Louisiana Tech University

2024

Symposium

Abstract Program

Abstracts are listed alphabetically in each category. Some abstracts have been excluded at the author's request.

Oral Presentation Abstracts

Ryan Aamodt and Erica Murray
College of Engineering & Science
"Understanding Surface Finish Impact on Corrosion"

An important factor in the use and operation of metals is the electrochemical corrosion of the material. Additive manufacturing (i.e., 3D printing) of metals and metal alloys offer new functionalities for various industrial applications. However, additive manufacturing processes result in microstructural features that cause the corrosion behavior of the 3D printed metal to differ from traditionally manufactured metal parts. As corrosion can have a negative impact on safety and economics, it is necessary to understand the corrosion behavior of additively manufactured metals. In this study, the electrochemical corrosion behavior of aluminum alloy Al6061 fabricated by hot rolled and additive friction stir deposition (AFS-D) was evaluated in a 5% NaCl solution. Measurements of cut, roughed, and polished samples were collected to determine the corrosion resistance, oxide layer formation, pitting potential, and passivation kinetics for various surface finishes. Scanning electron microscopy and confocal imaging of the samples were observed before and after testing to assess surface roughness and pit depth. It was determined that samples polished to a roughness of 0.5 μm produced results closest to the theoretical ideal responses and had a finish closest to a machined part. Comparisons of the electrochemical corrosion data for each surface finish were analyzed to acquire insights regarding the relationship between surface finish and corrosion behavior. These results are important for a following study to determine the efficacy of aluminum chromium conversion coatings on anisotropic materials, which is highly relevant to aerospace and other transportation industries.

Emma-Bernadette Faul and Elisa Castganalo
College of Engineering and Science
"Integration of Glassy Carbon microelectrodes and interconnections"

The real-time multi-site measurements of in vivo serotonin (5-HT) dynamics are fundamental in understanding its role in brain function and disfunction.

Fast scan cyclic voltammetry (FSCV) can provide real-time 5-HT detection with sub-second resolution. However, FSCV is typically performed on carbon fiber microelectrodes which are susceptible to electrochemical fouling and are often limited to only one active site per penetrating electrode. Flexible multielectrode arrays with glassy carbon (GC) electrode and metal interconnection (hybrid MEAs) have only recently been developed for implantable neural interfaces due to innovative pattern transfer technology. GC microelectrodes have demonstrated highly sensitive FSCV 5-HT measurements while minimizing electrochemical fouling. Additionally, flexible hybrid MEA implants have shown minimal inflammatory response and seamless tissue integration.

A primary concern faced with hybrid MEAs fabrication is the adhesion of the metal traces with the GC electrodes, as prolonged electrical and mechanical stimulation can lead to adhesion failure. Previous devices with all GC electrodes and interconnects demonstrated exceptional electrochemical stability but required miniaturization.

We report here a double pattern-transfer photolithographic process to develop implantable MEAs with all GC microelectrodes and interconnections on SU-8 substrate with miniaturized features. This process avoids the use of metal interconnections and allows the fabrication of 3μm GC traces with a conductivity that enables FSCV measurements. The fabrication steps and the optimization of the transfer-bonded temporary polymeric support of the all GC-MEAs will be detailed and discussed. Our goal is to propel the advancement of GC-based MEAs for the next generation of neural interface devices.

Naima Bomani and Brooke Cassady
College of Liberal Arts
"Addressing Racial Disparities through the Guise of Visual Art"
I amplify black voices in a society that continues to hush them. My work critiques the social, political, and cultural issues impacting the African American community. I want viewers to engage in the questioning of racial disparities, thus transforming the way they interact with their counterparts. I confront racial discrimination through the means of contemporary art because art is one of the best catalysts for conversations. Inspiration arises from firsthand social interactions from there; I cross examine my experience with corresponding moments throughout American history. The goal is to find a direct correlation between what was experienced, and what African-Americans have experienced historically. The work Hair Police critiques ongoing hair discrimination in America. Three wigs were created with caution tape, referencing the 1700s' Tignon Laws, The Civil Rights Act of 1964, and the Crown Act of 2022. Through art I create a safe space for black viewers to discuss their own personal experiences, as well as educate unsuspecting viewers, forcing them to face their own latent racial prejudices. This strategy was tested at the senior preliminary showcase Melange Mosaic. During this showcase many viewers approached me expressing awareness for their underlying prejudice. They recognized moments in which they had perpetuated harmful stereotypes and left with the intention of correcting their previous behaviors. Work like this is important to society because it is historical, educational, as well as a call to action for many viewers.

Lauren Brownlee, Madison Middleton, and Lacey Deal
College of Education and Human Sciences
"Service with a Purpose: Identifying the Need for Adapted Services for Special Needs Populations"
Kinesiology 414 is a class that teaches students the role that physical activity plays in the lives of everyone, especially those with special needs; the class also gives students the opportunity to gain hands-on experience working with local students. Each student is challenged to develop a goal-centered activity plan for their assigned student after assessing their motor skills with a state-approved assessment. Some saw tangible results in their child's behavior and motor skills, while others saw no changes at all; this was to be expected within the time frame of one quarter. Kinesiology 414 exposed the reasons behind why some children showed significant improvement and others did not. Students learned that their time spent in the gym once a week was some of the only time these children were offered adapted physical education services at their school. The purpose of this research and service is to educate those who do not work with special needs populations on the need for more services catered to these individuals in schools and in the community. When children are given a safe environment and the resources they need, they hold infinite potential to grow and adapt to adversity.

Lauren Cooper, Michel Meghan, and Lacey Deal
College of Education and Human Sciences
"Break or Burn: The importance of intentional study breaks"

The question we were seeking to answer was the effect of study breaks on test performance. We realized how much time we spend attempting to study. In the end, we waste our time because we do not remember what we have studied either because we crammed or did not actually focus on what we were trying to learn. We wanted to find the best way to study to maximize our test performance.

When collecting our research, we used multiple resources to aid our research. Each of these approached the topic in different ways which helped us understand different aspects of the topic.

In our research there were multiple facts about the positive impact of exercise on test performance. One example is exercise supports higher order thinking. This allows students to learn the information instead of just memorizing it. Exercise typically causes a larger hippocampus which is the center for memory.

After collecting and reviewing our research we were able to answer our question that effective study breaks have a positive impact on test performance. Active study breaks proved to be one of the most effective breaks. We also think it is worth noting that not everyone will benefit from the same kinds of breaks. Some students have a hard time refocusing after a break so they may need to take their break before and after studying. Ultimately it is about finding the best way to implement effective breaks based on the student's personality and how they learn.

