

## Abstracts

### Northwestern State University of Louisiana

#### Oral Presentations

##### *Creating a School Based Health Clinic in Nepal*

**Alexandra Brossett, Shaun Wheat**, Calyn Nash; Grace Penrod & Karlyn Trahan

The need for improved healthcare, especially in third world countries, is growing exponentially. One of these third world countries who are especially in need of improved healthcare is Nepal. Our service-learning project was to help set up a school-based health clinic at Rhombus National School in Bhaktapur, Nepal. We worked with one of our nursing instructors, Shaun Wheat, to create this clinic. We recognized that the needs of a school clinic in rural Nepal were different from the needs of a school clinic in the United States. Through Mrs. Wheat, we communicated with a nurse in Nepal to conduct a needs assessment. As nursing students at Northwestern State University, we are taught about the etiology, prevention, and treatments for many different medical conditions including first aid, infections, viruses, and diseases. Using the information we received and resources from the World Health Organization, we researched first aid needs and health conditions commonly seen in Nepal. We used our knowledge to provide education, teach prevention, and how to treat each one based on the resources available in Nepal. We then created informational pages for each medical condition. The informational pages were placed in a binder to provide a quick reference for the school officials. Mrs. Wheat brought the binder and medical supplies to Nepal and set up the clinic. While there, she taught the school's faculty basic first aid and left the information we compiled in the clinic.

Oral session 2D

##### *Design, A Transforming Discipline*

**Juan Sebastian Castilla**

Faculty mentor: Mirla Gonzalez Enriquez -

The Design Center, an in-house design lab that services the university and the community, a tool for Students' Experiential Learning. The Design Center (DC), at the Northwestern State University School of Creative and Performing Arts, is an in-house design studio in which undergraduate students practice the profession of Graphic Design through experiential learning. All work is pro-bono, client centered. Under the guidance of their professor, students intern for one semester. The most successful students' internships are extended to a full year. Due to a lack of design agencies or companies in Natchitoches, Louisiana, the Design Center offers students the opportunity to practice their design skills, and apply knowledge gained during course assignments to solving real-world problems. Being an office that offers pro-bono services has been very attractive for clients in our area. At the same time, client-based projects completed with the DC allow our students to work on a variety of projects, that many times challenge their expectations. This presentation will show work completed in the areas of advertising design and animation: Logo design for Preservationist of St. Landry Foundation and lyric video for a local musician which includes text and animated graphics. Software used: Adobe Photoshop, Illustrator, Premiere and After Effects. This presentation will provide a scope of the work completed by the Design Center and will focus on how it impacts students learning experience within an incubator business concept.

Oral session 1C

##### *Effects of Solvent on Nucleation and Growth of CaS Nanostructure: A DFT Approach*

**Jenna Caswell**

Faculty mentor: Dr. Daniel Rivera-Vazquez

Nucleation and growth of nanostructures is both a thermodynamically and statistically driven phenomenon. In this study, the energetics of a stepwise mechanism of formation of  $(CaS)_n$  ( $n = 1-6$ ) are compared to a concerted mechanism of formation.  $(CaS)_n$  clusters ( $n = 1-6$ ) were analyzed at the B3LYP/DGDZVP level of theory. In addition to vacuum conditions,  $(CaS)_n$  structures were optimized under conductor-like polarizable continuum model

(CPCM) conditions. Solvents selected for this calculation include H<sub>2</sub>O, dimethyl sulfoxide (DMSO), and cyclohexane. Nucleation energy was calculated assuming a stepwise formation ( $DE = E_n - E_{n-1} - E_1$ ); a similar calculation was performed assuming spontaneous formation of each cluster ( $DE = E_n - nE_1$ ). In the gas phase, (CaS)<sub>1</sub>  $E = -1075.69821252$  Hartrees, (CaS)<sub>6</sub> E step-wise =  $-0.04015024$  Hartress, (CaS)<sub>6</sub> E spontaneous =  $-0.65921714$  Hartress. Similar values were found for (CaS)<sub>n</sub> clusters in H<sub>2</sub>O, DMSO, and cyclohexane. The data suggests that, while spontaneous formation of CaS clusters is energetically favored, the mechanism contains a significant statistical component. Surface area-to-volume ratios were calculated for the clusters under each solvent. The values decreased from  $1.29 \text{ \AA}^{-1}$  to  $0.89 \text{ \AA}^{-1}$  as the aggregate number increased. Electronic transitions and HOMO-LUMO gaps were studied using configuration-interaction singles (CIS) calculations. The results suggest electronic transitions in the UV region (around 250 nm) that extend towards the visible trailing off around 600 nm. Absorbance measurements from CaS nanostructures prepared coincided with the results from the CIS calculations. Further studies include band gap formation on CaS nanostructures as a function of their size and solvent environment.

