Undergraduate Research Conference 2022

Oral Presentation Abstracts

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Jo'Vian Baker, Brionne Stinger, Richard Stepney, John-Clifford Obih, Rachid Belmasrour, Mostafa Elaasar, Joseph Olubadewo, Christian Clement

Mentor: Christian Clement

Southern University at New Orleans

Nanoparticle-Drug Complex Simulations-Deep Tissue Delivery-Blood Brain Barrier

Nano-drug delivery is being evaluated, using nanoparticles and observing how they move in deep tissues under gravity and Brownian motion simulations. Nano-drug delivery was designed to administer drugs to a specific targeted area. Generally, nanoparticles are tiny measuring between 1 to 100 nanometers in size. They are coded with the specific drug and designed to freely navigate the bloodstream for diagnosis a disease and also target particular cells and tissues. Because of their submicroscopic size, they have become unique in the medical world. The nano-drug delivery method is more effective in treatment than larger particles because of body absorption and target-specific delivery error—the machinery to conduct this experiment was fluorescein, bacteria, nutrient broth, and nanoparticles. Fluorescein is an organic compound and dye. The fluorescein acted as the drug, bacteria as the red blood cell, other cell components and debris and agarose as the nanoparticles. The method used was gravity and random Brownian simulations of trafficking and accumulations of nanoparticles in blood fluidics. Our ongoing research experiments will give us a better representation of predicting the proper movement patterns occurring, which we will analyze to study the accumulation of the drugs inside vein-like structures. Using mathematical equations, we can build models that exemplify this movement and use them to predict information about where and when the drugs accumulate. Our preliminary data shows at the highest concentration of bacteria, the nanoparticles dropped more quickly than in the lowest concentration of bacteria.

Abigail Baumgartner

Mentor: Dr. Robyn Andermann

Louisiana State University

Highways, Byways, and Intersections; Using the Steps of the Writing Process to Study Identity and Characterization

As a pre-service secondary English teacher, I want to engage students in two types of work. First, I want students to connect to the course content by reading and analyzing literature. Secondly, I hope students invite literature to help them inform their identities as students build "coherent sense[s]" of who they are as individuals and "in relation to the world" (Sokol, 2009, pg. 7). In trying to connect these academic and personal objectives, teachers are often left wondering, "How can we create classroom spaces that achieve both?"

The answer must come through writing. Regardless of content area or discipline, reading and writing have a symbiotic relationship (Friedman and Steinberg, 1989). In reading, students encounter new ideas; then, through writing, students internalize, synthesize, analyze, and ultimately come to understand those ideas in new ways. Prior scholarship on student perceptions of writing suggests students "[seek] out writing projects… that are personally meaningful," and students develop writing skills alongside their identities as readers, writers, and individuals when they can share their "unique" knowledge and experience through writing (Robillard, 2018, pg. 222). When educators, especially those teaching literature, allow writing and reading to work together, "we see learning not as input but as the making of meaning and connections" (Elbow, 2000, pg. 292). Therefore, writing can create a special place in the classroom by layering personal and academic meanings and building connections between those two types of knowledge. But this only happens if classroom writing activities are personally and academically engaging for students. By drawing on psychoanalytic and reader response theoretical approaches to analyze literary texts in combination with an Understanding by Design (UBD) curricular planning model (Wiggins and McTighe); the teacher ensures the planning of reading and writing activities allow students to critically analyze literary texts while investigating components of identity.

In the 10th grade literature classroom I observed throughout the fall of 2021, students engaged in a series of practical writing activities called "Identity Roadmaps." Focusing on identity, characterization, and Kimberly Crenshaw's concept of intersectionality, "Identity

Roadmaps" walk students through brainstorming, drawing, and journaling activities to help them craft personal essays and literary commentaries. Ultimately, "Identity Roadmaps" help students draw connections between themselves and a literary text as they engage in the writing process. In this presentation, I explain the benefits of this approach to writing and showcase how the roadmaps themselves exist at the intersection of pedagogy and practicality. I will explain how these activities functioned in the classroom and encourage attendees to imagine ways the activity could be applied in other writing contexts beyond the literature classroom.

Wyatt Beachy

Mentor: Dr. Leslie Bary

University of Louisiana at Lafayette

Anti-Blackness in *El Reino de Este Mundo*: A Haiti without Hope

Without a doubt, the most important slave rebellion in the history of the world is the Haitian Revolution. It was the only slave rebellion to be successful in completely abolishing slavery and earning independence for its people; all in all, it was a critical moment in the fight against European colonialism. *El Reino de Este Mundo*, by Alejo Carpentier, is a work about this very revolution and the slave experience as a whole; however, it's not a strictly anti-colonial text. Although Carpentier is very interested in the Afro-Caribbean experience, in a book about revolution specifically from an Afro-Caribbean point of view, he manages to create a hopeless depiction of Haiti. Even more so, his representation of Blackness with respect to freedom goes so far as to be anti-Black. Carpentier creates this negative atmosphere through various means. Firstly, he makes the transition from slave to person impossible through his depiction of slavery. Secondly, he rewrites Haitian history, excluding certain facts purposefully so as to focus on the downfalls of the Revolution. Lastly, he makes discrimination a normal and inextricable part of Haitian society through the utilization of various perspectives. In other words, it is impossible, precisely because of Haitian history and its impacts, to achieve true freedom.