Ethan Dowell, Ahmed Radif Uddin, and Rahman Shafiqur
College of Engineering and Science/College of Applied and Natural Science
"Methodology for Converting a FDM 3D Printer to a DIW 3D Printer"

The world of three-dimensional (3D) printing is rapidly growing and changing with various methods of 3D printing available to consumers. One of the methods which holds great potential is known as Direct Ink Writing (DIW) printing. DIW printing uses non-Newtonian fluids as its printing material meaning that there are plenty of opportunities to apply DIW printing. Compared to other forms of 3D printing, DIW printing possesses capabilities that are inherently unique, such as printing living cells, photosensitive polymers, and chemical curing materials. To better understand DIW printing and how it can be used, we set out to convert a standard Fused Deposition Modeling (FDM) printer into a DIW printer to better learn how they are related and understand key differences between the two methods. For conversion of an FDM printer into a DIW printer that could produce prints of high accuracy and resolution, a FDM printer and syringe to house printable fluids or inks were carefully selected, custom hardware was designed and fabricated, and software was altered to achieve the different behaviors required of this printer. After many adjustments to firmware and slicer settings, prints using 10 different extruder sizes ranging from 1.5-0.2mm were able to be accurately replicated by the converted printer. This presentation will detail the conversion process from an FDM to DIW printer along with differences and similarities between the two printer types. Additionally, applications of DIW printing will be discussed to showcase the potential this technology holds.

Greer Handley and Julia Earl
College of Applied and Natural Sciences
"Weathering the Drought: Effect of Drought Conditions on the Tannin Content of Senesced Leaves"
With climate change exerting unprecedented stress on ecosystems worldwide, understanding its effects on trees, particularly in terms of biochemical changes such as tannin content in leaves, is critical for ecosystem management and conservation. Tannins play a crucial role in plant defense against herbivores, pathogens, and environmental stressors. However, the specific impact of drought-induced premature leaf senescence on tannin content remains understudied. This study investigates the effects of drought-induced premature leaf senescence on tannin concentrations in four tree species: Black Cherry (Prunus serotina), Black Tupelo (Nyssa sylvatica), Southern Magnolia (Magnolia grandiflora), and Sweetgum (Liquidambar styraciflua). Senesced leaves were collected from Ruston, LA during during a severe drought mid to late September 2023. Tannin concentration was estimated using a colorimetric reaction. ANOVAs were performed to test for differences in tannin concentrations between the drought-affected trees and those from non-drought-affected years, specifically comparing leaves collected in 2021 and 2022. We found no significant difference among leaves collected from different years, contrary to studies from other tree species. Future studies should include a larger sample size and additional years. These findings contribute to our understanding of how trees respond to drought stress at the biochemical level, shedding light on their adaptive strategies in the face of climate change.

Annie Roche Hendrick, Erin Singer, and Jane Jacob
College of Liberal Arts/College of Education and Human Sciences
"Lessons on the Visual Network and Conscious Perception from the Formal Features of Ezra Pound's 'In A Station of the Metro.'"
Ezra Pound's most popular modernist piece, "In A Station of the Metro," is a poem only two lines long. However, Pound's use of caesura, careful diction, and intentional punctuation transcends the piece's brevity, making it the inspiration for a multitude of literary analyses. Scholars of American early modernism and Pound's Imagist movement notice heavy inspiration from the Symbolists and John Locke's association of ideas theory. Locke's contributions to the field of psychology and Symbolism's attempt to communicate the emotions that arise during a human experience and the image of the experience itself spark an interdisciplinary question: What can the formal features of Pound's "Metro" poem teach us about the intersection of the neurobiological visual network and conscious perception? A review of philosopher G.W.F. Hegel's theory of sensuousness and of psychologist Kevin O'Regan's meditations on sensorimotor perception aid in this analysis.

Anna Jones and Amy Yates
College of Applied and Natural Sciences
"Disordered Eating: Providing Resources to Students"

Disordered eating is a complex mental and physical disorder that occurs when a person establishes unhealthy eating practices and compensatory behaviors and is a precursor to eating disorders. Unhealthy practices such as undereating, bingeing, self-induced vomiting, and over-exercising are some indicators of disordered eating. These behaviors are considered disordered eating when they are done two to four times weekly. This project aims to educate students on the signs, symptoms, and risk factors associated with disordered eating behaviors. Disordered eating behaviors such as stress eating and skipping meals are highly prevalent among college students, and these behaviors are often viewed as "normal" and overlooked (Choi, 2020). The presenters stress the importance of providing aid as soon as possible since these behaviors can manifest into an eating disorder. Prevalence estimates of current EDs among college students range from 8% to 17% (Eisenberg et al., 2011). As previously stated, many cases go unreported, meaning this range is likely significantly lower than what is actually occurring among college students. Spreading awareness and implementing proper support strategies can decrease this percentage and promote well-being. Eating disorders are the deadliest mental illness, resulting in one death every 62 minutes (National Eating Disorders Association, 2021). This project provides details on where to receive help at Louisiana Tech University and how to support people who may be struggling with these unhealthy practices.

Heather Kennedy, Dario Cosic, Julie Odom, Emma Dupree, Annabelle Yates, Mollie Owens, and Julie Rutledge
College of Applied and Natural Sciences
"Implementing the 'You Can't Say You Can't Play' Rule in Classrooms to Encourage Equity and Inclusion: An Intervention Project Promoting Individual Well-Being Among First Graders and Capacity Building within an Elementary School"

One in every five children in the US report being bullied at school, and 42% indicated that the bullying occurs inside the classroom (National Center for Educational Statistics, 2019). Peer rejection and neglect increases for children with physical characteristics that other children consider "different," such as obesity or overweightness. Such exclusion can be detrimental to the development and well-being of a child (Harrist et al., 2016). The purpose of this intervention is to implement a seven-week, classroom-based program that: (1) encourages first-grade children to consider empathy and inclusivity in their actions to increase the well-being of children in the classroom and (2) increases resources for school faculty that promote inclusion and acceptance and reduce social exclusion within the classroom. A pilot of the classroom-based "You Can't Say, 'You Can't Play'" (YCSYCP) intervention curriculum was evaluated for three first-grade classrooms in Lincoln Parish (n = 51 children). Each classroom was visited weekly for approximately thirty minutes. Within sessions, passages were read to students from the YCSYCP novel with guided discussions about character development and experiences followed by role play for students to apply morals about inclusivity. Following the intervention, teacher interviews were conducted and coded by the faculty mentor of the project using a semi-structured interview guide. Results from teacher feedback said the YCSYCP program was worthwhile and good, and role play was well-received and applicable to real-life scenarios. The continuation and improvement of the YCSYCP intervention can impact classrooms by fostering positive peer relationships and social awareness.

Hali Mitchell, Chiara Digilormo, and Rhonda Boyd
College of Education and Human Sciences
"Senior Adult Fish Fry"
This service learning project was completed by the KINE 406 Health Aspects of Aging class. The Senior Adult Fish Fry is a fun, free event for members of our Adult Fitness Program. The students helped organize, set up, and run the event. The purpose of the event was not only a time of a get-together for the older adults, but a learning activity for the students to hone in on their organizational skills as well as their soft skills in interacting with the older community. Students wrote a pre-reflection before the event to see where they stand with their comfortability with the older population as well as a post-reflection. The reflection is to help them gain skills that will help them in their chosen career paths.