Oral session 2C

### *1 of 7: Choose 1 Day of 7 to Give Back*

**Madison Cook**

Faculty mentor: Mary-Katherine Horton -

1 of 7 is a simple concept, and it's one that can make a difference. Pick one day of the week...do something good...the following week, repeat. Started by NSU alumnus, Kip Patrick, NSU has adopted this simple program to help make a difference in the local community and at NSU. 1 of 7 is a service project hosted by the Office of First Year Experience during our Demon Days Welcome Back each fall. During our 42 Demon Days, you can do something good for someone else at least six times with the 1 of 7 mindset. Are you ready to get involved while giving back?

Oral session 1A

### *President's Leadership Program (PLP): An Immersive Experience with Leadership and Service*

**Matthew Courville, Jesus Bravo; Nicholas Knotts; Mary Scruggs**

Faculty mentor: Reatha Cox –

The President's Leadership Program (PLP) was established in 1975 beginning as a program for proven leaders to elevate their leadership skills. Since its inception, PLP has produced many successful graduates in their respective fields. The purpose of PLP is to provide students with the opportunity to learn the best form of leadership, servant leadership. The program is divided into two semesters. During the first semester, the primary focus is to define leadership styles and determine which category members fall into. The program utilizes seminars and service opportunities to further enhance and develop an understanding of what leadership is. Communication skills are honed through networking practice, whether it be with faculty and staff, peer mentors, students, or guest speakers. During the second semester, students put these learned leadership skills into practice. Impact Projects are service initiatives designed to address a need in the community. They are student led and operated. By serving in these projects, students acquire valuable experience in facilitating events. Additionally, time management, dependability and team building skills are an integral part of this process. Students are graded based on how effective their project was at solving the need in the community. One of the most influential projects throughout the program's history is Special Olympics. In 2016, the members of the President's Leadership Program brought this event back to Natchitoches and NSU's campus. Since then, PLP has organized the event in its entirety.

Oral session 2B

### *NSU Conservation Club: Conservation Starts with NSU*

**Madison Dalusung, Kasey Strother-Leone; Adelaide Soileau; Olivia Habetz**

Faculty mentor: JD Cox -

The Conservation Club of Northwestern State University is dedicated to bringing together like-minded individuals interested in natural science and conservation. This is done at a local level through various volunteer opportunities and local community outreach. Conservation Club is currently working towards building pollinator habitats around the Northwestern State campus.

Oral session 2C

*Poinsettia as a Present*

**Emily Dawson**

Faculty mentor: Corbin Covher -

Poinsettia as a Present was a collaborative sculpture created by Corbin Covher and painted and designed by Emily Dawson. It is a steel sculpture of a Poinsettia painted in acrylic paints to resemble a Christmas Present. The sculpture was created for the Cane River National Heritage Area. It was unveiled in November 2022 near the Santa Claus House on the Natchitoches Riverbank where it will remain as a permanent installment.

Oral session 2F

*Discovery and Identification of Bacterial and Viral Communities within Natural Spring Water in Natchitoches, Louisiana*

**Austin Grooms**, Lindsay LaPrarie, Addison Duet, Hunter Hamilton, Leah Thompson, Jerry Brunson, Ph.D., Trenton O'Neal, M.S., & Daniel Rivera-Vasquez, Ph.D.

Faculty mentor: Dr. Trenton O'Neal

Historically, Louisiana natural springs were used as a primary source of potable water for municipalities and private residences. Today, these springs are utilized in a smaller scale by individuals for drinking water. The purpose of this study is to identify bacterial communities within natural spring water and to determine whether pathogenic microbes are present. The natural spring at Grady Erwin Nature Preserve was piped and used to supply potable water to the city of Natchitoches, Louisiana. Though decommissioned for municipal use, the general public still uses this spring. Water from the spring was collected, vacuum filtered, and grown on LB and R2A plates to isolate viable microbes. To identify microbial communities present in the water, additional samples were filtered, processed for DNA extraction. It will then be run on a MinION for DNA sequencing by a collaborating team. Results from the LB and R2A plates yielded innumerable bacterial colonies from as little as 25 ml of spring water. However, countable bacterial colonies were yielded when 5mL and 10mL of spring water were filtered and plated. The extraction method used did generate DNA from 6L of water, but too little for analysis. This study will continue to elucidate the microbial communities present and to identify the chemical profile of the spring water in the Grady Erwin Nature Preserve. Future studies will include investigation of other Louisiana natural springs.

