activities synchronized with the tidal cycle during incubation and are not inactive in the burrows, as it would appear from field observations.

Abstract #: 866

Title: Effects of Physical Activity, Nutrition, and Sleep on Stress in College Freshmen

Student Author: Katerina Lantz

Faculty Mentor (s): Dr. Hannah Peach

College: College of Liberal Arts and Sciences

It is well known that college students experience stress. The change in lifestyle from high school to college makes them susceptible to several risk factors for increased stress. Previous research has found uncontrolled eating and poor sleep quality are associated with higher perceived stress among college students, and that physical activity can partly manage stress by increasing positive affect. Therefore, the present study examined how physical activity, nutrition, and sleep longitudinally affect the stress of first year college students. Data were collected using a Qualtrics survey. Self-reported perceived stress, eating habits, physical activity, and sleep quality were collected from college freshmen (N=131) during their first (Time 1) and second (Time 2) semester. A regression was used to examine if eating habits, physical activity, and stress at Time 1 predicted perceived stress at Time 2 above and beyond known covariates. After controlling for age, gender, alcohol consumption, socioeconomic status, and depression, a regression analysis found that eating habits ( $b = -.07$ ,  $\beta = -.14$ ,  $p = .443$ ), sleep quality ( $b = .34$ ,  $\beta = .06$ ,  $p = .64$ ), and aerobic exercise ( $b = .66$ ,  $\beta = .16$ ,  $p = .34$ ) were not significant predictors of Time 2 perceived stress. However, strength/flexibility exercise significantly predicted stress ( $b = -2.45$ ,  $\beta = -.42$ ,  $p = .003$ ). Strength/flexibility exercise was the only health behavior found to predict perceived stress longitudinally above and beyond known risk factors for stress. More research is needed to understand why strength/flexibility exercise is beneficial to the reduction of stress.

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Abstract #: 869

Title: Administration of 5-FU Combined With MCC950 Reduces Inflammasome IL1 $\beta$  and IL18 Cytokine Secretion in Tumors in an Immunocompetent Pre-Clinical Breast Cancer Model

Student Author: Melissa Aiello, Katherine Holtzman

Faculty Mentor (s): Dr. Didier Dréau

College: College of Liberal Arts and Sciences

In breast cancer, inflammation is a key factor in tumorigenesis and metastasis, promoting tissue remodeling, angiogenesis and immunosuppression. NLRP3 inflammasomes are cytoplasmic complexes that pair the adaptor ASC1 protein and receptor NLRP3 to activate caspase 1 leading to the generation of the pro-inflammatory cytokines, interleukin (IL) 1 beta (IL-1 $\beta$ ) and IL18. NLRP3 activation, associated with inflammation and cancer progression, is selectively inhibited by NLRP3 inflammasome inhibitor MCC950. Here, we investigated the potential benefit of a therapeutic regimen combining MCC950 and fluorouracil (5-FU) in the 4T1 immunocompetent pre-clinical murine orthotopic model of breast cancer progression and the associated IL1 $\beta$  and IL18 expression in tumors. After 36 days, the 5-FU + MCC950 regimen led to significantly reduced tumors compared to vehicle or MCC950 treatment ( $p < 0.05$ ). Apoptosis and growth as determined by active caspase 3 and Ki67 expression were not significantly altered in tumors. However, both IL1 $\beta$  and IL18 expression were lower in tumor from mice treated with both 5-FU and MCC950 compared to tumors from mice treated with vehicle or MCC950 alone ( $p < 0.05$ ). Notably, whereas IL18BP expression was similar regardless of treatment, IL1RA expression was significantly increased in tumor from treated mice ( $p < 0.05$ ). Together, these observations highlight the potential of combining inflammasome inhibition with standard of care treatment to prevent breast cancer progression. [-Supported by UNC Charlotte Faculty Research Grant to DD; MA is Charlotte Research Scholar-].

Abstract #: 870

Title: Evolution of Dissolved Inorganic Carbon in Shallow Groundwater and its Relationship to Water Quality at Three Piedmont Research Sites

Student Author: Elizabeth Batianis

Faculty Mentor (s): Dr. David Vinson

College: College of Liberal Arts and Sciences

Carbon in groundwater evolves as it flows through different geologic regions. This study focuses on using stable carbon isotope tracer techniques to witness the behavior of carbon isotopes as water moves through extremely chemically weathered rock called saprolite. The groundwater and surface water in a region is often influenced by chemical processes like oxidation-reduction reactions. These reactions most often occur in the saprolite and can remove water quality contaminants, as well as release unwelcome elements into the groundwater. As a result, the water quality is challenging to predict. Weathering silicate minerals and microorganisms releasing carbon dioxide are examples of processes that dissolved inorganic carbon (DIC) tracers record. There are three research sites to this project in the Charlotte area; Redlair, Langtree, and Reedy Creek. Each sampling well is pumped or bailed, then filtered for analysis later. In the lab, a sample is analyzed for cations, anions, dissolved inorganic carbon, and alkalinity. At the Langtree site, the average alkalinity values for the shallow wells were low, while the highest values were found in the deep wells. At Redlair, the same pattern can be seen. The shallow wells have the lowest alkalinity values and the deep wells have the highest. The delta C thirteen ratios for deep groundwater wells are higher than shallow and intermediate wells. This conclusion points to the groundwater evolution through mineral reactions. The hydrolysis of the saprolite rock changes the groundwater chemistry as water travels vertically and laterally through it.



Abstract #: 871

Title: Identifying Sex and Gender Dimensions of Tuberculosis in Tanzania

Student Author: Alexandria Belton

Faculty Mentor (s): Dr. Monika Sawhney

College: College of Health and Human Services

Tuberculosis (TB) caused by bacillus mycobacterium dramatically impacts countries around the world causing approximately 1.3 million deaths in 2017 (WHO, 2018). In Tanzania the epidemic is fueled by gender inequity, urbanization, and delay in diagnosis. Tanzania utilizes passive case findings to control TB prevalence (WHO, 2018). This method relies on the health-seeking behavior of those who exhibit TB related symptoms. Rates of infection can be minimized if those infected are promptly diagnosed and treated. Gaps in detection will aid in the assessment of the potential gender divide existent in Tanzania. Diagnostic delay, and faulty case reporting impact the spread of disease and infection. Women are predictably the vulnerable population however, in Tanzania this notion does not persist as true. Gender disparity has an impact in terms of utilization of health resources. This project uses qualitative methods (primarily focus groups) to identify facets of the gender divide including demographic and cultural barriers in seeking care for TB in Tanzania. Preliminary data highlight women being less vulnerable to TB due to their health seeking behavior. Women seek medical treatment for maternal/fetal health screenings leading to timely detection of TB. Men have disproportionately higher rates of disease prevalence, treatment failure, and TB related mortality, primarily due to limited utilization of healthcare services. Results from this project will strengthen the use of passive case findings in Tanzania. Furthermore, results from the study will assist in bringing policy level changes in provision of education and timely treatment among men and other vulnerable populations.

Abstract #: 872

Title: In Vitro Characterization of Tdp-Fucosamine Acetyltransferase Activity Using Instrumental Analysis

Student Author: Cassidy Means

Faculty Mentor (s): Dr. Jerry Troutman

College: College of Liberal Arts and Sciences

The enterobacterial common antigen is a glycan that resides on the outer membrane of bacteria in the Enterobacteriaceae family that is involved in bacterial virulence. The antigen is assembled on a bactoprenyl phosphate (BP) anchor in the inner membrane, and consists of the following polymerized trisaccharide unit: [N-acetyl-D-glucosamine ( $\alpha$ -D-GlcNAc)]-(4 $\rightarrow$ 1)-[N-acetyl-D-mannosaminurinic acid ( $\beta$ -D-ManNAcA)]-(4 $\rightarrow$ 1)-[4-acetamido-4,6-dideoxy-D-galactose ( $\alpha$ -D-Fuc4NAc)]. Fuc4NAc, the final sugar to be added to the trisaccharide unit, is produced by a series of reactions involving three enzymes: RffG, WecE, and WecD. RffG utilizes thymidine diphosphate (TDP)-glucose to produce TDP-4-keto-6-deoxy-D-glucose, which WecE uses as a substrate to produce TDP-fucosamine. WecD utilizes the molecule acetyl coenzyme A (AcCoA) to acetylate the 4' amine group of TDP-fucosamine, which produces TDP-Fuc4NAc and coenzyme A (CoASH). Due to the implication of ECA on bacterial virulence, it is of value to characterize the activity of WecD. To do this, *E. coli* designed to overproduce RffG, WecE, and WecD were grown and lysed to extract and purify the proteins. SDS-PAGE was used to determine that the proteins were pure. TDP-fucosamine was synthesized in vitro using a one-pot reaction with RffG and WecE. Reaction progression was monitored via high performance liquid chromatography, which used an Agilent Zorbax NH2 column. The TDP-fucosamine was then used as a substrate for WecD (in combination with AcCoA) to synthesize TDP-Fuc4NAc in vitro. This project was the first to characterize the activity of WecD in vitro and provides information for future studies that can identify ECA pathway inhibitors.

Abstract #: 874

Title: An Examination of the Extent to Which Caucus Leadership Attracts Similar Levels of PAC Financial Support as Committees.