Ashtyne Monceaux, Caroline Cresap, David Hall, and Krystal Cruse
College of Engineering and Science
"Weekly Professional Development Lunches to Build Community Among an S-STEM Cohort"
This research will assess a weekly lunch that was implemented by eight faculty mentors to promote student retention for an S-STEM scholarship cohort of approximately twenty engineering students. The faculty mentors hosted the students by providing simple home-cooked meals, which helped reduce food insecurity among the cohort while providing a venue for professional development and fostering faculty and peer relationships. The weekly lunch was initiated in the winter quarter of the students' first year. As students moved into their sophomore year and began to enroll in separate, major-specific courses, the lunches helped to preserve previously formed relationships and group identity.

While the weekly lunches focused on social interaction and provided a relaxed environment for catching up, each lunch included professional development "nuggets" that were strategically timed to increase impact. Example activities included the initial introduction of faculty mentors, talks from Ph.D. students, ambassadors from student organizations, discussions about academic success, discussions of interview skills in preparation for upcoming university career fairs, and research opportunities for undergraduates.

This paper quantifies the impact of the lunches on professional development, group identity and belonging, connections with faculty mentors, and academic success using a 25-question survey. The survey includes Likert scale questions, yes/no/unsure questions, and open-ended discussion questions. While survey results show that students enjoy the lunches and believe the social and professional support activities are very beneficial, the results are mixed on whether or not the lunches play a role in their decision to remain in an engineering major.

Daniel Rivera, Austin Broussard, and Elisa Castagnola
College of Engineering & Science
"Double Dry-Etching Microfabrication of Neural Probes with Homogenous Glassy Carbon Microelectrodes and Interconnections"

Glassy carbon (GC) has recently been considered for neural interfaces, due to a key technology that allows for pattern transfer and integration of pre-pyrolyzed GC electrodes into flexible circuits. Hybrid GC multielectrode arrays (hybrid" GC-MEAs) have shown promising performance in neural applications, such as high sensitivity in neurotransmitter detection, high-quality single-unit recordings, and reduced tissue damage and inflammation. However, the mechanical contact between the metal interconnects and the GC electrodes may not chronically withstand prolonged electrical and mechanical stimulation. MEAs with both electrodes and interconnects from a homogeneous GC layer ("all" GC-MEAs) have been previously fabricated and show outstanding electrochemical stability, which eliminates this concern. However, the complex manufacturing process is not ideal for miniaturization.

Here, we introduce an alternative double dry-etching process for fabricating "all" GC-MEAs and GC-fibers with miniaturized features. First, we pattern the SU-8 precursor on a Si3N4 wafer followed by pyrolysis to obtain GC microstructures. Dimensions of trace width (3µm) and thickness (2-3µm) are optimized to ensure practical conductivity (1.21±0.26 Ω/sq). Second, we lithography pattern the insulation of the device, protecting its features with a sacrificial hard mask. Then, we etch the Si3N4 layer using CF4 reactive ion etching, leaving silicon exposed. Finally, we use a chemical isotropic XeF2 etching, taking advantage of the > 100:1 Si versus Si3N4 selectivity, to release the Si3N4 insulated devices from the wafer. We will present and discuss our fabrication and characterization results.

Audrey Shank, Mohammad Tarikuzzaman, Emma Agan, and Joan Lynam
College of Engineering and Science
"Tensile Strength Enhancement of Regolith-Based Cement with Human Hair"

If a persistent human presence on the Moon or Mars is anticipated, building materials that are already present at the site will be needed to construct bases. Radiation shielding materials, such as concrete, are strong in compression, but weak in tension. For this reason, metal rebar is typically added to concrete. However, such metal is heavy and thus would increase mission payloads. Meanwhile, a waste material strong in tension will become available in any long-term mission. Human hair grows at about 1.25 cm (½ inch) per month. It is made of the protein keratin and is considered a bio elastomer, due to its elastic qualities. Keratin is among the toughest of biological materials, possessing both high toughness and high modulus. Human hair is made up of primarily of keratin microfibrils, which are surrounded by a thin layer of protective cuticle. Human hair has a tensile strength of about 225 MPa. On any long-term mission, personnel may desire to cut or shave their hair for comfort or mental health reasons. Rather than waste this resource, such hair may be able to be added to produce a stronger tensile strength building material. The technical challenge to be addressed is: Can human hair improve the tensile strength of regolith-based cement, thus enhancing its durability?

Savannah Spivey, Emad El-Giar, and Erica Murray
College of Engineering & Science
"Study of Corrosion Barrier Properties of Poly (oxy phenylene) on Austinite Steel Using Electrochemical Impedance Spectroscopy"

The corrosion characteristics of poly (oxy phenylene) (POP) barrier coatings on austinite steel were studied to assess the potential for preventing galvanic corrosion between metal components commonly used in automobiles and other transportation vehicles. An electropolymerization technique was used to apply the POP coating onto 316 stainless steel plates with dimensions of 3" x 3". The polymerization mixture composed of 0.40M allylamine, 0.23M 2-allylphenol, and 0.23M 2-butoxyethanol in a 1:1 DI water-methanol solution was applied using a voltage of 10 V for one hour. Electrochemical impedance spectroscopy (EIS) was performed to assess the corrosion resistance of the coating. EIS is an effective method for evaluating corrosion resistance as the data can reveal corrosion reactions occurring at different time constants (i.e., diffusion, charge transfer, and other fundamental processes). EIS is highly sensitive to changes at the coating surface, within the coating, and at the coating/metal interface. The EIS measurements of the POP coatings on 316 stainless steel samples were collected using a 3-electrode corrosion cell in a 5% NaCl electrolyte solution. The data was collected every 3 days over 21 days. Measurements were made in triplicate to ensure the data was stable and reproducible. Confocal Imaging and Scanning Electron Microscopy was used to observe the coatings post corrosion testing to evaluate the coating integrity and aid interpretation of EIS results. Noticeable changes in the coating resistance were observed following corrosion testing, which suggested that increasing the coating thickness and/or modifying the polymerization mixture may promote corrosion resistance.

Emily Watts and Rhonda Boyd
College of Education and Human Sciences
"Winter Games"

This service learning project was completed by the KINE 406 Health Aspects of Aging class. The Winter Games is a fun, free event for members of our Adult Fitness Program. The students planned, organized and ran the event. The purpose of the event was not only a time of fun activities for the older people but a learning activity for the students to hone their organizational skills but also their soft skills in interacting with the older population. Students wrote a reflection summarizing the event and what they gained that will help them in their chosen careers.

Poster Presentation Abstracts

Shaylee Boudreaux, Navya Uppu, Kelly McHahen, Tasneem Khasru, and Mark DeCoster
College of Applied and Natural Sciences/College of Engineering and Science
"Green Synthesis of Metal-Organic Biohybrid (MOB) Nanomaterials"

Green synthesis of nanomaterials endeavors to reduce the use of high energy methods with those that may include lower temperatures and pressures, use of natural products, and bottom-up self-assembly. Here we describe the generation of metal-organic biohybrids (MOBs) with nanoscale features synthesized at physiological (37°C) and room temperature (25°C). These MOBs utilized the naturally occurring amino acid dimer cystine as the biological component, and a series of metals, including copper, silver, and cobalt. The copper- and silver- based nanomaterials generated were distinct in size and shape. Copper formed elongated high-aspect ratio structures which we have named CuHARS. In contrast, the self-assembly of cystine and silver formed nanoparticles which we designate as AgCysNPs, and cobalt formed particles which we designate as CoMOBs. Both cobalt and silver could be combined with copper in the same reaction vessel to carry out green synthesis of different nanomaterials simultaneously. Post-synthesis the polarization of light by CuHARS provided one measure to distinguish the size and shape of different MOBs generated simultaneously.