Oral session 2E

*The degradation of acetaminophen under various redox conditions*

**Caleb Helms**, Grace Dean; Jamie Dodds; Trenton Kaine O'Neal, & Christopher N. Lyles

Faculty mentor: Dr. Christopher N Lyles

Acetaminophen, also known as paracetamol, is a medication widely used in the United States to treat pain and fever; however, accumulation of this compound in water has raised growing concerns on the possible toxic effects in the environment. Aerobic and anaerobic enrichment cultures were established using a defined basal medium, amended with 500  $\mu$ M of acetaminophen, and inoculated with 100  $\mu$ l of wastewater sludge. Acetaminophen degradation was measured over time using liquid chromatography. Cultures were then extracted and analyzed via GCMS. After nine days complete degradation of acetaminophen was observed under aerobic conditions. GCMS analysis indicated the presence of the hydroquinone-TMS derivative between 25 and 27 mins. After 882 days of incubation under nitrate reducing conditions, we see 33% reduction of acetaminophen. The GCMS analysis revealed the presence of the hydroquinone-TMS derivative at 26 minutes, after 893 days of incubation no acetaminophen loss was observed under sulfate reducing conditions. Our results suggest that under aerobic conditions, acetaminophen was readily degraded; however, under strict anaerobic conditions very little acetaminophen was metabolized. Incubations containing activated sludge and acetaminophen showed the presence of the hydroquinone-TMS derivative. Suggesting that anaerobic metabolism under nitrate reducing conditions could potentially proceed through a hydroquinone intermediate similar to the aerobic pathway.

Oral session 2D

*Year-long After School Program with Robotic Education and Training for Middle School Students*  
**Shahriar Hossain & Jafar Al Sharab-**

This study presents the experience and learning from a year-long after-school program for middle school students. The program was divided in two segments, namely, Robotics camp and Astro camp. The robotics camp was equipped with robot programming education and training, whereas the Astro camp was equipped with some STEM activities to mimic some space science and research. The whole program was hosted by the Engineering Technology (ET) department and Natchitoches Parish Library (NPL) and sponsored by the ET department, NPL and STEM pioneers. The program started in Spring 2022 with a short tour to the ET department at NSU. There was a week-long camp in summer and hour-long weekly meetings during the Fall semester. The participants received an Arduino based robot kit which they assembled by themselves with the help of NSU students. The participants were given a challenge to navigate the robot kit on a specific map, which mimics the craters on an asteroid. They built the map on 8 ft by 8 ft paper which demonstrates their geometry and math knowledge. The participants were trained through sequential programming module to program the robots as per their challenge. These programming modules covered controlling LED lights, motors, sound, and sensors. Sometimes the robots went wrong and needed to be repaired which the participants did very professionally. The participating kids enjoyed the whole event through decorating their robot, having bull fight, racing, and controlling the robot on the map which was their main challenge. The program continued during the fall 2022 semester titled as "To MARS & BEYOND". During the weekly hour-long sessions during Fall 2022, the kids learned about basic electronics with parallel and series electronic circuits, renewable energy sources, electricity from lemon juice & coke, magnet truss structure, plastic pipe structure, searching for life with microscope, engineering drafting with orthographic projection, little bit of statistics with frequency diagram, projectile analysis with popsicle stick catapult and foam rocket, and calculating the area for different geometrical shapes. The feedback from the participating kids and their parents were inspiring and encouraging for the organizers and sponsors. The close observation on this program clarifies that these types of activities are making a noticeable impact on the local STEM education and to attract the kids towards STEM education.

Oral session 3C

*Minimizing Power Consumption for 3D Printed Consumable Mold*

**Sonny Johnson**

Faculty mentor: Dr. Shahriar Hossain

In recent years, fused deposition modeling (FDM) technology is widely used to produce 3D-printed consumable mold patterns for metal casting. Surface roughness (SR) is viewed as a crucial quality aspect of the casting products and hence the 3D printed patterns. In FDM, surface roughness depends on several process parameters including build angle, layer thickness, temperature, % infill, and feed rate. In this research, a set of experimental data is presented, and the experiments are carried out using the Taguchi Design of Experiment. A data-driven prediction model is presented that correlates the power consumption and surface roughness of the 3D-printed consumable molds with the system parameters. This model is further used to minimize the power consumption of the 3D printing process while satisfying the desired surface roughness. The optimum process parameters are suggested for presetting the process parameters that can result from a desired surface roughness at minimum power consumption.