Student Author: Riley Kramer

Faculty Mentor (s): Dr. Eric Heberlig

College: College of Liberal Arts and Sciences

Members of Congress can signal their political priorities through joining congressional membership organizations, which consume legislative time and personal funds. Membership benefits of these organizations, informally called congressional caucuses, include the facilitation of repeated interactions with like-minded politicians, lobbyists, and PACs (Kroszner 1998). Recent literature has begun to value the caucus system for its social utility amongst legislators, more specifically for the relationships fostered from membership (Victor 2009; Hammond 1998). In multiple studies, it's been found PACs contribute to legislators in congressional committees to encourage the social utility and coordination of shared policy and political goals which benefit their industries (Forgette 2004). PAC contributions towards committee members is well documented, however there hasn't yet been a large scope of research on how it compares to caucus members (Hojnacki 2001; Hall 1990). These studies on committees indicate a correlation between PAC contributions and legislative effectiveness, which reflects their drive to have access to powerful incumbents (Heberlig 2018). This guided me to access the extent to which the effects of caucus leadership attract similar levels of financial support. As membership in caucuses can act as vouchers for affirming party position or indicating independent beliefs, I expect holding leadership within caucuses could act as a voucher for being able to influence and access powerful incumbents. In addition, I'm going to examine the impact of partisanship and ideology on PAC contributions to caucus leaders.

Abstract #: 875

Title: Using Open Street Maps and BRIDGES to Create a More Interactive Learning Experience for Early Level Computer Science Classes

Student Author: Jason Strahler

Faculty Mentor (s): Dr. Erik Saule

College: College of Computing and Informatics

The purpose of this research is to investigate and create a way to bring real world data sets into the classroom. Using Open Street Maps and BRIDGES it will be possible to generate a callable map through a web server to help students gain interest, engagement and a deeper understanding of course material taught in early level programming courses. We will ask three questions throughout this research. The first is to discover what the best method is for converting, updating and handling map data requests. Is there a method to data processing that is best suited for handling the Open Street Maps data? The second is to figure out how best to handle and layout map storage and caching. Will having a dedicated cache and hash layout for maps be beneficial in increasing server efficiency? The third and final one is to create a method and format for simple and easy URL requests to the server for requesting specific map data. How are requests and parameters normally handled through web servers? Through the use of literature review research I have found two sources that give insight to some of my questions. Through this research I will report on two different aspects of the project, (1) the process of generating maps and handling requests more resource and time efficient on the server, and, (2) how data efficient it is to store requested map data locally with a hash to signify if the file needs to be updated.

Abstract #: 879

Title: An Examination of the Potential of Dance And Movement in the Virtual Reality Medium

Student Author: Charlotte Barrett

Faculty Mentor (s): Dr. Kaus Sarkar

College: College of Computing and Informatics

The purpose of this research is to investigate the interaction between the virtual reality (VR) medium with dance and motion, by developing a game that explores multiple methods of exposure to an ancient Indian dance form called Odissi using the game engine Unity3D and the HTC Vive with additional trackers. This game serves as an immersive experience for users, providing a virtual environment and instructor that is intractable and adaptable in order to cater to all skill levels and needs. I explore the use of VR in fields of education and sports as well as its use as a training tool for dance studios to determine how viable VR technology is to track movement specific to dancing, and what rewards users experience from interacting with a virtual avatar. This information will support the development of the game and outline how best to approach designing the experience. Borrowing from Rosemary Cisneros's research on the WhoLoDance project, as well as other sources and my own game prototype, I will show how virtual reality can complement dance movement to create a unique and practical experience.

Abstract #: 880

Title: Deep Reinforcement Learning Text Relational Agent

Student Author: Kristian Melendez

Faculty Mentor (s): Dr. Minwoo Lee

College: College of Computing and Informatics

Deep reinforcement learning (DRL) algorithms have been successful in identifying objects within images from random datasets. They can also leverage natural language processing to assist with human computer interaction in text based models. Combining these methods to create a system capable of communicating with a user solely through drawing objects is a promising platform and involves the more difficult tasks of this research. Instead, the focus of this research will be focusing on a smaller part of the main project to provide a baseline for future research. The agent presented focuses purely on identifying objects within words. Once a word is identified, it attempts to find another word which will be returned as text. The agent will learn to aggregate words into the same classes, distinguishing others as well. This project demonstrates the effectiveness of DRL methods that scale reasonably with larger state spaces and in similarly unknown environments.

Abstract #: 881

Title: Nucleic Acid Devices that Control Thrombin Activity in Vivo

Student Author: Nguyen Truong

Faculty Mentor (s): Dr. Caryn Striplin

College: College of Liberal Arts and Sciences

Thrombin is the principal enzyme of hemostasis with the central role in the final step of the blood coagulation cascade. Besides catalyzing the conversion of fibrinogen to fibrin and activating pro-coagulant factors V, VIII, XI, and XIII, thrombin also activates platelets and regulates endothelial cell function. Therefore, the regulation of thrombin activity will enable the treatment of conditions such as venous thrombosis, pulmonary embolisms, cardiovascular diseases, and possible applications in anti-cancer therapy to inhibit the pro-coagulant activity. A vast library of nucleic acid aptamers, which are single-stranded DNAs or RNAs selected to bind specific target molecules, has been produced over twenty years by a process called SELEX. Aptamers are short, low cost, low immunogenicity sequences that are also fully biocompatible and biodegradable. 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 and to cancel its intended function. Overall, thrombin-binding aptamers are valuable tools that show promise in biomedical various applications. However, due to their small size, the aptamers are rapidly cleared by the renal excretion. In this work, bulky nanoassemblies are designed to act as scaffolds for aptamer coordination while to increasing their molecular weight and thus decreasing the renal clearance.

Abstract #: 882

Title: Evaluation of the Impacts of Vegetation Species on Water Quality in Wet Ponds

Student Author: Ifedayo Ajasa

Faculty Mentor (s): Dr. Nicole Barclay

College: College of Engineering

The University of North Carolina at Charlotte holds several wet ponds on its campus to retain and manage stormwater runoff during and after heavy rainfall events. Stormwater is exposed to various pollutants as it flows along impervious surfaces. Common pollutants include nitrogen, copper, and total suspended solids (TSS). Efficient stormwater management is invaluable as it can have an effect on the overall quality of resulting runoff as it travels into larger bodies of water. Poor water quality can degrade the local bank areas, coastal environments, damage aquatic wildlife, and hinder recreational use of local beaches and lakes. Therefore, it is important for wet ponds to have certain manmade features in order to have a positive effect on the stormwater quality as it travels across the inlet to the outlet of the wet ponds. The purpose of this research is to evaluate how the aquatic vegetation placed alongside the wet ponds at Davis lake and CRI lake affects the water quality on UNCC campus. The formulaic process - Summation of Loads will be used to calculate the concentration of the selected pollutants being observed. This analysis uses datasets calculated from collected water to compare pollutant concentrations and variations of plant species between Davis and CRI wet ponds. As a result, this information can provide conclusions as to which plants are more influential on the water quality, ultimately leading to a decision to add or remove specific vegetation to benefit the stormwater ecosystem.



Abstract #: 887

Title: Numerical Analysis of Ocean Current Turbine Hydrofoil Designs to be Installed in North Carolina Shores

Student Author: Nicholas Brummitt

Faculty Mentor (s): Dr. Navid Goudarzi

College: College of Engineering

The purpose of this research is to investigate and evaluate the flow field around ocean current turbine (OCT) hydrofoils for implementation along the North Carolina shores. OCT hydrodynamics performance is dependent on flow conditions, turbine hydrofoil design and site characteristics. The questions that drive this research are: How does the experimental setup and testing differ from the real current conditions? How can these conditions change the way we select and define different design specifications? An in depth understanding of site conditions is needed to form basic design constraints. Similarity analysis will be employed to account for restrictions presented by the experimental/computational setup as compared to deep/shallow ocean conditions. Criteria for hydrofoil selection will be formed using principles of fluid mechanics, hydrodynamics, hydrofoil design principles, and environmental conditions. 3D fluid flow simulation in computational fluid dynamics (CFD) will be developed to understand and predict flow behavior around selected OCT hydrofoils; the computational boundary conditions, geometric constraints, and mesh structure will be generated. To better understand the CFD procedure in ANSYS Fluent software, preliminary CFD simulations will be conducted on simple geometries such as a cube. Simulations will then be conducted on selected hydrofoils. Each model is created using the computer-aided design (CAD) feature in ANSYS/SolidWorks. Once all the results are concluded, cross-comparison between computational results and current literature will be done for validation.

Abstract #: 888

Title: Binge Eating: Understanding Motivations for Seeking Health Behavior Change

Student Author: Stephanie Street

Faculty Mentor (s): Dr. Virginia Gil-Rivas

College: College of Liberal Arts and Sciences

In exploring the phenomenon of binge eating, this project aims to examine motivation(s) for treatment-seeking behavior among women. Binge eating is linked to adverse mental and physical health outcomes such as depression, overweight, and obesity (Yager, Mehler, Yager, & Yager, 2017). Binge eating can also interfere with health behavior change and maintenance. While there is an abundance of literature on overweight and obesity, research on why individuals seek help for problem eating is limited. Knowing the factors and individual motivations for seeking help with binge eating is important for understanding why some health behavior changes are sustained while others are short-lived. Women from diverse racial backgrounds (n= 24) were recruited into a guided self-help intervention aimed at reducing binge eating. Participants from a who self-identified as having a problem with binge eating were screened over the phone to determine their eligibility for the study. Initial interviews with participants were transcribed and analyzed to identify themes in participants' expectations of the intervention, concerns about the intervention, and prior experience making a health behavior change in regard to their eating habits. Qualitative data from this study will help determine the effectiveness of guided self-help lifestyle change programs. Implications for future research and intervention efforts for disordered eating are discussed.