Jacob Brown, Praveen Pasupathi, Jordan Blazo, and Andrew Parks
College of Education and Human Sciences
"Intraindividual Variability in Attention Associated with Acute Mindfulness Meditation in College Students"

Modern technology provides immeasurable access to knowledge, often at the expense of the users ability to sustain focus and maintain the attentional demands needed to process an abundance of information. This struggle can be a serious problem, especially for college-age students who increasingly rely on technology for their education, as well as their personal lives. One suggested approach to aid in overcoming these challenges is to engage in mindfulness meditation. This meditative practice focuses on stabilizing the mind in the present, and improving consistency in cognitive performance. While mindfulness programs have been researched before most have been long-term programs focused on measures of central tendency. Therefore, the purpose of this study is to investigate the influence of a single bout of guided mindfulness meditation on intraindividual variability of attentional processes. A within-subjects design was used with 24 college-aged participants. The participants completed the modified Eriksen Flanker task, three-stimulus oddball task, Mindfulness Attention Awareness Scale, and Five Facet Mindfulness Questionnaire during both a control and meditation session. Data showed guided meditation did not significantly effect consistency within the attentional processes measured. While no significant positive, or negative, effect was found, these findings suggest in order to detect within-subject variability in cognitive processes it may be necessary to include more sensitive methods of measurement (i.e., EEG) in future studies. Additionally, long-term meditative practices have been shown to improve psychosocial aspects of daily life, indicating there may be a minimum threshold of exposure necessary to experience benefits from these methods.

Kansas Cooley and Patrick Scott
College of Business
"Advancing Technologies Affects On Energy Cost"
Some technologies that have affected energy costs are smart grids, solar panels, and wind-turbines. The following technologies allow customers to manage their own energy and find the parts in their home or business that are taking the most energy. In the energy efficiency sector of power companies, it is their job to help customers lower their energy bill by implementing new advanced technology. Power companies are even incentivizing the use of new technology, so on their end, energy costs are lowered as well. Through looking at the Global Energy Prices and Producer Price Index, I am able to conclude that on average the investments in technology lower prices more. I have plot each model, created a regression equation, and have forecasted the results that answer and prove my theory to be correct.

Christina Doolittle and Julia Earl
College of Applied and Natural Sciences
"The Effects of Tannic Acid and Water Color on Chlorophyll Concentration"
Chlorophyll is the green pigment found in photosynthetic organisms. In a body of water, chlorophyll is a direct indicator of algal biomass, which can reveal valuable information about water quality. Increases in algal biomass can result in an algal bloom, which can produce toxins harmful to fish, wildlife, and humans. Based on a previous study, water with higher tannin concentration and darker water color had lower chlorophyll content. Here we examined tannins, water color, or both have an effect on chlorophyll concentrations. Our experiment used buckets of water as small aquatic mesocosms. We established an experiment with all combinations of 2 treatments: tannins (0 or 10 mg/L) and water color (clear or brown). We found that water color has a significant effect on the chlorophyll, but tannins did not. We used brown food coloring to darken the water, and we found that the dye contained a small amount of tannins. However, we manipulated the tannin concentrations throughout the experiment to minimize this effect. The darker water resulted in more shade, so less light could penetrate the water and reach the algae for photosynthesis. The findings from this experiment furthers our understanding on why chlorophyll could vary among different bodies of water. These findings could be useful in controlling algal blooms or minimizing their impacts on fish, wildlife, and people.

Annie Roche Hendrick, Emily Johnson, Tristen Roussell, and Jane Jacob
College of Education and Human Sciences
"The Relationship Between Imagery Ability and Goal-Oriented Motivation: An EEG Study"
There are very few studies that utilize electroencephalography (EEG) recording to examine imagery vividness differences, like aphantasia and hyperphantasia. Out of those few, the majority are case reports. This study is perhaps the first of its kind, extending beyond just a singular participant and using EEG to observe the connection between imagery ability and affective motivation issues. The results of this study will not only contribute to this small community of existing research but will also promote equity in goal-reaching techniques. During the experiment, high-density (128-channel) EEG recordings are obtained while the participants complete mental imagery and working memory tasks. Additionally, participants complete assessment questionnaires on motivation to reach goals, planning anxiety, and the Vividness of Visual Imagery Questionnaire (VVIQ-2). The VVIQ-2 tests the vividness at which participants can visualize people, objects, or settings in their "mind's eye." Through analysis of collected data, we expect to see differences in performance across imagery and working memory tasks in participants with low VVIQ-2 scores versus those with 'standard" and high scores. We also hypothesize self-reports of lower motivation and higher planning anxiety symptoms in the participants with low imagery abilities.

Trilby Hill and Louis Reis,
College of Engineering & Science
"Using Machine Learning to Geospatially Predict Submerged Paleo Forests in the Northern Gulf of Mexico"

In 2010, multiple samples of preserved wood were discovered within the Gulf of Mexico seabed offshore Alabama. This unique discovery was followed by extensive research, which led to the conclusion that the site contains a preserved drowned bald cypress forest from the Pleistocene epoch. This site offers excellent preservation of past ecosystems, and scientists believe that similar sites exist in the region that could be explored for archaeological, ecological, and geological research if located. However, it is difficult to locate drowned forest sites and extents due to Pleistocene wood being buried beneath the seabed or degraded by the water column once unburied. Here, we utilize machine learning algorithms to predict the presence or absence of wood (as a proxy for paleo forests) within sediments offshore Mississippi and Alabama. The observed data comprises hundreds of sediment cores that record the presence or absence of wood at described depth intervals below the seabed. These observations serve as training and validation data for machine learning algorithms, enabling estimation of drowned forest existence outside of the known dataset. Reconstructed paleo topography models from the last glacial maxima and modern bathymetry are used as predictors to identify the probable locations of buried wood. These predictors incorporate knowledge related to the observed data, and machine learning algorithms identify relationships between the predictors and observed data to make predictions. In these predictions, we explore the relationship between drowned forest location and the predictors, geospatially depicting the probability of wood within sediments throughout the Northern Gulf of Mexico.