Oral session 3C

*Motion and Time Study for Increasing Time-Efficiency, Productivity, and Safety for Unloading Facility at a Warehouse*

**Matthew Lovelady, Nickolas Tramel; Tanner Funderburk, & Shahriar Hossain**

For this project, the group proposed the installation of a loading dock to increase the efficiency of the unloading facility while ensuring the employees' safety. Interstate Building Materials (IBM) has a potential problem with the unloading and organization of doors from Louisiana Millwork. This two-man operation begins with unloading the doors onto a rack that is lifted in the air by a forklift operator. After unloading the doors, they are carried into a shed and the rack is placed where there is free space. If there is only one rack available, the doors are unloaded from the rack and placed in a row against the wall. The project team conducted a time study to examine the total

time it takes to unload the doors each week and found the standard time it takes to unload each door. With this information, the team proposed the installation of a loading dock into the east wall of the shed. With the installation of the loading dock, Louisiana Millwork will be allowed to back into the loading dock at ground level and provide a safer and more efficient method of unloading doors while keeping them organized afterward. For evaluating the effectiveness and efficiency of the proposed dock, some economic and technical analyses are conducted. The Pay Back Period and Net Present Value analysis justify the economic benefit of the proposed unloading dock. The simulation model with Simio software gave an insight idea about the safety and technical issues of the proposed dock structure. The time it takes to unload the doors will be significantly less and efficiency will be increased.

Oral session 2D

### *Remapping Louisiana's Cradle to Prison Pipeline through Service Learning Projects*

**Christian Mercer & Lindsey Mercer**

Faculty mentor: Dr. Michelle Brunson

The Cradle-to-prison Pipeline (CPP) is a societal phenomenon where children, particularly those from historically marginalized communities, are pushed out of schools and into the juvenile and criminal justice systems. This term highlights the correlation between poverty, inadequate education, and the disproportionate incarceration of people of color. As a social work student, I contacted Dr. Michelle Fazio Brunson regarding her ongoing Cradle-to-Prison Pipeline Service-learning Project. Her project promotes literacy at an early age, with the ultimate goal of breaking the cycles of arrest, conviction, and incarceration. Brunson assumed that if she could address children's needs early on, they would not be her husband's client ten years later. She began years ago with seven family literacy bags. By providing educational materials and school supplies to families with young children, the project aimed to empower parents to support their children's literacy development and increase their chances of success in school and in life. With help from Pi Kappa Alpha fraternity, we collected literacy bags and delivered them to 106 pre-K and Kindergarten students throughout LP Vaughan and Fairview Alpha. The fraternity was even granted the option to engage with the community by reading to the children. By supporting initiatives like Dr. Brunson's Cradle-to-Prison Pipeline Service-learning Project, we can work towards creating a more just and equitable society, where all children have access to the resources and support they need to thrive and succeed.

Oral session 3F

### *Logo Design for NSU School of Social Science and Applied Programs*

**Cameron Murphy, Dyra Turner; Christian Robinson; Juan Castilla**

Faculty mentor: Mirla Gonzalez Enriquez -

Professors from the NSU School of Social Science and Applied Programs requested our Advertising Design Class from the Creative and Performing Arts Department to design a logo that represents the new structure the school is building. The School of Social Science and Applied Programs currently does not have a logo to represent the new structure being built. Since this is a merger of the programs Criminal Justice, History, and the Social Sciences, the new academic unit would like a logo that signifies their new values. In our research, we discussed the needs expected from this project. The client wanted an inclusive logo to show the unity of the programs. This logo needs to represent various programs that are available to students. They offer bachelor's in Criminal Justice, History, and Unified Public Safety Administration; a Masters program in Homeland Security and Adult Education with the concentration in Homeland Security. Various certifications, minor's programs, and partnership with Anthropological and Archaeological Training Lab, The Cultural Resource Office, Heritage Resource Lab, Louisiana Creole Heritage Center, Williamson Museum, Archaeology Program and Regional Folklife Programs are also part of their curriculum. As part of our research, we concluded that the logo needed a circle to signify unity and companionship, the shield to represent protection and Criminal Justice, the scale to represent Social Sciences, and the book to represent History. As a result, we are proposing these two logos to our client. We will discuss our results and after further discussions we will work on the final design.