Abstract #: 891

Title: Adaptive SVD Image Compression Framework for Modeling the Impact of Visual Stimulus Luminance and Complexity of Digital Images

Student Author: Jesse Redford

Faculty Mentor (s): Dr. Xingjie Helen Li

College: College of Liberal Arts and Sciences

Singular Value Decomposition (SVD) has been employed for processing a variety of data types and dimension reduction. A unique SVD exist for any real, complex, rectangular or square matrix. Because all digital images can be represented as matrices, this method of matrix factorization is universally accessible to a variety of image processing applications including compression, encryption, analysis, and denoising. This paper proposes a survey based on numerical experiments of how SVD can be used in conjunction with applied mathematics, statistics, and principal component analysis (PCA) to model the impact of visual stimulus, luminance, and complexity in digital images. This paper offers an adaptive image compression method for optimizing the rank approximation of color images and their respective grayscale. This method follows the assumption that the optimal rank of a given image matrix occurs at the peak quality value. Analytically, we define quality as the ratio between semantic error and the compression factor achieved as a result of iteratively truncating the number of singular values used to reconstruct the image matrix. This adaptive method is used as a subsidiary component to introduce a novel prediction framework, aimed to emulate the unconscious human visual processes of saliency detection, attention deployment, and figure-ground separation based on developed visual system methodologies. In this paper we discuss how our proposed methods can be used to enhance feature extraction, pattern recognition, and generalization of visual semantics on both synthetic and natural images. The intent of this paper and future research seeks to provide new contributions to computer vision applications through analysis of SVD properties and results generated by our prediction algorithms.

Abstract #: 893

Title: Analysis and Annotation of Gene Sequences Within the Oat Genome Assembly

Student Author: Sarah Estvander

Faculty Mentor (s): Dr. Robert Rei

College: College of Liberal Arts and Sciences

Every year, farmers will lose a percentage of their crop yield to disease, to environmental conditions such as drought or flooding, and up to 30% of otherwise perfectly fine crops will be thrown away for cosmetic reasons. This is a troublesome idea in a country where over 40 million people are experiencing food scarcity. In this research study, scientists will analyze the genomic sequence of *avena sativa* (oat). The annotation and categorization of genes in the oat genome provides agricultural scientists with a valuable genomic resource which can be used to selectively breed plants with desirable genetic traits, such as those which predict resistance to disease, the ability to survive in higher temperatures or periods of drought, and increased nutritional qualities. These qualities will lead to increased yields of nutritionally enhanced crops. It was predicted that bioinformatic tools will be successful in identifying 30,000- 40,000 genes in the oat genome assembly. Bioinformatic programs such as BRAKER, augustus, and GMAP were used to identify novel genes, such as those that control nutritional quality and predict crop survivability, within the oat genome assembly. Unknown gene sequences were annotated and categorized using additional bioinformatic software, and genomic reference databases were utilized in a comparative genomics approach.

Abstract #: 895

Title: Semba: Influence of Dance and Music of the African Diaspora in the Americas

Student Author: Lydia Heidt

Faculty Mentor (s): Dr. Tamara Williams

College: College of Liberal Arts and Sciences

This research investigates how the African Diaspora has contributed to popular culture (specifically music and dance) in the locations throughout the Americas in which those of African descent were forcibly displaced due to transatlantic slave trade. These events took place from the 15th to the 19th centuries. For centuries African cultures have been transposed to the Americas and have had a significant influence in the music, dance, and spiritual practices in southern and northern American countries. Dance is the central focus to this research: how were these cultures' dance and music significant to the lives of these peoples, and how were these cultural factors preserved in the areas of the new world in which they were brought?

The central ethnic group focused on in this research is the Congo or Bantu peoples, which are highly concentrated in Angola where semba dance is considered to have originated. I will discuss semba dance, and how it is related to tarraxinha and kizomba dance. Through this, I will highlight its role in popular culture in the Americas. Kizomba is gaining global popularity, and it comes from semba dance. It is important to explain its origins because many people who come across kizomba believe it to be a latin dance form due to its popularity in South American countries, however it is indeed African. African Diaspora communities have historically had their contributions to the societies in which they were displaced be whitewashed and unattributed to the true source. It is important to document true histories and give credit where it is due as a means of ceasing further appropriation of these cultures.

Abstract #: 896

Title: An Examination of Dance and Movement Experienced Through a Virtual Reality Medium

Student Author: Charlotte Barrett

Faculty Mentor (s): Dr. Kaus Sarkar

College: College of Art and Architecture

Digital mediation of artistic movement often dilute the latter in order to ensure commercial appeal. This experiment involving virtual reality (VR) gaming technology and an ancient Indian dance form called Odissi, complicates this, often construed, indirectly proportional relationship between art and technology. By developing a game that explores multiple methods of exposure to Odissi using the game engine Unity3D and the HTC Vive with additional trackers to enhance the user experience via direct intervention with particular choreography or basic movement structures, I argue that the immersive environment of VR exacerbates the user's interactivity with movement than the experience of a passive observer sitting in an audience. I borrow from dance-scholar Royona Mitra's characterization of South Asian aesthetic theory as an immersive phenomenon. This game serves as an immersive experience for users, providing a virtual environment and instructor that is intractable and adaptable in order to cater to all skill levels and needs. I explore the use of VR in fields of education and sports as well as its use as a training tool for dance studios to determine how viable VR technology is to track movement specific to dancing, and what rewards users experience from interacting with a virtual avatar. This information will support the development of the game and outline how best to approach designing the experience. Borrowing from Rosemary Cisneros's research on the WhoLoDancE project, I will show how virtual reality can complement dance movement to create a unique and performative experience.

Abstract #: 897

Title: Shining the Light on Immigrant and Refugee Families of the Ourbridge for KIDS  
Community

Student Author: Delaney Burns

Faculty Mentor (s): Dr. Lan Kolano

College: College of Education

Charlotte-Mecklenburg Schools (CMS) is a diverse school system that educates students from a variety of cultural and ethnic backgrounds. There are approximately 197 languages spoken within CMS, which showcases the diversity of student backgrounds in the school system. OurBridge for Kids is a local non-profit organization that was established to serve refugee and immigrant children in Charlotte, kindergarten through eighth grade. Data from this research project showcases year two of a multi-year longitudinal evaluation of ourBRIDGE for Kids. The research project explores the impact of the after school program on the students, families, and community. Data was collected in the form of pre and post student surveys, parent surveys, individual interviews, and one year of participant classroom observations. Specifically, this research project explores the lives of immigrant families in Charlotte who participate in OurBridge for Kids from the perspective of the families. Data analysis will focus on individual student and parent interviews and surveys. Results from the study will provide educators and stakeholders insight into the unique experiences of immigrant families living in Charlotte.

Abstract #: 899

Title: Purification of FAM35A protein for Antigen Development

Student Author: Loriann Bobins

Faculty Mentor (s): Dr. Junya Tomida

College: College of Liberal Arts and Sciences

*FAM35A* was recently characterized by our group. Our data shows that *FAM35A* is depleted in 6-13% of prostate cancers, and *FAM35A* mRNA expression is significantly reduced in metastatic prostate cancer compared to the primary tumor. We reported that U2OS cell line stably expressing GFP fused *FAM35A* shows GFP foci formation in the nuclei after treatment with DNA damaging agents. Furthermore, *FAM35A* depleted and knockout cell lines are hypersensitive to DNA damaging agents (i.e. X-ray, etoposide and mitomycin C), suggesting that *FAM35A* is involved in a DNA repair pathway. We expect that hypersensitivity to DNA damaging agents in *FAM35A* depleted and knockout cell lines can eventually be exploited for development of alternative treatment plans for *FAM35A* depleted prostate cancers. A commercial *FAM35A* antibody is available for purchase; however, this antibody does not specifically detect endogenous *FAM35A*. A more specific antibody will allow for improved study of *FAM35A* localization in cells and tissue. The objective of this research is to create novel *FAM35A* antibodies using the purified OB fold domain of *FAM35A* (381–904aa). This region was successfully purified by another group. We will purify GST fusion *FAM35A* fragment (381–904aa) from *E. coli* using glutathione sepharose 4B beads. Monoclonal antibody development requires at least 4 mg of GST fusion *FAM35A* fragment, with a recommended protein concentration of 1mg/mL. We will submit purified protein to a third party for generation of monoclonal antibodies. These antibodies have potential benefits for prostate cancer research, including diagnostics, development and investigation of new treatment plans.



# College of Computing and Informatics REU

Abstract #: 884

Title: Security for Insecure Wi-Fi Calling

Student Author: Jalen Young

Faculty Mentor (s): Dr. Weichao Wang

College: College of Computing and Informatics

Wi-Fi calling is a fairly new way of calling other mobile users through Wi-Fi rather using Long Term Evolution (LTE) service of a phone company and it is free to use. For example, if a person at a café and saw that the Wi-Fi is free, they might consider joining since there is no password required and they will not consume their phone company data. This is very beneficial for the person, yet this person has joined an unsecured Wi-Fi, a Wi-Fi network that does not have any security protection, which is susceptible to devious hackers who may be on the same network. If this person were to make a call, then the hacker would be able to analyze the packets between the person calling and callee and disrupt the call through the use of two spoofing and sniffing tools: Ettercap and Wireshark. The purpose of this research is to find a solution that will prevent hackers from harassing mobile users when they are using an unsecured Wi-Fi network. There are three aspects of an unsecured Wi-Fi networks that allow hackers to disrupt mobile users which are design defects, operational slips from operator's network, and user's device implementation issues. After performing the attacks on my own devices and analyzing the effects of each attack, besides using a Virtual Private Network (VPN) there are ways to counter these devious attacks to prevent hackers from interrupting Wi-Fi callers.