Nathan Holley and Sven Eklund
College of Engineering & Science
"Degrading Organic Pollutants via the Generation of Radical Oxygen Species from Piezoelectric Materials"

The presence of organic pollutants in water is a growing concern due to their impact on aquatic ecosystems and public water sources. Pesticides, pharmaceuticals, and other organic compounds are commonly found in water supplies across the United States. The issues posed by these contaminants in the water are serious and can cause lasting health effects. Current methods of removing organic pollutants from water sources require an outside energy source, which can be circumvented by applying piezoelectric materials. A piezoelectric material generates an electric charge from applied mechanical pressure, such as the motion of water down a drain. This generation of an electric charge causes radical oxygen species to form in the presence of organic pollutants, which, in turn, degrades the organic pollutants. MoS_2 is the principal piezoelectric compound being researched. MoS_2's ability to degrade organic contaminants such as dyes, antibiotics, and various other organic materials is being investigated. Additionally, the factors influencing its effectiveness as a piezo catalyst are of specific interest. MoS_2 was synthesized via reacting thiourea and MoO_3 in a hydrothermal reaction vessel at high temperatures. To test the ability of MoS_2 to degrade organic materials, the compound was added to a cuvette containing the organic material, and the cuvette was suspended in an ultrasonicator to provide the required mechanical stress. The concentration of the organic material over time is found by plotting the fluorescence intensity of the mixture over time. From this data, the catalyst's ability to degrade organic compounds can be determined.

Kate Horton, Morgan Bourgeois, Kristin Jackson, Jeanne Dugas, and Jamie Newman
College of Applied and Natural Sciences
"The Influence of Perturbing a Hormone Signaling Pathway on Human Adipose Stem Cells"

Adult stem cells are undifferentiated cells that originate from one lineage and can self-renew and differentiate into specialized cells. Human adipose-derived stem cells (hADSCs) are mesenchymal stem cells harvested from adipose tissue that can differentiate into adipocytes, osteocytes, or chondrocytes. hADSCs have implications for regenerative medicine in areas of wound repair, degenerative diseases, and obesity treatments.

Many factors affect a stem cell's ability to differentiate towards a specific cell lineage type. Growth hormone-releasing hormone (GHRH) is one hormone that affects how a stem cell differentiates. GHRH can trigger the secretion of growth hormone (GH) by attaching to its receptor. In addition, GHRH has been found to regulate the synthesis and destruction of fat cells. We expect that manipulation of GHRH will interrupt the differentiation of hADSCs into fat cells, decreasing adipogenic tissue volume. In order to test this hypothesis, we will inhibit the hormone pathway using an antagonist of GHRH and monitor both the self-renewal and adipogenic differentiation of hADSCs. To monitor the cells, we will stain both normal and inhibited cells with phalloidin and perform qRT-PCR and western blots to monitor expression of GHRH, GHRH-receptor, GH, IGF-1, and PPAR-γ. We expect to find that the inhibition of GHRH will result in less adipocyte formation, thus demonstrating the possible use of GHRH antagonists in combating the obesity epidemic.

Cassidy Husson, Matthew Franklin, Cameron Bradford, Rebecca Giorno-McConnell, and Gergana Nestorova
College of Applied and Natural Sciences/College of Engineering and Science
"Gene Sampling Technology for Rapid Microbial Genotyping in Microfluidic Device"

This study reports a lab-on-a-chip platform for bacterial lysis for subsequent one-step RNA purification and PCR analysis of bacteria. The developed portable platform eliminated the multistep protocol for additional pre-concentration steps of the bacterial specimen while enabling selective isolation for bacterial 16S rRNA for genotyping. The microfluidic chip will elegantly interface with a gene sample tool for dry and selective purification of 16S ribosomal RNA (rRNA) for microbial rRNA reverse transcription PCR genotyping. The efficiency of mechanical, enzymatic, and ultrasonic lysis efficiency was assessed using gram-positive (B. cereus) and gram-negative (E. coli) bacteria using commercial RNA purification. Ultrasonic lysis was the most efficient method for bacteria that have a thicker cell wall resulting in an average of 502ng of RNA from 1^10 7 B. cereus cells. Mechanical lysis provided the highest yield for gram-negative bacteria at an average of 4,438ng of RNA from 1^10 7 E. coli. Lysis efficiency testing was done using LIVE/DEAD™ bacterial viability fluorescence assay. The design of the microfluidic platform includes piezoelectric plate ultrasonication. The design of the microfluidic platform includes piezoelectric plates (25mm×5mm×0.3mm) for ultrasonic-based lysis. A Gold-plated microscopic pin (200µm×25mm) was functionalized with thiol-conjugated synthetic RNA capture sequences for selective purification of bacterial nucleic acid. The quality and the quantity of the nucleic acid were characterized using the Agilent 2100 Bioanalyzer which confirmed that the captured nucleic acid is selectively enriched for 16S rRNA. The RNA capture pin efficiency was 60ng of RNA per pin using E. Coli and 28ng per pin using B. cereus.

Ethan Jamerson, Gavin Soniat, and Elisabeth Fatila
College of Engineering & Science
"Developing Metal-organic and Organic Working Scintillator Materials"

In modern particle physics, one key tool often used to analyze particles and their interactions are scintillators; these are materials that fluoresce when struck by high energy particles, allowing for the detection of particle interactions by measuring the emitted light from the scintillating material. However, one issue with modern scintillators is the lack of variety in available materials, leading to a reduced measuring capacity as certain properties cannot be correctly measured. One solution is to synthesize new scintillating materials that can cover these measurement gaps created by a lack of variety, especially in regard to the emission wavelength, decay time, and intensity. To create these materials, our group synthesized and characterized a variety of compounds, using a fluorometer to identify the potential of each compound as a scintillator, then characterizing the compound using infrared spectroscopy and X-ray diffraction. In this search for new materials, one consistent issue we found is the solubility of the compounds involved; for instance, our attempts to create bismuth based compounds were unsuccessful due to the lack of solubility. Similarly, attempts to create materials using organic compounds were often unsuccessful due to the molecule's insolubility, this property also affected the quality of the polymers doped with these materials, as the resultant polymers were not optically clear. One overarching solution to this problem is to use different reaction methods, such as mechanochemistry or to modify the molecules by attaching fluorine atoms to enhance solubility.

Emily Johnson, Tristen Roussell, and Jane Jacob
College of Education and Human Sciences
"Exploration of the Dynamics of Information Transfer Across Stages of Visual Short-Term Memories Through Event-Related Potentials"

Previous behavioral studies have suggested that visual short-term memory (VSTM) has three (or more) phases of visual information processing-- iconic visible persistence, iconic informational persistence, and visual working memory (Jacob & Breitmeyer, 2013)-- and that these phases can be affected by cognitive load (Jacob, Breitmeyer & Trevino, 2022). The stages were demonstrated through reaction time differences between congruent and incongruent pairings of stimuli in comparison tasks. The current study explores the neural underpinnings of these previous findings through the added use of a high-density 128-channel EEG array as participants completed memory comparison tasks where they viewed 1,3, and 5 memory display items and were tested with a display item at a range of several interstimulus-intervals (ISIs: 0-1500ms) spanning across the previously identified phases of VSTM. We expect, similar to previous behavioral studies, onset delays and/or amplitude differences in event-related potential (ERP) components in response to increasing memory load and ISIs.

Emmanuella Kabran, Kevin Singh, and Terri Maness
College of Liberal Arts/College of Applied and Natural Sciences
"Biophilic Design: Connecting People to Nature through Architecture"

The COVID-19 pandemic has brought to light the critical role spatial constraints play in our daily lives, revealing that our ability to breathe freely can be severely restricted within defined spaces. This realization prompts a reevaluation of the layout and purpose of our built environment.