Oral session 2A

*Elucidation of potentially bioactive compounds from leaf extracts of Erythrina herbacea - The Mamou plant*  
**Koral Richard**

Faculty mentor: Dr. Adonay Sissay

*Erythrina herbacea*, the Mamou plant, has cultural relevance in Louisiana due to its historical use as an herbal medicine. Tea was made from this plant's leaves, roots, and seeds to treat symptoms of the flu, pneumonia, bronchitis, and respiratory illnesses (Louisiana Medicine). Plants in the genus *Erythrina* are known to commonly produce their own class of alkaloids which mainly have anxiolytic effects (Rambo et al., 2018, p. 1268). Alkaloids erythrosine and erysotramidine from the flower of *E. herbacea* show strong antioxidant activity due to their ability to scavenge free radicals of peroxy nitrite in vitro (Tanaka, 2008, p. 230). Antioxidant scavenging of free radicals is a renowned pharmacological effect that can reduce the likelihood of developing many diseases including cancer. Non-alkaloid constituents from the roots of *E. herbacea* are bactericidal against 13 strains of methicillin-resistant *Staphylococcus aureus*, indicating possible use as an antimicrobial (Tanaka et al., 2010, p. 916). My research has set out to expand the scholarship on the potential pharmacological benefits of this plant by elucidating the phytoconstituents from acetone leaf extracts of *E. herbacea*. Extracts were fractionated using column chromatography, then elucidated through modern spectroscopic techniques like UV-Vis, FTIR, HNMR, and GCMS. The leaf extracts' antioxidant activity and nitric oxide radical scavenging potential were analyzed through phytochemical screening methods. The extracts were also tested for antibiotic activity against *E. coli* through MIC and MBC plates. Results indicated that some leaf extract fractions exhibited antioxidant activity and microbial inhibition, however, the fractionation methods were not sufficient to elucidate the structure of individual compounds.

Oral session 1B

*The Lonely Londoners: The Art of Calypso*

**Angela Saldivar**

Faculty mentor: Dr. J. Ereck Jarvis

This paper explores the origins of calypso, a Caribbean musical genre where calypsonians perform and adlib verses to display their wittiness and ability to provide social commentary on current events. I will be delving into the history of calypso and its different African and European origins and discuss calypso as a form of anticolonial resistance. Curwen Best categorizes calypsos as having four of these characteristics: extemporaneous performance, picing, satire, and a call and response. I argue that Sam Selvon's 1956 novel *The Lonely Londoners* embodies the traditional Trinidadian calypso through its storytelling, using Best's categories to demonstrate how the novel's form follows the aspects of calypso through its narrator and different characters.

Oral session 3A

*Body Modification in Nineteenth and Twentieth Century Britain*

**Skylar Sanders**

Faculty mentor: Dr. Dean Kostantaras

Despite extensive research conducted on nineteenth and twentieth century Britain, few academic works talk about tattoos and piercings as they existed in society and their prevalence. Some works discuss the mechanical aspects of tattooing or piercing but fail to address how truly common body modifications were at this time and how they related to personal identity and sexuality. This interdisciplinary work examines contemporaneous historical sources such as newspapers, personal journals, medical articles, and social science reports that discuss firsthand experiences and academic opinions on body modification, as well as analyzing secondary sources of the same themes. An analysis of body modifications and identity shows that body modifications, from tattoos to piercings to cosmetic tattooing of eyebrows and moles were daily realities in Victorian England.

Oral session 1C

### *Service in Nepal*

**Baylee Spencer, Jordan Wilburn; Makalah Koeberlein, & Bryce Moulton**

Faculty mentor: Patrice Moulton -

Just a few weeks ago, an interdisciplinary team of 7 graduate students and faculty, representing Northwestern State University, Delgado Community College, and Tulane University, spent spring break on a service-learning project in Nepal. Team members led projects in relation to their areas of specialty. Projects included training on mental health issues and coping strategies; a cultural exchange cooking class charity fundraiser; development of a rural school health clinic; art & advocacy mural project; and a higher education interdisciplinary research panel presentation at the U.S. Embassy. Nepali Higher Education Faculty and graduate students will participate in this presentation and exchange. Mentoring and collaboration for planning and developing these projects across Universities between the U.S. and in Nepal was necessary for successful implementation. The project is a wonderful example of true service-learning, utilizing professional knowledge and skills acquired in education to share in culturally collaborative efforts for the betterment of communities.