Abstract #: 894

Title: Converting Analysis Reports from Gextractor into the Malware Instruction Set

Student Author: Bryce Henry

Faculty Mentor (s): Dr. Jinpeng Wei

College: College of Computing and Informatics

The goal of this research is to aid in the efficiency of a malware analysis and deception tool by creating a file parser that converts the malware reports it generates into a smaller, more efficient format. The analysis tool, named gExtractor, is capable of capturing, analyzing, and thwarting malware attacks by taking a more offensive approach – namely by feeding the attacker false, but legitimate looking, information. The report produced by gExtractor consists of all of the pathways that the malware takes in order to accomplish its goals on the victim's computer. The issue that arises is that the process of creating 'deception plans' (sets of data that can be falsified for a specific piece of malware to take back to the attacker) is tedious and can become repetitive as current and future malware may target the same pieces of data on a victim's computer; the malware may be different only in that it takes different pathways to achieve its goals. To alleviate this issue, another tool called Malheur is able to take malware analysis reports and plot them on a clustering graph. This allows us to determine how similar or dissimilar newly analyzed malware is from ones that have already been found. The usage of Malheur to act as a database for gExtractor is impeded by one issue: the file format that Malheur accepts for its clustering tool is different from what is produced by gExtractor. This is where the need for a file parser arises.

**Department of  
History: Capitalism  
Initiative**

Abstract #: 883

Title: Investigating How Human Trafficking Affects North Carolina's Economy

Student Author: Susanny Acosta

Faculty Mentor (s): Dr. Mark Wilson

College: College of Liberal Arts and Sciences

Human Trafficking is an epidemic that happens all across the world. The International Labor Organization (ILO) reports that an estimated 32 billion dollars in transactions is made by businesses annually from human trafficking, with 15.5 billion coming from so-called industrialized countries which include the U.S. In the U.S. 20.9 million adults and children are victims of forced labor, bonded labor and sexual labor, and Charlotte is no exception. Charlotte is considered #8 in the country and #1 in North Carolina in Human Trafficking. Thanks to Anti-trafficking agencies such as the URSUS Institute, copious amounts of data has been collected regarding human trafficking practices in Charlotte. The URSUS Institute has found over 55 massage parlors that hired exploited workers and this data has helped shut down some of them. I am going to continue using this data along with other research found about human trafficking in Charlotte, which would include news articles about these massage parlors, court documents and police reports to answer two main questions. First, I will find how prevalent human trafficking is in our region by using the sources I mentioned above. This will also include a timeframe of about 10 years, starting in 2009. Second, it addresses the question of how the problem can be alleviated, so that the region can develop a more just and humane economy. Specifically, it suggests the utility of employing creative capitalism tactics, as well as broadening the practice of corporate social responsibility.

Abstract #: 889

Title: Capitalism and Sleep

Student Author: Kalei Woodford

Faculty Mentor (s): Dr. Mark Wilson

College: College of Liberal Arts and Sciences

This research asks why and how capitalism affects the way one sleeps. The main question of this study is why did the general public continue and in some instances increase their use of sleeping pills, known as barbiturates, despite the known dangers of them throughout the 1950s to the 1970s. The primary sources of this research are newspapers from across the U.S. and international newspapers as well as medical journals such as the British Medical Journal and the American Science journal.

Through the research so far, I am tracing the changes of the public attitude towards barbiturates such as Seconal, Amytal, and Luminal and why they were and continue to be used at such a dangerous rate. As far back as the 1950s, it was known that sleeping pills negatively affect the quality of sleep one gets. Many find that sleeping pills are only effective for a couple of weeks and once those initial weeks are over, the pill remains in their system and causes any more pills ingested to be ineffective. The FDA has done very little to curb the sale of sleeping pills due to the outrageous profit the pharmaceutical companies make from them.

The sleeping pills mentioned have been taken off the market due to an increased risk of addiction, overdose, and suicidal use. However, barbiturates were replaced with benzodiazepine-based pills like Xanax and Ambien. They still pose a significant risk of addiction, overdose, and are not accurately labeled for the dangerous side effects it can have.

**Department of  
Mechanical  
Engineering REU**

Abstract #: 827

Title: Exploring Three-dimensional Architectures of Two-dimensional Nanomaterials

Student Author: Samuel Bultman

Faculty Mentor (s): Dr. Haitao Zhang

College: College of Engineering

Two-dimensional (2D) nanomaterials with thickness of a few atomic layers have attracted extensive research attentions 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 band structure tailoring by thickness control, as well as strong light absorption, large in-plane carrier mobility, and short carrier transport distance. These advantages make them excellent candidates for applications in optics, electronics, and energy conversion. While the majority of research efforts are focused on the planar structures of 2D nanomaterials, three-dimensional (3D) architectures of 2D nanomaterials have not been thoroughly investigated. With the interconnections of 2D layered nanomaterials in the 3D space, these 3D architectures are expected to provide large specific surface area, ultralow mass density, and large internal space for mass transport and storage with great potential in applications of energy storage, photocatalysis, and solar energy harvesting. In this project, I explore the synthesis and structure characterization of 3D molybdenum disulfide nanoarchitectures of 2D nanomaterials using a 100 nanometer sized order pores anodic aluminum oxide (AAO) template assisted chemical vapor deposition (CVD) method. While exploring the AAO method, I attempt to create a more versatile and durable template using a die to hand-press various grain sizes of aluminum oxide into a templated disk and repeating the chemical vapor deposition method to create a 3D architecture from 2D nanomaterials. I examine the structure characterization of both methods using scanning electron microscopy (SEM) and energy-dispersive x-ray spectroscopy (EDS).



# Making Future Communities REU

Abstract #: 829

Title: Machine Learning as a Tool to Classify Acoustic Sensing Signals

Student Author: Matthew Conn

Faculty Mentor (s): Dr. Yu Wang

College: College of Computing and Informatics

Acoustic sensing is a relatively new technique to allow for object detection and tracking from smart devices. These devices can generate inaudible pulses and then capture the high frequency responses, which are used to calculate the position or motion. Acoustic sensing is great of interest because it utilizes the existing hardware of smart devices and can provide flexible control schemes. For this project, we will study how machine learning can be applied for object detection in this context. When a response is measured, the frequency components themselves may be used to train a classifier for position or motion. However, the raw data for a given response may result in a slow process because of the large number of sampling points. As an alternative, we are working to identify what spectral features of the response may be used as a more efficient substitute to train a classifier. The proposed features include the spectral flux, entropy, spread and centroid. During this process, we will consider other features which can be extracted from the data to aid in classification. Once the features are clearly identified, the most appropriate classification algorithm can be determined. By increasing the precision with which responses are classified, we can provide increased mechanisms for security with user-specific data as a unique identifier.

**NanoSURE REU**

Abstract #: 818

Title: The Synthesis and Testing of Si(Bzimq)<sub>2</sub> for Electron Transport in Organic Electronic Devices.

Student Author: Rayven Todd

Faculty Mentor (s): Dr. Thomas A. Schmedake

College: College of Liberal Arts and Sciences

Hexacoordinate silicon-based complexes with pincer ligands have been identified as effective materials for electron transport in organic electronic devices such as organic light-emitting diodes or organic photovoltaics. Complexes with the ligand, 2-(benzimidazol-2-yl)-8-quinolate, bzimq, are expected to be attractive candidates based on computer models conducted by the Schmedake research group. To test this hypothesis, the complex Si(bzimq)<sub>2</sub> was synthesized and studied to determine the optical and electronic properties of the complex in the solution and the solid state. The first step of the research was to synthesize the bzimq ligand. Three separate methods were tested: (1) a previously reported direct one-step reaction from 8-hydroxy-2-methylquinoline (8-HMQ), (2) a two-step procedure involving oxidation of 8-HMQ to an aldehyde followed by condensation with o-phenylenediamine, and (3) a variation of the two-step procedure utilizing a silyl protecting group, tert-butyldimethylchlorosilane. Ultimately, the second method provided the most convenient route to the bzimq ligand. The bzimq ligand was reacted with SiCl<sub>4</sub> in chloroform with triethylamine as an HCl scavenger to generate the hexacoordinate silicon complex, Si(bzimq)<sub>2</sub>. The solution phase properties of Si(bzimq)<sub>2</sub> were studied, including the optical properties (UV-vis and fluorescence spectroscopy) and the electronic properties (cyclic voltammetry). Thin films of the complex were grown to also study the solid state properties of the material. Ultimately, if time permits, the incorporation of the complex into an organic electronic device, such as an o-FET (organic field effect transistor) will be attempted.