As we grapple with the consequences of this realization, there is a growing emphasis on reimagining interior spaces. The focus extends beyond safety considerations to prioritize the well-being of occupants. Our reliance on technology has caused us to lose sight of the fundamental idea that buildings should be essential parts of a system that prioritizes health. Unfortunately, this essential design idea has been sidetracked by the misuse and exploitation of technologies. In this project, I designed spaces analogous to the functioning of lungs to improve respiratory health within the built environment. Ensuring access to clean air continues to be a pressing and urgent need.

Stuti Khatiwada, Sudhir Amritphale, Hussain Shaikh, and John Matthews
College of Engineering & Science
"Dynamic Sequestration of Carbon Dioxide"

The emission of primary greenhouse gas, CO2 has increased significantly over the years causing the earth's surface temperature to rise. Therefore, it is important to find a method to mitigate the emission of CO2. The present research work aims to use environmentally friendly permeable geopolymer concrete as a carbon dioxide capturer due to the presence of strong alkali, NaOH. This research will focus on the use of geopolymer concrete to demonstrate an onsite dynamic sequestration system for carbon dioxide using sustainable materials like fly ash. Our primary focus relies on replacing toxic organic polymers with non-toxic inorganic geopolymers-based permeable scrubber systems capable of sequestrating CO2 dynamically. While conducting our research experiment, we have considered three major process parameters; concentration of NaOH, porosity of pervious geopolymer concrete, and flow rate of CO2. The developed methodology will be useful for CO2-generating industries like cement industries, steel industries, and thermal power plants. In the latter half of the experiment, we have used lime water for the regeneration of NaOH.

- $NaOH + CO2 \rightarrow Na2CO3 + NaHCO3 + H2O$
  $Na2CO3 + NaHCO3 + Ca(OH)2 \rightarrow NaOH + CaCO3$

Stuti Khatiwada, Sudhir Amritphale, Hussain Shaikh, and John Matthews
College of Engineering & Science
"Dynamic Sequestration of Flue Gases"

The emission of flue gases (sulfur oxides, nitrogen oxides, and carbon monoxide) has increased significantly over the years causing the earth's surface temperature to rise and adversely affecting the environment. Therefore, it is important to find a method to mitigate the emission of flue gases. The present research work aims to use environmentally friendly permeable geopolymer concrete as a flue gas component capturer due to the presence of strong alkali and appropriate additives in the geopolymer matrix. This research will focus on using geopolymer concrete to demonstrate an onsite dynamic sequestration system of flue gases using sustainable materials like fly ash and other industrial waste such as red mud from the Aluminum industry. Our primary focus relies on replacing toxic organic polymers with non-toxic inorganic geopolymers-based permeable scrubber systems capable of sequestrating flue gases dynamically. While conducting our research experiment, we will consider three major process parameters; concentration of NaOH, porosity of permeable geopolymer concrete, appropriate waste for absorbing flue gas content, and flow rate of flue gases. The developed methodology will be useful for flue gas-generating industries like cement industries, steel industries, and thermal power plants.

Hojun Lee and Erica Murray
College of Engineering & Science
"Pit Morphology of Corroded Al6061 Fabricated by Additive Friction Stir Deposition"

Additive friction stir deposition (AFS-D) is a manufacturing method where a metallic rod, called a feed stock, is spun rapidly to lay down material and make an object or a structure. AFS-D is promising for many industrial applications, due to its scalable capabilities and speed. As AFS-D is a new 3D printing technique for metals, it is necessary to understand the impact of this manufacturing method on the corrosion of fabricated metals. This study evaluated the corrosion characteristics of aluminum alloy Al6061 fabricated by AFS-D. Electrochemical corrosion tests were carried out in 3.5% NaCl solution. Post corrosion testing, microscopy and spectroscopy studies were performed on various surfaces of the corroded Al6061 samples. The corroded samples had several pits of various morphologies. Scanning electron microscopy images revealed the location, distribution, and area size of the resulting corrosion pits. Confocal imaging was used to determine the surface roughness, maximum pit depth, and pit profile. Energy dispersive X-ray showed the elements present in the samples. Corrosion was more extensive along the boards of the Al6061 sample. This variation in corrosion was observed in the Al6061 AFS-D samples where larger and deeper pits were present over exterior regions of the sample, whereas smaller pits were present within the sample interior. Overall, these results indicated the AFS-D process caused the Al6061 samples to have higher corrosion resistance along the center of the part. This knowledge will be beneficial for improving AFS-D processing techniques to establish more uniformity to eliminate preferential corrosion behavior.

Margaret Lott, Annie Roche Hendrick, Trevor Mills, and Kacie Mennie
College of Education and Human Sciences
"Memory for Scenes"

Discovering how scenes are structured in one's memory is crucial for understanding event memory. This adds to our understanding of how we remember everyday events and topics like the reliability of eyewitness accounts. This project extends our previous findings that attended items are placed best and examines the direct binding of objects in the context of scenes and the role of attention in binding. Specifically, whether objects bind together in memory and to the scene itself or if the scene affects direct binding between these objects. During the experiment, participants viewed scenes that contained various objects. Half of the participants viewed unique rooms, while the other half viewed rooms with replicated backgrounds. While the scene was shown, attention was drawn to some of the objects. After viewing the scenes, an object was shown along with a blank section of the screen, an attended object, or an unattended object to test the participant's memory of objects when paired with different cues. Our previous results indicated that cues were unhelpful, suggesting a lack of binding. However, the previous study was underpowered. After resolving these issues, current results demonstrate the direct binding of objects, such that memory for attended objects paired with attended cues is significantly better than that of observed objects paired with unattended objects or no cues and is also better than that of isolated objects.

Vance Melmoth, Megan Burns, Annabeth Rawls, Caitlyn Fontenot, and Jennifer M. Hill
College of Applied and Natural Sciences
"Fipronil Pesticide Cause Declines in Zooplankton Populations"

Zooplankton are foundational microinvertebrates in the food webs of aquatic ecosystems. Many zooplankton are arthropod crustaceans, and are thus vulnerable to insecticide pollution that contaminates ponds, lakes, and rivers through runoff. Consequently, insecticide contamination can reduce zooplankton populations and indirectly negatively affect higher trophic levels. Fipronil is a broad-spectrum insecticide in the phenylpyrazole family that is most commonly used as a topical flea and tick pet treatment, and for residential, commercial, and agricultural pest control. It can be lethal to several zooplankton species in laboratory studies, but its impacts have rarely been examined under field conditions in natural communities. To test the effects of fipronil on zooplankton, zooplankton communities were created in outdoor mesocosms by aliquoting pond water containing planktonic organisms into each mesocosm. After several weeks, fipronil (1ug/L) was added to half of the mesocosms. Zooplankton samples were collected twice (days 7 and 13) then filtered and preserved for identification and enumeration. The zooplankton community was composed primarily of copepods, cladocerans, and aquatic mites. Fipronil significantly reduced the total number of zooplankton, and zooplankton abundance also declined over time, likely due to high temperatures in mesocosms. While the abundance of all zooplankton groups declined due to fipronil, declines over time were strongest in cladocerans. Our results suggest environmentally realistic concentrations of fipronil result in declines in zooplankton populations in natural conditions which could indirectly negatively affect aquatic food webs suggesting the need for monitoring of fipronil in aquatic communities.