Oral session 3B

### *The Developmental Effects of Infant, Transracial Adoption on Young Adults*

**Kaci Waguespack**

Faculty mentor: Dr. William Housel

Existing research on infant, transracial adoptees is limited. When the scope is narrowed to studies focusing on young adults affected by their adoption, the research is virtually nonexistent. The current study highlighted Erik Erikson's theory of psychosocial development due to its exploration of development beyond childhood and adolescence and its focus on the relationships in an individual's life as related to their effects on development. The purpose of the current study was to determine the developmental effects of infant, transracial adoption on young adults. The researcher hypothesized that transracial individuals adopted as infants who have had more consistently positive experiences with their adoption are less likely to face developmental issues than transracial individuals adopted as infants who have endured negative experiences regarding their adoptions. The researcher conducted interviews with 10 transracial adoptees, who were adopted during their infancy, regarding their adoption experiences and subsequent upbringings. These interviews were supplemented with the Developmental Assets Profile (DAP) which measured development in terms of their assets and context areas. The results indicated that the hypothesis was supported. The results also suggested that if the primary caretakers in the adoptees' lives were unequipped to raise children of a different race or ethnicity, the adoptees are more likely to face issues in development. The research has implications for further studies beyond childhood and adolescence. Additional research on this subgroup is vital in ensuring the appropriate development for all infant, transracial adoptees beyond childhood.

Oral session 2B

### *V. L. Roy Day of Service: Giving Back to NSU*

**Bailey Willis & Mayala White**

Faculty mentor: Mary Katherine Horton

V.L Roy Service Day was founded in 2016 by the Student Government Association leaders that year. The event brings NSU student volunteers and the Natchitoches community together for a day of service. Past service projects have ranged from volunteering at the Women's Resource Center, the NSU E-lab, the Cane River Children's Center, and many other locations in our community. The event is named after V.L Roy because of how instrumental he was with the creation of many student organizations and traditions that shaped student life and the service mindset at NSU. Some of these organizations include SGA, Purple Jackets, Demon VIP, and many other organizations on campus dedicated to service. We will continue to honor V.L Roy and live up to his legacy of excellence and service.

Oral session 3F

## *The Pantry—Feeding Student Success at Northwestern State University*

**Kacy Young**

Faculty mentor: Reatha Cox-

What started as a social work class project in 2015 has become an essential service at Northwestern State University. Food insecurity has increasingly become an issue on college campuses and can pose a significant barrier to student success. We know that college is a major investment and many students come to campus with limited resources and very little experience managing their needs. Once tuition is paid, sometimes a student doesn't have enough money left to cover the essentials—including food. The Pantry is equipped to provide a variety of food and personal hygiene items for our students in need and to help them stretch their budget. The mission of The NSU Pantry has remained the same since inception: to address food insecurity among NSU students, feed student success and create a community of compassion. Our vision is that no student at NSU will be impacted by hunger due to the lack of ability to afford food. Throughout the 2021-2022 academic year, over 400 students utilized The Pantry on a regular basis. The Pantry is 100% volunteer supported—both with volunteers and donations. The NSU community continues to unite in support of The Pantry by hosting food drives, volunteering, and donating items to keep the shelves stocked.

Oral session 1B

## **Poster Presentations**

### *Environmental Drivers That Structure Productivity and Zooplankton Communities in Local Aquatic Systems*

**Jesse Cochran**

Faculty mentor: Dr. Billy Culver

The freshwater ecosystem of a body of water hides in plain sight. Underneath the surface, there's an entire ecosystem and community flooded with life along with an organized food web, routines, and habitual behaviors. Understanding the environmental factors that structure these ecosystems are important for understanding the overall health of those particular ecosystems. Here, we monitored, over a five-week period, several environmental factors, productivity, and species composition of the zooplankton of several local lakes: Cane River Lake, Chaplin Lake, Sibley Lake, and the Grady Erwin Pond. We predicted that seasonal temperature variation would drive the ecosystem productivity and community species composition. In order to test our hypothesis, we measured the following abiotic factors weekly: weekly rainfall, mean air temperature, water temperature, dissolved oxygen, pH, salinity, turbidity, and light luminosity. Additionally, we sampled weekly for productivity, as measured by chlorophyll a content, and species composition. Species were identified to their most specific taxonomic classification as possible according to standard taxonomic identification keys for freshwater zooplankton. The data was analyzed to find the best fit model that explained which environmental factors drove productivity and zooplankton species diversity. We found that several abiotic factors drove these ecosystems and that they were lake specific.