Abstract #: 830

Title: Comparing a Reactive Oxygen Species Responsive Polymer Functionalized MSNs to PEI Functionalized MSNs in the Release of DNA Plasmids with GFP Expression

Student Author: Taraneh Barjesteh

Faculty Mentor (s): Dr. Juan Vivero-Escoto

College: College of Engineering

Gene therapy has emerged in recent years as being a potential treatment for cancer. The efficacy of this approach depends on the development of safe, efficient, and targeted carriers. Mesoporous silican nanoparticles (MSNs) have been used as nanocarriers for the delivery of drugs, proteins, and both DNA or RNA for gene therapy. MSNs are safe materials with lower risk of immunogenicity than other carriers and larger gene loading capacity than viral vectors. The structure of MSNs contains mesopores with adjustable pore diameter and have two functional surfaces and an adjustable pore diameter, which allows for selective functionalization on the interior or exterior of the nanoparticles. Our group has functionalized MSNs are functionalized with poly(ethyleneimine) (PEI) and polyethylene glycol (PEG) to DNA or RNA compounds by electrostatic interaction. We have shown that this platform is stable, protects DNA/RNA from enzymatic degradation, delivers DNA/siRNA inside the cells and knockdowns the expression of green fluorescent protein in cancer cells. However, the silencing efficiency I still lower than the one for lipofectamine 2000, which is the standard for transfection in cells. Therefore, we envision than other strategies can be used to improve the effective delivery of DNA/siRNA with MSNs. Potential alternatives are to substitute PEI for a polymer that can be degraded upon different stimuli such as light or the presence of reactive oxygen species (ROS), which exist in higher quantities in cancer cells than healthy cells. Herein, we hypothesize that by functionalizing the MSNs with an ROS-responsive polymer with similar properties as PEI, the transfection of siRNA can be dramatically improved. In this project, I will graft Chlorin-e6, a photosensitizer that generates ROS upon exposure to light, into the interior surface of of MSNs. In parallel, I will synthesize a ROS-responsive PEI polymer using protocol already reported in the literature. I will have two samples of MSNs, one functionalized with PEI, control material, and the other with the ROS-responsive PEI polymer. Finally, either fluorescein-labeled dsDNA or siRNA that is encoded for knocking down the expression of green fluorescent protein (GFP) will be loaded to the nanoparticles. It is hypothesized that the MSNs functionalized with the ROS-PEI polymer will release a significantly higher percentage of the attached DNA than the MSNs functionalized with PEI. Similarly, it is expected that the green florescent protein knockdown by siRNA loaded in the POS-PEI modified MSN will be much higher than the control material and lipofectamine 2000. It is also predicted that because nanoparticles are internalized through the cell through endocytosis, the ROS will help break the organelles that the MSNs become encased in and further aid transfection of the attached DNA into the cytoplasm of the cell.

Abstract #: 838

Title: Aqueous Organic Redox Flow Battery Implementing Robust Two-Electron Storage Anolytes

Student Author: Jonathan Palmer

Faculty Mentor (s): Dr. Michael Walter

College: College of Liberal Arts and Sciences

Increasing worldwide energy demands and fluctuating outputs from renewable power plants have stimulated much research investigating electrochemical storage technologies that take advantage of solar and wind energies. Redox flow batteries implementing easily tunable organic molecules have gained increasing attention for this role, especially when used as grid-based energy storage devices. Herein, we report a series of functionalized viologen derivatives as anolytes in aqueous organic redox flow batteries (AORFBs). Full structural and electrochemical characterizations, as well as supporting density functional theory (DFT) calculations, have been performed for each molecule. Throughout the series, the 4,4'-bipyridinium rings of the viologen are bridged by a highly planar and thermo-oxidatively stable fused bicyclic thiazolo[5,4-d]thiazole (TTz) system. Additionally, the pyridyl nitrogens are functionalized to create charged species with enhanced water solubility, and thus enhanced theoretical charge capacities. These TTz-bridged viologens are capable of effective two-electron storage, with the potential gap between the two single-electron reduction events being exceptionally small due to the increased conjugation from the TTz moiety. The increased conjugation and  $\pi$ - $\pi$  overlap from the planar TTz also leads to improved electron delocalization compared to typical viologen species, resulting in greater radical stability upon both single electron reductions. The overall modifications across the series lead to stable device performances upon full battery tests.

Abstract #: 848

Title: Development of a Gold Nanostar-Embedded Agar as a Biosensing Platform for Surface-Enhanced Raman Spectroscopy-Based Bacteria Detection

Student Author: Michael Gladden

Faculty Mentor (s): Dr. Swarnapali Indrasekara

College: College of Liberal Arts and Sciences

The purpose of this research is to develop a biosensing platform composed of gold nanostars (AuNS) and agar and to detect pyocyanin (PCN), a metabolite excreted by pathogenic bacteria. PCN is an aromatic molecule with a unique Raman spectrum; therefore, this biosensor will use surface-enhanced Raman spectroscopy (SERS) as the detection method. This project follows a three-part process. First, AuNS will be synthesized by changing the amount of citrate-capped gold nanospheres in the reaction and will be characterized using ultraviolet-visible (UV-VIS) spectroscopy to determine the AuNS with the highest light scattering effects at the 638 nm laser irradiation that later will be used in the Raman microscope for the SERS characterization. Next, a lysogeny broth (LB) agar medium with AuNS will be formulated to obtain similar light scattering effects as the AuNS alone. This will be achieved by adjusting the temperature at which the AuNS are added to the LB agar medium, the thickness of the LB agar medium, and the concentration of the AuNS in the medium. These samples will be analyzed under a dark-field scattering microscope to gather information on the distribution of AuNS within the solid agar and the wavelength at which they scatter light. Finally, different concentrations of PCN will be sprayed onto the optimized AuNS embedded agar matrix, and they will be analyzed using the Raman microscope to detect the Raman signal of PCN. The limit of detection and the sensitivity of the AuNS embedded agar matrix for PCN detection will be calculated.

Abstract #: 853

Title: Lock-In Based Technique for High Sensitivity Probe of Dielectric Modulation

Student Author: Joseph Tolone

Faculty Mentor (s): Dr. Yong Zhang

College: College of Engineering

The purpose of this research is to develop a system that can detect weak, modulated signals. When taking measurements that are directly concerned with waves, interference and noise can become problematic. A lock-in amplifier is able to extract accurate information about the signal it is measuring and minimize the noise. By modulating incoming signals with an optical chopper, the lock-in amplifier is able to discriminate between modulated signal and un-modulated noise, and it can selectively amplify only the modulated signal. The development of a data acquisition system that uses a lock-in amplifier, optical chopper, laser/light source, and photo detector interfaced with a computer would improve the efficiency and effectiveness of optical-based measurements. In this research, I developed a data acquisition system using the format outlined above. At first, the system was synchronized with just the lock-in amplifier, optical chopper and photo detector. After testing and optimizing this system, the computer interface was added to provide more control and automation for future experiments. This modulation system will be applied to multiple areas of research and experimentation upon completion.



Abstract #: 855

Title: Thiazolothiazole-Based Ligands for Electrochromic Metal-Organic Frameworks

Student Author: Johnathon Johnson

Faculty Mentor (s): Dr. Michael G. Walter, Dr. Christopher M. Bejger

College: College of Liberal Arts and Sciences

The main objective of this project is to explore the synthesis of several thiazolothiazole (TTz) based metal organic frameworks (MOFs). MOFs are multidimensional, crystalline, solids comprising metal atoms or clusters (referred to as a node) crosslinked with organic ligands (referred to as linkers). MOFs exhibit permanent porosity and have applications in gas storage, catalysis, renewable energy, and medicine. Viologen-like TTz compounds are attractive linkers for new MOFs due to their fluorescence and electrochromic properties. We have prepared several viologen-TTz-based ligands with amino and carboxylic acid functionalities. All new ligands were characterized using  $^1\text{H-NMR}$  spectroscopy and were used to synthesize framework solids under solvothermal and room temperature conditions. The target MOFs were characterized using single-crystal X-ray diffraction, cyclic voltammetry, spectroelectrochemistry, as well as by fluorescence and UV-Vis spectroscopy.

Abstract #: 857

Title: Plasmonically Active Magnetic Beads

Student Author: Joshua Taylor

Faculty Mentor (s): Dr. Pali De Silva Indrasekara

College: College of Liberal Arts and Sciences

Malaria is a large health issue in most of the tropical countries. The detection of malaria within the first 10-15 days is difficult due to the fact there is a low concentration of the malaria parasite RNA inside the blood. Our lab is developing an assay that includes a sandwich nucleic acid hybridization reaction and Surface Enhanced Raman Spectroscopy (SERS) to detect Malaria RNA at early stages. The sandwich hybridization utilizes a reporter probe containing gold nanostars with a Raman tag that will give us the SERS signal and a capture probe that contains magnetic beads that help for separation. In my project, I will synthesize plasmonic-active magnetic beads to increase the SERS signal amplification when they are used in the sandwich hybridization reaction. I will synthesize plasmonically active magnetic beads by first coating the surface of the magnetic beads with a gold or silver layer. Then, they will be used as seeds to synthesize gold or silver nanostars. The result will be a magnetic bead with silver or gold nanostars on it. The new magnetic beads with nanostars will be analyzed using UV-visible spectroscopy to find out their maximum absorbance wavelength. The new magnetic beads with nanostars will also be analyzed under a transmission electron microscopy to verify if the magnetic beads are coated properly with gold or silver, the thickness of the coating and the presence of nanostars. When a Plasmono-Magnetic Bead is successfully synthesized, it will be tested in the sandwich hybridization assay for Malaria.

Abstract #: 864

Title: New Thione Complexes of Silver with Potential Anticancer Properties

Student Author: George Mitchell Harris

Faculty Mentor (s): Dr. Dan Rabinovich

College: College of Liberal Arts and Sciences

The antibacterial activity of silver and a variety of silver compounds have been known for a long time. More recently, however, the potential anticancer properties of certain silver compounds containing N-heterocyclic thione (NHT) ligands has been explored as well. We have recently explored the synthesis and reactivity of a range of such compounds supported by five- and six-membered NHT ligands. We are now expanding the scope of this project by targeting the corresponding seven-membered ring systems formally derived from diazepine. More specifically, three new saturated ligands containing 2,6 xylyl (Xy), mesityl (Mes), or 2,6 diisopropylphenyl (Dipp) N-substituents, have been synthesized. The reaction of the new ligands towards silver salts (AgX) has led to the isolation of several cationic complexes  $[\text{Ag}(\text{SDiazArS})_2]\text{X}$ , where X = NO<sub>3</sub> or BF<sub>4</sub> and Ar = Xy, Mes, or Dipp. This presentation will provide the details pertaining to the synthesis and characterization of all these compounds, including the use of elemental analysis and nuclear magnetic resonance (NMR) and infrared (IR) spectroscopies to assess their purity. Several attempts to obtain single-crystals suitable for X-ray diffraction studies have also been made, the results of which will be also outlined in this presentation.