Trevor Mills, Annie Roche Hendrick, Margaret Lott, Hannah Hendry, Tristen Roussell, and Kacie Mennie
College of Education and Human Sciences
"Preliminary results of a pilot Study on Content Warnings"

Misinformation is a plague on social media (SM). A report by Orbanek (2021) showed that only 67% of people can detect misinformation when they encounter it on SM. Current literature focuses on the effectiveness of the type of content warning (e.g., Lanius et al., 2021) and the emotional valence (Lanuis, et al., 2021; Sharevski et al., 2022) of the flagged content without considering whether the amount of misinformation in a SM feed impacts the effectiveness of warnings. However, the amount of misinformation present on a social media feed could create criterion shifts wherein people adjust their decision for what is misinformation (Godwin & Hayward, 2010). The current study rectifies this issue, considering both the type of content warning and the amount of misinformation present on a SM feed. Participants viewed feeds with varying amounts of false posts. Additionally, depending upon the content warning condition, misinformation was not tagged, or was "flagged" by fact checkers, or labeled as bot-created. After examining the feeds, participants viewed the posts again as statements (without the warnings) and rated the accuracy of the statements and their confidence in their answer. Preliminary results suggest that a link between the type of warning and accuracy, as well as a warning x amount of false information interaction that impacts confidence in responses.

Lauren Niten and Patrick Scott
College of Business
"Do Tariffs Make or Break Economies?"
My goal is to determine whether tariffs have a positive or negative impact on economic growth in developing countries.
Tariffs are taxes imposed on imports and they regulate international trade.
Economic growth leads to job creation, increases access to healthcare, and improvement in the standard of living. While also considering other factors such as foreign direct investment and poverty rates what are true tariff effects. In order to answer my question I used these methods: Data Collection and Preparation: Collected Tariff Data from Our World in Data, FDI data from, Poverty Data, and GDP Per Capita data from the World Bank. I then used three different regression models to show the significance of the results. The first equation considered the dependent variable GDP per capita and the independent variable tariff rates. The second equation considered the dependent variable GDP per capita, the independent variable tariff rates, and the independent variable foreign direct investment. Finally, the third equation considered the dependent variable GDP per capita, the independent variable tariff rates, the independent variable foreign direct investment, and the independent variable percent of people living in slums. I then ran regression analysis on these equations.

Landon Ossman, Carter Murphy, Logan Escalon, Isabella Redman, and Jamie Newman
College of Applied and Natural Sciences
"The Effects of Fructose and Sucralose on Adipogenesis and Self-Renewal in Human Adipose Derived Stem Cells"
Today, approximately two-thirds of the United States population is obese or overweight. Obesity is intricately linked to a myriad of diseases, including diabetes, cardiovascular disease, metabolic syndrome, and respiratory disorders. The multifaceted impact of obesity on health underscores the need for comprehensive strategies to address and mitigate its associated comorbidities. Sugar is one of many established contributors to the progression of adipogenesis; therefore, we aim to find relative data on sugar concentration and subsequent effects on gene regulation and expression throughout adipogenesis in human adipose derived stem/stromal cells. Quantitative reverse-transcriptase PCR (qRT-PCR) will be used to monitor changes in transcription of specific genes related to self-renewal and adipogenesis. To confirm proper proliferation and morphology of self-renewing cells we will monitor ki-67 expression, a gene expressed during DNA replication, and stain the cells using phalloidin and dapi, which stains actin filaments and nuclei, respectively. To confirm adipogenic differentiation, we will monitor pparγ expression, a gene associated with adipogenesis, and use Oil Red O staining. We will test four concentrations of fructose and sucralose using previously published data that indicates an optimal range for these types of experiments. With each treatment we will assess changes in self-renewal and adipogenesis by monitoring the expression of ki-67, pparγ, glut5, adipoq, notch1, and notch3 in both self-renewing cells and those undergoing adipogenic differentiation. With this work we aim to contribute to our understanding of the molecular mechanisms that sugar and sugar substitutes utilize to initiate and enhance adipogenesis in hASCs.

Sophia Owens and Simone Camel
College of Applied and Natural Sciences
"The Prevalence of Orthorexia Nervosa Risk in Future Nutrition Professionals"

Goal

Investigate the risk for Orthorexia Nervosa (ON) in Nutrition and Dietetics (ND) students and its relationship to academic performance.

Motivation

ON is the obsession with and avoidance of unhealthy/unclean foods. Research indicates that 4-32% of ND students are at increased risk for eating disorders (ED) other than ON.

Methodology

A cross-sectional study using an electronic questionnaire was administered to 65 ND students; 46 responded (70.76% response rate). It collected demographics, grade point average (GPA), BMI, and Test of Orthorexia Nervosa-17 (TON) scores (5-point Likert scale; range = 17-85; three subscales).

Results

This primarily female (84.8%), White (76.1%) sample had a mean age and BMI of 22.31 (SD = 4.95) and 30.84 (SD = 7.54) respectively. Mean TON score was 48.91 (SD=9.12); Factor I (control of food quality), Factor II (fixation on health and healthy diet), and Factor III (disordered eating symptoms) had M=17.23 (SD=4.03), M = 13.32 (SD 4.73), M=18.45 (SD=3.27) respectively. Five (10.9%) respondents scored ≥ 61, at increased risk for ON. GPA positively correlated with Factor I, r(37) = .431, p=006, and II, r(37) =.386, p=.015. GPA satisfaction positively correlated with Factor I, r(39)= .378, p=015, and II, r (40) = .468, p = .002 and negatively correlated with BMI, r(40)=-.329, p=.033. BMI negatively correlated with Factor II, r(42)= -.335, p=.026.

Conclusion

ON factors appear related to academic performance and BMI. Of concern, 10% of future professionals may present with ON which could bias practice and may be in addition to other EDs.

Abigail Pierce and Patrick Scott
College of Business
"The Unexpected Factors Driving the Gender Wage Gap"

This project analyzes various social, economic, and political factors that affect the gender wage gap using a cross-sectional time series technique to determine the impact from 2004 to 2022. The variables used include state majority house & senate, reproductive rights for each state, population changes for each state, equal pay policy for each state, real gross domestic product for each state, birth rate for each state, and educational attainment for each state. The main purpose of this project is to determine what factors aid in narrowing the gender wage gap compared to others. It explores social, political, and economic variables due to them normally being contributed to impacting the gender wage gap. This project analyzes various social, economic, and political factors that affect the gender wage gap using a cross-sectional time series technique to determine the impact from 2004 to 2022.