Poster session 1A

### *Phytoextraction of Heavy Metals from Chaplin Lake using *Landoltia punctata*, *Salvinia molesta*, & *Pontederia crassipes**

**Ashley Eubanks**, Dr. Adonay Sissay, Dr. Margaret E. Cochran

Metals contaminate water by a variety of processes. Many remediation methods are expensive and require heavy manpower. Phytoextraction is less expensive and labor intensive, using plants that accumulate pollution to remove contaminants. *Landoltia punctata* (duckweed), *Salvinia molesta* (giant salvinia), and *Pontederia crassipes* (water hyacinth) were grown in tubs of water from Chaplin Lake in Natchitoches, LA to study the accumulation of nine metals: copper (Cu), iron (Fe), manganese (Mn), zinc (Zn), aluminum (Al), cadmium (Cd), chromium (Cr), molybdenum (Mo), and nickel (Ni). Six replicates of each species were grown in ambient conditions for four weeks. Starting concentration of metals was analyzed by ICP-MS; at week 2 and week 4, additional samples were analyzed. Metal concentrations varied by metal and within the species; Mn concentrations were two to three orders of magnitude different between *P. crassipes* and *S. molesta*. Percent change of metals between week 4 and week 2 was calculated to compare the effectiveness of



phytoextraction. Only four values were positive, none of which were significantly greater than zero. In water, many concentrations were below detection. The smaller concentrations of some metals in the water compared to concentrations in plant biomass indicates these macrophytes have potential for use in phytoextraction, however, larger sample sizes are needed to account for the high variability.

Poster session 2A

### *Synthesis of Tobramycin Functionalized Carbon Nanotubes*

**Emily Farmer**

Faculty mentor: Dr. Jennifer Hill

Tobramycin is a 4,6-disubstituted 2-DOS aminoglycoside antibiotic that has been included in numerous studies surrounding the creation and derivatization of conjugates and analogues; largely with the goal of decreasing bacterial resistance or increasing activity. A study on the synthesis of dimeric aminoglycosides has shown success in modifying tobramycin for use in the creation of linkages. Using this previous methodology, tobramycin was successfully protected with tert-butyloxycarbonyl groups to be further modified for use in the generation of tobramycin-graphene nanostructures. A more efficient methodology has since been found in literature to yield an acylated tobramycin analogue in a single step. The generation of tobramycin functionalized carbon nanotubes is a novel study with the goal of increasing the opportunities for the therapeutic use of tobramycin. Carbon nanotubes have previously been functionalized using a Cu(I)-catalyzed azide-alkyne [3+2] cycloaddition, or CuAAC. The CuAAC mechanism has also been investigated to confirm the ability for use in bioconjugative applications. A base-catalyzed reaction of tobramycin with an Nhydroxysuccinimide ester can be used to selectively modify the 6' amine of tobramycin. This analogue can be linked to graphene oxide, a nanostructure, using the CuAAC mechanism. The CNT would be reacted to add an alkyne for click chemistry with the azide on the tobramycin. Ongoing research is being conducted to obtain results.

Poster session 2B

### *Minimizing Power Consumption for Laser Beam Machined Acrylic Pattern-Making Process Under Surface Roughness Constraint*

**Sonny Johnson**

Faculty mentor: Dr. Shahriar Hossain

Laser Beam Machining is getting popular and available for a variety of applications. Many manufacturing industries are now utilizing this technology for preparing molds and patterns for plaster or ceramic casting. This pattern-making process is easy and faster for medium-scale plaster and ceramic industries. Patterns made of acrylic plastic can be used multiple times. It has a self-lubrication ability for separating patterns from plaster or ceramic products. However, the roughness of the laser-machined surface reduces the final product quality and self-lubrication of the acrylic pattern. The surface roughness of the laser beam machined pattern significantly depends on several direct and indirect process parameters. Moreover, some of these process parameters affect the total power consumption of the laser beam machining process. The appropriate selection of process parameter values needs to be ensured to reduce power consumption while satisfying a desired surface roughness level. Hence, this research aims to minimize the power consumption of the laser beam machining process on acrylic plastic. This paper presents a set of experimental results following Taguchi Design of Experiment. A data-driven prediction model is then developed to correlate power consumption and surface roughness, to some significant process parameters. This prediction model is further used for determining the optimum combinations of the process parameters that minimize the power consumption while satisfying a desired surface roughness constraint. The outcome of this research will benefit the medium-scale manufacturers of plaster and ceramic products to improve their product quality.