Abstract #: 868

Title: Analyzing the Immunostimulatory Effects of Structurally Modified and Functionalized Nucleic-Acid Nanoparticles

Student Author: Sandra Arroyo-Becker

Faculty Mentor (s): Dr. Kirill Afonin

College: College of Liberal Arts and Sciences

"Nucleic acids are best known as carriers of genetic information; however, biomolecules DNA and RNA have intrinsically defined features that allow them to be manipulated to produce a myriad of nanostructures. Elaborate multistrand assemblies—nucleic acid nanoparticles (NANPs)—are composed of several oligonucleotides designed to fold into predicted three-dimensional structures via multifarious connectivities such as canonical Watson-Crick base-pairing, kissing loop motifs, multi-way junctions, or others. Using bottom-up fabrication, these structures can be programmed to function as scaffolds or as nanotherapeutics. While these NANPs are promising in their potential biomedical applications (i.e. cancer therapy, treatments of bacterial infections and auto-immune diseases, etc.), research regarding immunorecognition of, and reaction to, complex NANPs is lacking. Recent advancements have explored how the design of three-dimensional NANPs (cubes) functionalized with therapeutic moieties affect immune stimulation and processing in the cell. It was observed that the RNA cubes were the most immunostimulatory amongst the other NANPs chosen for a representative panel including their DNA counterparts, thus signifying that composition (RNA or DNA) and dimensionality are key players in immunorecognition. Herein, an array of nanocube designs with varying functionalized appendages are reported, along with an analysis of their immunomodulatory properties. "

Abstract #: 876

Title: Replicating Specific RNA Self-Assembly of Paranemic Motifs

Student Author: Jyailah Friendly

Faculty Mentor (s): Dr. Kirill Afonin

College: College of Liberal Arts and Sciences

Ribonucleic acid (RNA) is the vital building blocks of life, as it spearheads copious bioprocesses such as DNA replication, regulation of gene expression, and protein synthesis, among others. Its biocompatibility and structural customizability make it a desirable tool for nanomedicine and synthetic biology; therefore, nanotechnologists aim to explore, characterize, and manipulate RNA using various bottom-up approaches. One of the major characteristics being explored is the various structural identities, or motifs, of RNA, as structure dictates function in cell communication and operations. A repertoire of existing motifs and their respective properties (such as thermodynamic, kinetic, and immunogenic) continues to be developed for use in RNA nanostructures in order to expand RNA's possible applications and build upon those existing. Herein is an account of the assembly of an RNA paranemic motif consisting of three half turns using thermodynamically and kinetically stabilized RNA strands, as well as the assembly of a 2D sheet to be used as a basic building block for more complicated structures.

# NSF Criminal Justice REU

Abstract #: 804

Title: Human Trafficking in the Dominican Republic

Student Author: Samantha Hamilton

Faculty Mentor (s): Dr. Matthew Phillips.

College: College of Liberal Arts and Sciences

This research project provides a better understanding of the framework of human trafficking in the Dominican Republic over a three-year time period. The Dominican Republic is a popular destination for both domestic and international human trafficking, chiefly for the purposes of sexual exploitation, child exploitation, and labor trafficking. The landscape of human trafficking in the Dominican Republic is not well understood due to inadequate policing resources; to gain a clearer picture of human trafficking trends in the country, a series of exploratory and descriptive analyses were performed using data obtained from the Dominican Republic's Office of the Attorney General. The results will allow for a pattern analysis of drug activity and tourism rates in the Dominican Republic during this time period and showcase how these elements interact with other factors of human trafficking, such as victim nationality or province. The Office of the Attorney General can utilize this information to remain compliant with the Trafficking Victims Protection Act (TVPA), which ranks countries on a tier system in accordance to their compliance with TVPA standards. In doing so, the Dominican Republic minimizes their risk of dropping down from Tier 2 and losing global anti-trafficking funding.

Abstract #: 860

Title: Race, Gender, and the Mark of a Violent Record: Can Certificates of Relief Improve Employability for Individuals with Violent Felony Convictions?

Student Author: Casey Buttke, Andrella Collins, Ashly Hanna, Jennifer Hart

Faculty Mentor (s): Dr. Samuel E. DeWitt

College: College of Liberal Arts and Sciences

The purpose of this project is to investigate callback rates for entry-level job applications among fictional applicants with randomly varying race, gender, criminal conviction history, and positive credential status using an experimental correspondence study. Specifically, we sent approximately 3,600 fictitious resumes to employers in 30 large cities across the state of North Carolina. We randomized whether applicants were male or female, black or white, had a class H felony assault conviction or not, and whether or not they had a Certificate of Relief granted by the state. Applicant race was indicated by racially-suggestive combinations of first and last names derived from vital statistics records. Criminal record status was indicated by their report of a felony assault conviction on the job application and a gap in their employment history. All felony assault convictions were Class H felonies which in the state of North Carolina are eligible for Certificates of Relief, which is used as our positive credential. Results will be discussed.



Abstract #: 885

Title: Societal Costs and Benefits of AI Surveillance in the Context of Parking Lot Crime

Student Author: Shannon Spencer, Lorenzo Robinson, and Devon Kaat

Faculty Mentor (s): Dr. Shannon Reid

College: College of Liberal Arts and Sciences

This research is a focused investigation into the potential costs and benefits of object-detection artificial intelligence (AI) in policing, specifically, this technology will be implemented in community parking lots. The fundamental queries within the project are as follows: How does object detection AI create safer public spaces? What are the main limitations of such technology in the context of modern communities and their concerns? What are the best practices for the implementation of this technology into policing? Finally, How does the community respond to this application of AI? There is a strong focus on the balance between public safety, community relationships, and civil liberty infringements. To investigate the technology's potential costs/benefits, community opinions, and AI functionality, we used literature review, population survey, and immersive development methodologies respectively. Additionally, GIS software was utilized for analyzing crime hot spots within Charlotte and comparing them to the results of the gathered qualitative survey data to underscore a more precise plan for the implementation of this technology. Criminal Justice and Engineering students worked conjointly to train the software in its behavior detection and improve this technology's data to achieve more accurate algorithms and crime prevention.

Summer Program to  
Increase  
Undergraduate  
Research

Abstract #: 810

Title: Impacts of Participation in the Brain Architecture Game on Attitudes About Trauma Informed Care

Student Author: Aryana Ware

Faculty Mentor (s): Dr. Phyllis Post (Grad student mentor: Amy Grybush)

College: College of Education

Adverse Childhood Experiences (ACEs) are negative and/or potentially traumatic instances that occur to an individual between birth and 18 years of age, and may have long-term damaging impacts. These traumatic events include, but are not limited to, maltreatment, abuse, and incarceration of a household member. Research on ACEs consistently depicts a positive correlation to physical, social, and emotional problems, such as heart disease, substance abuse, and risky behaviors. However, the harmful effects of childhood trauma can be reduced with social supports from caregivers, especially those who practice trauma-informed care. This study seeks to determine if participation in the Brain Architecture Game, created by the Center on the Developing Child at Harvard University, significantly impacts the participant's attitude in relation to trauma sensitivity and trauma-informed care. The limitations and applications of this study are also discussed.

Abstract #: 812

Title: Understanding the Emotional Experience

Student Author: Kamryn du Plessis

Faculty Mentor (s): Dr. Lisa Walker

College: College of Liberal Arts and Sciences

Emotional complexity is one factor that promotes adaptation to our social environment. Emotional complexity has two components: range and differentiation. Range refers to the scope of emotional experiences had by an individual, whereas differentiation concerns an individual's ability to distinguish between emotions. Both components have proven to be positively correlated with mindfulness, a trait that strengthens affect labeling ability. This study will collect data using a measure of emotional experience based on Affect Control Theory, as well as the Range and Differentiation of Emotional Experience Scale (RDEES) to assess how respondents' level of emotional complexity impacts the correspondence between the label they assign to their emotional experience and its characterization on evaluative scales. We expect scores on both subscales of RDEES to enhance this relationship, demonstrating a positive correlation between emotional complexity and affect labeling capacity. By establishing a connection between emotional complexity and affect labeling capacity, we hope our research may contribute to the development of novel interventions to enhance emotion regulation.

Abstract #: 817

Title: Understanding the Emotional Experience

Student Author: Joshua Blair

Faculty Mentor (s): Dr. Lisa Walker

College: College of Liberal Arts and Sciences

Individuals with psychopathic traits experience emotion differently than those without these traits. Specifically, they lack the full capacity to feel emotions such as fear, guilt, and anxiety. Affect Control Theory (ACT) has proven to be a reliable predictor of emotion in many social situations, but may not be sufficient for individuals with psychopathic traits. The main focus of this research is to evaluate the extent to which individuals with psychopathic traits experience emotions differently. In the current study, we will compare the scores on the Self Report Psychopathy Short Form test with the extent to which individuals' self-labeled emotions compare with their ratings of emotional experience using ACT. We expect results to show that individuals high on psychopathic traits will have a higher discrepancy between their self-labeled emotions and the associated cultural sentiments. Affect Control Theory may not be sufficient to predict emotions in social situations for these individuals.