William Sandel, Ran Sun, Dylan Ward, William Humphreys, John Sibley, Daniele Kropp, and Tom Bishop
College of Engineering & Science
"A modeling and simulation workflow for the comparative analysis of chromatin folding"
Nucleosomes are protein-DNA complexes that serve as the structural building block of chromatin(Olins 2003). Chromatin is the biomaterial that houses the genomes of all higher organisms. After extensive efforts to characterize chromatin folding by various theoretical, computational, and experimental methods, scientists still struggle to identify the rules that govern the folding of nucleosomes into chromatin(Ozer 2015). Recently an X-ray structure of 354 base pairs of DNA associated with two nucleosomes, each containing a linker histone was determined(Adhireksan 2021). This structure provides a starting point for exploring how the topological constraints imposed on circular DNA, alter the structure and dynamics of free nucleosomes. For this purpose, we conducted and compared implicit solvent all-atom molecular dynamics simulations of the following systems: DiNuc+LK, DiNuc-LK, NucA+LK, NucA-LK, NucB+Lk, NucB-LK. Here the designation +/-LK indicates whether or not the system contained nucleosomes. The system names designate: the full dinucleosome structure on closed, circular DNA, DiNuc; the nucleosome associated with base pairs 1-177, NucA; the nucleosome associated with base pairs 178 to 354, NucB. Each structure was determined from protein data bank entry 7COW. The analysis seeks to establish the efficiency of our workflow, the stability of the implicit solvent simulation methods, and comparative metrics for assessing the structure and dynamics of the nucleosomes as a function of DNA sequence, the presence of linker histones and topological constraints. We expect the linker DNA that joins nucleosomes to exhibit significantly different dynamical properties depending on the presence or absence of linker histones and/or topological constraints.

Jonathan Tairov, Yashodara Ekanayaka, Jared Melseth, Sandra Zivanovic, Lee Sawyer, and Shengnian Wang
College of Engineering & Science
"Carbon Quantum Dot Heavy Metal Sensor"
Heavy metal pollution poses a significant risk to our health and environment. In many cases, heavy metals can be toxic even in very small doses. Therefore, it is important to be able to track the presence of heavy metals in the environment, such as in water or soil. However, traditional methods of identifying these kinds of contaminants are often very expensive and require specialized workers. Carbon quantum dots (CQDs) pose a cost-effective method of heavy metal detection by utilizing their fluorescent properties. In this project, we investigated the effects copper pollutants have on the fluorescence of CQDs. We synthesized CQDs by a one-pot hydrothermal reaction of citric acid and ethylenediamine. We measured the fluorescence of our CQDs and the change in fluorescence in the presence of copper salt. We found that we can identify the concentration of copper within the 1-25 mM range using this method. To better enable access to this kind of technology, a cheap, portable measurement system will be created and tested as well. Creating more access to pollutant sensing technology could enable people around the world to make more informed decisions by taking samples more consistently. This could help manage ecological disasters before they become widespread.

Kenzie Thomas, Kelsey Shoemaker, and Paul Jackson
College of Applied and Natural Sciences
"The 'Edge Effect' Reduces Loblolly and Longleaf Pine Seedling Quality"

In southern forest tree seedling nurseries, 300 million conifer seedlings are grown in container trays each year. Seedling roots develop in a root plug within a cavity in the tray, which offers protection and moisture and nutrient retainment for better field establishment. Nursery managers encounter many challenges during production that affect seedling quality, and one of these is known as the 'edge effect'. This occurs when seedlings exhibit less growth in the cavities along the edge of the container compared to seedlings positioned closer to the center. With no published data to reference, it is speculated that this may involve interior seedlings growing taller as they seek more light in the tray, or seedlings on the edges becoming stunted from increased air movement and subsequent drying.

The edge effect was observed on container-grown loblolly and longleaf pine seedlings grown in the 2023 growing season at Louisiana Tech University. To determine the effects on seedling quality, height, root collar diameter (RCD), and dry biomass was measured on seedlings growing in cavities designated as either outside, middle, or inside rows in the tray. Loblolly pine grown in the outside cavities had less RCD, height, and shoot/root biomass compared to seedlings grown in the middle and inside rows. Longleaf pine grown in outside cavities had less RCD and root biomass compared to seedlings grown in the middle and inside rows. These results indicate that seedling quality can be reduced by the "edge effect", and that more research is needed in operational nursery settings.

A'Myra Whitby, William O'Brochta, and Jeremy Mhire
College of Liberal Arts
"Understanding Partisan Media Consumption and How It Facilitates Political Division"

To what extent does partisan media consumption have an effect on political division among its consumers? Previous research has argued that there is a relationship between partisan media and political division but whether partisan media is responsible or not remains unexplored. I argue that partisan media consumption causes an increase in political division because the media pushes polarized opinions on their supporters. Using the 2020 Cooperative Election Study data I tested this hypothesis by first defining partisan media and social division, then I selected certain questions and produced statistical data. The results show support for the hypothesis: partisan media consumption does cause an increase in political division. This means that the media plays a major role in the division of its consumers. From my data a future policy proposal could focus on enforcing these media sources to be less partisan and incorporating all side media sources in mainstream media. For an individual application, those who find themselves a part of the same groups used in my study could consider if their styles of media consumption have led them to be politically divisive.

Rachel Williamson and Julia Earl
College of Applied and Natural Sciences
"The Impact of Leaf Species Diversity in Ponds on Cope's Gray Treefrog Oviposition"
Frogs choose pools to oviposit their eggs into based on a variety of factors, including the leaf species present in the ponds. Most ponds contain a variety of leaf species, which may also be important for oviposition site selection. It is also unclear what cues females use to make oviposition decisions. This experiment aimed to determine if leaf species diversity has an impact on Cope's gray treefrog oviposition preference. This knowledge is important to determine best management practices for bodies of waters where frog populations are declining. We established pool mesocosms in a rural area near Ruston in April 2023 and manipulated leaf species richness in each pool. Pools had either 3, 5, 7, 9, or 11 species of leaves and 8 of each species richness treatment. An additional 5 pools had no leaves added. Leaf species diversity did not have an effect on Cope's Gray treefrog oviposition. This research is useful, because it suggests leaf diversity should not be a management target to affect treefrog oviposition. Future work will examine effects of water and leaf chemistry on oviposition site selection.

Ben Willis and Elisabeth Fatila
College of Engineering & Science
"Trials and Tribulations in Lanthanide Coordination Chemistry"
In the last few decades, light-emitting diode technology has been increasingly implemented and studied for use in optical displays and devices. While there are several families of compounds that can give rise to these LED behaviors, lanthanide coordination complexes are well-known for their characteristic optical properties. Lanthanide beta-diketonates are simple coordination complexes which can be used in such applications; however, they can be difficult to purify and identify. This is a consequence of the inherent difficulties in controlling the coordination environment of lanthanides. By identifying synthetic methods and characterization techniques that increase the predicted coordination of these reactions, we can assist other researchers who use these compounds as starting materials. In previous work, we have shown that a fluorinated ligand can generate a variety of complexes. Now we have extended the list to include other beta-diketonates. Notably, several of the new additions contain phenyl rings, which may act as "antenna ligands" to increase or cause luminescence. In addition to the ligand used, we utilize both solution and mechanochemical syntheses, as some reactions result in differently coordinated products depending on the method of synthesis used. For identifying and characterizing the products we use Fourier-Transform infrared spectroscopy, fluorescence spectroscopy, nuclear magnetic resonance, and powder X-ray diffraction. Thus far, we have found that there is variation in product coordination across both methods and most ligands.