Poster session 2B

*The Effects of the Beta-Blocker, Propranolol, on the Economically Important Red Swamp Crawfish, *Procambarus clarkii**

**Schuyler Mason**

Faculty mentor: Dr. Billy Culver

The use of pharmaceuticals in society is increasing as the human population continues to boom. Pharmaceuticals and their metabolic intermediaries excreted from humans have become an increasing pollutant in our natural environment due to the inability of wastewater treatment plants to fully break them down and remove them from waterways. One of these pharmaceuticals is the beta-adreno blocker, Propranolol, which is used to commonly treat high-blood pressure and anxiety in humans. Propranolol breaks down into twelve different metabolites that are then excreted from the human body. These metabolites could be harmful to the environment, especially aquatic ecosystems, as large doses of propranolol can prove fatal in humans. Acute toxicity testing of propranolol has been done on *Daphnia magna*, but testing has not been done on the economically and ecologically important (especially in Louisiana) *Procambarus clarkii*, also known as the red swamp crawfish. This study attempts to elucidate the acute toxicity effects of Propranolol on juvenile red swamp crawfish by exposing them to a range of 5 different concentrations over a 96hr period and determining the concentration at which half of the crawfish are sacrificed (LC50). The results of this study could help wildlife biologists and crawfish farmers manage this important resource.

Poster session 1B

*The Linguistic Implications of Sexism in Victorian Medicine*

**Meghan Quaglino**

Faculty mentor: Dr. Dean Kostantaras

It is a core tenet of language philosophy that language shapes meaning and meaning shapes reality. Because of this, it is important to consider the hidden implications of our language when it comes to the general gender dynamic in our society. In order to identify hidden biases woven into the very fabric of our current language, however, we must go back to the root of the issue and determine at what point these issues arose. This paper deconstructs articles from the Victorian-era medical journal, *The Lancet*, and analyzes the functional forms of the words “woman” and “female.” These functional roles are used to determine the semantic markers that women were designated at this time and also determine if men were being described in the same way. It has been established that women are the lesser gender in Victorian England, but this goes beyond simple societal conventions and is embedded in the features of the language itself. While the level to which sexism is embedded is cause for further study, it is at least a syntactical fact that women do not receive the same level of agency and animacy as men do, even when they are in highly similar situations. Because of the way that culture and society construct peoples’ ideas of sexuality, these language conventions would define the way that people viewed themselves and their sexuality in a way that goes beyond conscious decision.

Poster session 2A

*Effects of Solvent on the Synthesis of Metal Sulfide Nanostructures*

**Maggie Stanford**

Faculty mentor: Dr. Daniel Rivera-Vazquez

Nano-scaled materials are an attractive alternative in materials science due to their thermal, electronic, and optical properties. Tunable optoelectronic properties allow the synthesis of materials for novel applications. Metal sulfides have garnered attention as quantum dot materials with applications in energy storage and as optical sensors, to name a few. One of the biggest drawbacks of metal sulfide-based quantum dots is the toxicity inherent to metals such as Pb and Cd. This project focuses on the synthesis of metal sulfide nanostructures with lower toxicity profiles. Previous studies have been conducted to compare methods of metal sulfide synthesis, and how the precursor source affects size and morphology. However, studies solvent effects on the formation of the quantum dots have not been studied. Our objectives are to synthesize metal sulfide nanoparticles (CuS, CaS, and ZnS) using various solvents, including DMSO and water, to compare the effect on particle size and band gap energy. CuS nanoparticles were synthesized following a microwave-assisted route. The absorbance spectrum showed a strong band around 250 nm that trailed off around 600 nm with an increase in absorbance at 650 nm towards the IR region. The absorbance is consistent with the values

reported by other groups. The nanostructures had a direct band gap energy that decreased with an increase in Cu content (1.4–2.9 eV). FTIR shows peaks at 1070, 2900, and 3030  $\text{cm}^{-1}$ . A similar synthesis approach is being performed for CaS. Future objectives include synthesis and characterization of ZnS using DMSO as a solvent.

Poster session 3A