Abstract #: 828

Title: Role of SNARE Proteins Snc1, Snc2 and Gos1 in Plasma Membrane to Golgi Fusion.

Student Author: Patricia Pujols

Faculty Mentor (s): Dr. Richard J. Chi

College: College of Computing and Informatics

"Clathrin-mediated endocytosis (CME) is a major trafficking pathway found in eukaryotic cells. During CME, plasma membrane (PM)-vesicles containing membrane receptors and their cargo shed their clathrin coat and typically fuse with the endosome. Defects in this pathway are linked to many human diseases. Our lab uses budding yeast as a model organism to study CME. Homologs of human endocytic proteins exist in yeast and thus ground breaking discoveries in human diseases have been made using it. While many of the subsequent steps of sorting and degradation have been elucidated, the fusion machinery from the plasma membrane (PM) to the target compartment is not defined. SNARE proteins are the core of the cell fusion machinery conferring docking and fusion of vesicles (R-SNAREs) to the targeted organelles membrane (Q-SNAREs). Recently, a study demonstrated that yeast have a minimal endomembrane system and unlike mammalian cells, PM-vesicles fuse directly to a trans-Golgi compartment and not an endosome. Using fluorescently labelled CME cargo, our lab is able to visualize PM to Golgi vesicle fusion, thus supporting this new model. We have also found mutants SNAREs snc1, snc2, and gos1 confer a reduction of PM to Golgi vesicle fusion. We hypothesize that the PM R-SNAREs Snc1 and Snc2 interact directly with Golgi Q-SNARE Gos1, for fusion to occur. To test this, we will engineer pairwise knockouts of Gos1, Snc1, Snc2 and quantify PM to Golgi fusion. If working in unison, we expect to see a synthetic loss of fusion when compared to the single deletions. "

Abstract #: 839

Title: Influence of Bilingualism on Short-Term and Long-Term Outcomes

Student Author: Lucia Colicchio

Faculty Mentor (s): Dr. Martha Bottia

College: College of Liberal Arts and Sciences

With an increasing number of immigrants and foreign language speakers entering the United States, the coexistence of a multitude of languages has become central to policy and economic growth. This increases the need to understand how speaking more than one language relates to individuals' realities. Using the Education Longitudinal Study of 2002, this research aims to explore the relationship between being bilingual and short-term educational outcomes and long-term economic outcomes. Educational outcomes will be measured by high school GPA and SAT/ACT standardized testing scores, while economic outcomes will be measured by status of employment, occupational prestige, and income. By analyzing the influence of being bilingual versus monolingual on those outcomes, the benefits and shortcomings of second language use in the United States can be better understood. Three central research questions will be addressed: (1) How does being bilingual relate to individual's educational, employment, and income outcomes? (2) How does this relationship vary based on race and ethnicity? (3) How does this relationship vary based on gender? Differing outcomes within racial, ethnic, and gender groups will illuminate how demographic variables moderate the relationship between bilingualism and educational and economic outcomes.

Abstract #: 841

Title: Does the Direction Giver's Study Time Predict the Direction Follower's Accuracy in a Route Direction Task?

Student Author: Imani Brown

Faculty Mentor (s): Dr. Alexia Gelati

College: College of Liberal Arts and Sciences

The purpose of this research project is to examine whether the direction giver's (DG) study time predicts the direction follower's (DF) accuracy in a direction giving task. Does studying a route for an extended period of time affect the accuracy in which the direction giver will describe the route to the direction follower, and will the direction follower be more accurate in executing the route? I will be coding study time in videos from a collected data set in which DGs studied route directions and described them from memory to DFs. While examining the participants' study time, I will note: the moment the studying of the route begins, any inconsistencies in studying (such as looking away from the route for an extended period of time), and the moment the studying of the route ends. After the description the DFs drew the described route on a blank map. I will be examining: 1. Whether the DGs study time predicts the DFs accuracy in the route drawings. 2. Whether the DGs study time is related to their individual spatial ability. 3. Whether study time is related to both task partners language use during the route description phase. The findings of this project will inform the interplay of various factors in complex collaborative tasks. These factors include: differences in individual ability, time investment in learning, description strategies, and task outcomes. My research on this topic is based on a previous project in relation to this one done by my faculty mentor, and observable evidence.



Abstract #: 842

Title: Healthy Eating Social Marketing Campaign: Formative Research

Student Author: Oluwaseyi Isijola

Faculty Mentor (s): Dr. Elizabeth Racine

College: College of Health and Human Services

"Social marketing campaigns are valuable resources that are helpful in addressing health issues that are prevalent within a region. They are widely used in public health interventions to influence behavior." In this study, we are planning to use a social marketing campaign to promote healthy eating behaviors for college students. According to the National College Health Assessment of Spring 2017 at the University of North Carolina at Charlotte, an estimated 49% of students self-reported being either obese or overweight. The social marketing campaign will act as an intervention to address diet behavior and weight status. In addition, this research project aims to evaluate the current buying habits of students on campus, especially retailers outside of the dining hall.

During the study, 50 students will be interviewed to hear the opinions of students who currently have a meal plan or have had one within the past year. After interviewing the students, we will send a survey for evaluation purposes. To incentivize the participants, we offered \$15 to anyone who showed up to a focus group. To implement social marketing strategies that are intended to improve student's diet quality, we analyzed existing data sources. We also reviewed other social marketing campaigns to see what was best suitable for our college population. Since many college students have values such as relationships and money, we are planning to create a social marketing campaign that addresses how these values are associated with eating habits. We believe that more students will be receptive to the social marketing campaign and willing to improve their diet if they can relate with the content.

Abstract #: 847

Title: An Exploration of the Relations Among Racial Discrimination,  
Subjective Social Status, Gender, and Psychological Distress

Student Author: Aliah Johnson

Faculty Mentor (s): Dr. Andrew Case

College: College of Liberal Arts and Sciences

African Americans are more likely to report discrimination than their white counterparts (Williams, Jackson, & Anderson, 1997), and African Americans who experience more discrimination report greater psychological symptoms such as depression and anxiety (Pascoe & Smart Richman, 2009). Past research has examined the relations among racism, socioeconomic status (SES), gender, and psychological symptoms; however, findings have been mixed. Mixed findings may be due to methodological differences between studies. For example, discrimination can be assessed in multiple domains including the educational, health, and criminal justice institutions. Similarly, SES is comprised of three components, income, education, and occupation and can be assessed objectively (homeownership, annual salary) or subjectively (perceived social class). The aims of this research are to assess: (a) whether there are gender or SES differences among those who experience discrimination.; and (b) whether gender and SES influence the relation between racial discrimination and health. I hypothesize that males and African Americans from a lower SES will report experiencing more racial discrimination. Also, gender and SES will be influential to the relation between racial discrimination and health, such that this association will be stronger for males and individuals from a lower socioeconomic status. The study will consist of 245 participants who completed measures of subjective social status, gender, perceived discrimination and psychological distress. My analytic plan for the first aim is to conduct two independent sample t-tests. For my second aim I will utilize a moderation analyses using PROCESS Macro in SPSS.

Abstract #: 886

Title: Models Development in Ocean Current Turbine Research: Image Processing (Cross-Correlation) and Machine Learning Tools for Flow Prediction Based on Tomo-PIV Data.

Student Author: Olorunjuwon Ajayi

Faculty Mentor (s): Dr. Navid Goudarzi

College: College of Engineering

"The purpose of this research is to develop a MATLAB code that will analyze the images taken from a Particle image velocimetry (PIV) set up. The images will be analyzed using cross-correlation to generate velocity vector field. After completing this first process then develop a Machine learning (ML) algorithm that will be able to predict the flow of the particle from images

taken from Particle image velocimetry set up. I am interested in implementing ML with PIV to analyze how accurate the ML model determines the flow of the fluid when relying on the input images from either computational or experimental results. Two research questions guide my research: First, how accurate the developed MATLAB code obtains the velocity vector fields compared to those from PIV results? Second, how accurate the develop ML model predict the flow field velocity values using the experimental/computational input data? For MATLAB, online courses and available resources in the research group will enable developing a simple, yet robust code. For ML, several courses are taken, and regression models on some sample data are being developed. The results of this research will be beneficiary to other researchers in the team to (1) educate them on how the cross-correlation in a commercial software (i.e., Dantec Dynamics for PIV) works and (2) how a data-based approach (i.e., ML) can use the physics-based data to obtain a faster and accurate prediction of flow fields."

Undergraduate  
Research Class  
(BIOL 3900)

Abstract #: 843

Title: A Comparison of Macroinvertebrate Biodiversity in Restored vs. Natural Salt Marshes

Student Author: Jack Morin

Faculty Mentor (s): Dr. Paola López-Duarte

College: College of Liberal Arts and Sciences

Salt marsh loss is a worldwide problem. According to the United States Geological Survey, about half of the wetlands in the US have been during the last 200 years. These ecosystems provide essential habitat for many species of invertebrates and fish and also help protect coastlines from storm damage. Louisiana has lost one quarter of its wetlands since the 1930s, making it the most severely affected state. Preventative efforts to mitigate 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. In this study, we are evaluating the biodiversity of restored marshes that are part of the Lake Hermitage Marsh Creation Project (LHMCP) in southern Louisiana. Our sites include two restored marshes and one natural (control) marsh that differ in elevation, but are dominated by the cordgrass *Spartina alterniflora*. To compare the biodiversity of benthic macroinvertebrates at these sites, we sampled using litter bags deployed for 2 months in the summer of 2018 at distances of 1, 10, 25, 50, and 100 m from the marsh edge. The contents of the litter bags were sorted into taxonomic groups and identified to the lowest possible taxon. We will calculate mean species richness, abundance, and diversity. We hypothesize that biodiversity and species abundance is less in the restored marshes because they are more recently established and due to the higher elevation of these newly-created marshes may prevent some aquatic species from accessing the marsh platform.

Abstract #: 890

Title: " Python Use in Multi-Elemental Data Automation Analysis"

Student Author: Hannielle Joseph

Faculty Mentor (s): Dr. Paola Lopez-Duarte

College: College of Liberal Arts and Sciences

"Data processing is critical to research because it is the way we translate experimental results into meaningful information. Processing data manually can be difficult and time-consuming, especially multi-elemental data. Micro-chemistry data, in particular, can be extensive and difficult to resolve due to the relatively high background to signal ratios inherent of trace elemental work. One way to reduce the analysis time is to automate data processing. Automation can also eliminate human errors and provide consistency. Python is a programming language with multiple open source packages that can combine multiple forms of data for processing. Our goals for this project are to automate the analysis of micro-chemistry data and compare automated vs. manual data processing. Our first case study focuses on the chemical composition of fish ear bones, also known as otoliths. Otolith layers are added throughout the life of a fish and resemble tree rings. Like tree rings, these structures are useful for aging. In addition, the chemical composition of otoliths reflects the environmental conditions in which that individual lived. This information is important to scientists and fisheries managers trying to understand the migratory patterns and habitat use of fish. The automation developed here will help to make the processing of otolith data more efficient, but it could also be applied to other types of data sets with high background noise."

# Charlotte Teachers Institute

Abstract #: 900

Title: Ultra-Small Gold Particles to Modify Fluid Properties

Student Author(s): Tenequa Jones, Roxanne Miller

Faculty Mentor (s): Dr. Shunji Egusa

College: College of Liberal Arts and Sciences

Engineering of rheological properties of fluids is imperative in society. Viscosity of fluids is engineered for, to name a few, lubricants, paints, pesticide applications in agriculture, and post-processing drying of silicon wafers. For example, lowering viscosity will benefit any pumping system, because it would require less power for pumping. In this project, we evaluate the effect of dispersing very tiny particles on the viscosity of fluids. Very tiny particles, called nanoparticles, of gold are chemically synthesized under different conditions. The sizes of these nanoparticles are characterized by electrophoresis techniques commonly used in biology. These nanoparticles are added to water and other solvents, and the resulting viscosities of these solutions are measured.



Abstract #: 901

Title: Temperature Sensor Measurement

Student Author: Robert J. Jackson

Faculty Mentor (s): Ana Hizaramirez Andrade, Dr. Konstantinos Falaggis

College: College of Engineering

The initial objective of the study is to investigate the temperature variances realized within a temperature-controlled environment. The experimental design of the study is using a methodology such that sixteen to twenty-five (16-25) sensors instinctive to temperature measurement configured equidistant from each other in a square pattern will quantify actual data points as voltages in real-time specific to predetermined measured positions. The captured data samples are converted to a digital format to be stored for analysis and transfer for future comparison. Additionally, the Analog to Digital Conversion (ADC) functionality is provisioned with the use of an open sourced electronics platform. Where a constructed single circuit board, microcontroller (IC; Integrated Circuit) comprised of thermistors (sensor), hardware and software capable of sampling, and reading the voltage(s) input, is used for converting the sample into an output. The circuit board will receive its instructions by means of the microcontroller according to the prescribed programming language, wiring configuration, and the processor parameters. In its entirety, the collected analyzed data generated from this study will support an application to be used for temperature measurement in a camera system for metrology with respect to free form optics arrangement.

Abstract #: 902

Title: Overcoming: Barriers Teaching Pre-K Students using 3D Modeling and Printing Process to Achieve Physical and Learning Objectives

Student Author: Nakisha Cornelius and LaKeesha Henderson

Faculty Mentor (s): Dr. David Wilson

College: College of Computing and Informatics

Pre-K or Pre Kindergarten is the foundation of formal education. A necessary introduction to the classroom setting, it sets young scholars on a 13 year journey to success. In certain definitions of "Makerspace," the Pre-K classroom could be considered a maker space in itself. Children are always encouraged to "tinker" and construct things with little to no direction; in order to build confidence and gain the necessary skills to grow and meet required curriculum goals. Even with the environment of encouraging students to enhance their cognitive, socio-emotional and language skills, there are certain barriers that must be assessed on a pre K level. In addition to meeting curriculum requirements, successfully engaging 3D modeling and printing at the pre-k level should spark an interest in using 3D printers and other makerspace items and encourage a young generation of computational thinkers. Strategically implementing maker spaces in order to enhance students' cognitive and physical skills can be measured by students achieving their learning objectives. An example of a physical objective of pre K students is proficient use of fingers and hands and refined wrist and finger movements. During the lesson, the students will be given opportunities to use their fingers and hands in all steps of the 3D printing process. A cognitive goal for the students is to persist and to be able to plan and pursue a variety of appropriately challenging tasks while a language goal for the students is to follow two-step directions. Throughout the 3d modeling and printing process the students will work on following multiple step directions from the facilitator helping break developmental barriers of teaching pre-k students. An extent of these barriers, which can be fine motor skills such as using a computer mouse or loading filament into a 3D printer, will be modified by using an iPad for the Tinkercad computer program and all 3D printing processes will be obtained using the help of the teacher or facilitator.

Abstract #: 903

Title: A Comparison of Camera Sensor Lenses in Deflectometry Applications

Student Author(s): Dalton Cooper, Robert Jackson, Ana Hiza Ramirez-Andrade

Faculty Mentor (s): Dr. Kosta Falaggis

College: College of Engineering

Deflectometry is a measurement technique used to inspect three-dimensional surfaces using only a pixelated light source and camera sensor. Each pixel will emit a bundle of rays of light, which the surface being measured will reflect into a camera, where it can be measured and mapped back to its original pixel using mathematics. This process shows promise as a relatively low-cost method to accurately render three-dimensional objects; this implies industrial applications for quality control in the manufacture of irregular objects such as lenses, automobiles, aerospace, and three-dimensional printed objects. Critical to the success of deflectometry is a camera sensor that can capture reflected rays with a high degree of accuracy such that the discrete patterns from the pixels of the monitor can be readily identified. For our research, we plan on testing two separate imaging systems for the camera; a single-lens camera, as well as a pinhole camera. Both of these setups show promise as low-cost, simple designs that can be easily constructed by amateurs, academics, and industrial professionals. When viewing an object through a classical lens, there is some degree of distortion. A pinhole camera, theoretically, will not have any distortion. When collecting data with our deflectometry experiments, we will compare the amount of distortion that arises from each setup with the intention of providing informing future studies as to the benefits and drawbacks of each setup, as well as the degree to which distortion may be minimized with a pinhole camera.

Abstract #: 904

Title: Examining the Role of University Research Labs in Secondary Teacher Education

Student Author: Erika Williams

Faculty Mentor (s): Dr. Aaron Socha

College: College of Liberal Arts and Sciences

Teachers spend hours in professional development, supposedly designed to improve teaching in the classroom, but most professional development lacks a mechanism that can be used to bring relevance into the classroom. Moreover, the existing curriculum lacks material that motivates students to understand the “real world” importance of science. To build a repertoire of interesting lesson plans, teachers must venture outside the classroom. For science teachers, first-hand laboratory research experience is a potential source of professional knowledge that can be translated to classroom enrichment. Working in an academic research lab, and spending time with the lab’s personnel gives an insight into the ups and downs of the scientific world. Additionally, through learning and practicing research techniques such as experimental design, solution preparation and gas chromatography-mass spectrometry, it is envisioned that my ability to communicate science to my students will be improved. By reading, understanding and presenting novel research in the field of biomaterials, I am also able to pique the interest of my students. Specifically, the use of ionic liquids to produce biofuels from switchgrass is relevant to Unit 4 of my Environmental Sustainability course. To collect information, I have conducted one on one meetings with the PI, attended weekly lab group meetings and interviewed a postdoctoral researcher, one high school student, and 4 undergraduate students working in the Queens University Chemistry Lab in Summer 2019. The ultimate goal of my interviews are to extract information from researchers that would be interesting to present to my students to encourage participation in STEM disciplines.

Abstract #: 905

Title: Examining the Rheological Properties of 3-D fiber Infused Gels with Silver Nanoparticles

Student Author: Tiara Davis

Faculty Mentor (s): Dr. Tracy Brown

College: College of Liberal Arts and Sciences

The synthesis of silver nanoparticles (Ag NPs) can yield particles ranging in size from 1 to 100 nm. Silver NPs have major applications in the medical field including diagnostic and antimicrobial properties. One of the drawbacks to making silver NPs is the toxicity associated with the chemicals used to make them, including chemical reducing agents such as trisodium citrate or sodium borohydride. Herein, we will discuss a green method through photocatalytic catalysis synthesis of formulating cellulose nanofiber gels embedded with silver Ag NPs. Using the bottom up method-materials containing desired precursors mixed in a control setting - colloidal solutions of cellulose nanofibers with increasing amounts of silver nitrate were used to prepare 3-D fiber infused gels with silver Ag NPs. Using viscosity measurements, the rheological properties of viscosity ( $\eta$ ), storage ( $G'$ ) and loss moduli ( $G''$ ) provided critical, yet insightful information of the 3-D fiber infused gel structure with Ag NPs, when stress and strain are applied.