Robert A Bergeron

Mentor: Gary LaFleur, Jr

Nicholls State University

Developing an Assay to Document Terrestrial Fauna at a Marsh Terrace Restoration Site in Terrebonne Basin

Because of subsidence, sea-level rise, hurricanes, and saltwater intrusion, freshwater marshes have undergone the largest rate of reduction in acreage of any of the marsh types in Louisiana. As a strategy to reverse the effects of marsh break-up in a Terrebonne Parish study site, terraces were constructed in 2018. In Spring 2019 the terraces were vegetated with Paspalum vaginatum across the crown, Spartina patens on the shoulder, and Spartina alterniflora at the toe. Since that time several other plants have colonized the habitat, including Roseau Cane Phragmites australis and Cattail Typha spp. At the beginning of this project no mammals were using this habitat except for nutria. However, over time the vegetated terraces began to attract several types of fauna, including mammals. For my project I sought to measure the abundance of terrestrial animals, including mammals that were using the terraces. To achieve this, three identical Moultrie M-880 camera traps with motion detection and IR sensors, were installed at several sites. So far, we have documented several mammals on the constructed terraces, including Nutria, Rabbit, and Raccoon, plus species from other classes including Great Blue Heron, and DragonFly. Nutria, Myocastor coypus, represented the most abundant animal encountered. Rabbit Sylvilagus aquaticus was encountered second most frequently, followed by Raccoon, Procyon lotor. One interpretation from our results is that the terraces not only protect the mainland from tidal surge and coastal land loss, but also provide habitat for use by a diversity of fauna helping to restore some of the trophic interactions expected to exist in a normally functioning intermediate marsh. In the future, we plan to compare species encountered on terraces to those encountered along the original marsh margin. This work was supported through funding by Resource Environmental Solutions.

Lucas Blanchard and Ian Gaughan

Mentor: Dr. Paul Darby, Dr. Raju Gottumukala

University of Louisiana at Lafayette

Multi-Purpose Camera for Object Detection, Distance Estimation, and Temperature Measure

The Covid-19 pandemic in recent years has raised an urgent call for improvement to safety monitoring systems. In addition to this, the growth of (Internet of Things) IoT sensor technology and data utilization has created the need for privacy awareness as a top consideration in projects like these.

Unlike invasive access control systems integrated with thermal sensors, this project aims to detect multiple people, detect fevers, detect whether people are acting with unsafe or unusual behaviors, and be able to anonymously communicate with individuals non-invasively.

This project seeks to create a multi-purpose camera with emphasis on safety-related applications and built from the ground up with conscious focus on individual privacy. In particular, the Electrical Engineering team is focusing on the design of the software system which incorporates open source projects, projects built and tested on campus, as well as our own code.

View presentation/PowerPoint recording.

Gabrielle Broussard, Lillian Mambiri, Dr. Dilip Depan

Mentor: Dr. Dilip Depan

University of Louisiana at Lafayette

Biomaterial Properties of GNS Double Porosity Membranes

At the cross section of nanotechnology and tissue engineering, there lies an incredible amount of potential for advancements in biotechnology applications. The fusion of a biopolymer film, such as a double porous chitosan membrane, and a structurally altered nano molecule, like graphene nanoplatelets, allow for the possibility of unique tissue engineering applications, and this study focused on exactly that. Using double porous membrane films made from a chitosan polymer blend, trials to study the impact of graphene nanoscrolls (GNS) on the integrity of the biomechanical properties of the films were conducted. As chitosan is a biopolymer known for its compatible and biomimetic nature, the use of a chitosan polymer blend as the basis for the study was crucial. The focus of these studies was on the effect GNS has on water absorption and structural integrity, and these properties were evaluated via swelling tests and degradation tests, respectively. Both the swelling and degradation tests were conducted by submerging the double porous films, each containing varying concentrations of GNS, in a lysosome and phosphate buffer saline. The double porous membrane films served as a biomimetic environment, comparable to skin cells, and the addition of GNS may improve the biomaterial properties of the membranes. Pending the results of the effect GNS has, the films may show potential to grow various cell types, from cancer cells for oncological studies to stem cells for regenerative tissue research. The outlook of GNS double porosity membranes points in the direction of successful synthetic environments for various kinds of cell growth and advancements in tissue engineering applications.

Chansey Champagne

Mentor: Dr. Edgard Rivera-Valentín

University of Louisiana at Lafayette

Automating Size Determination of Near-Earth Asteroids Using Low SNR Arecibo Radar Imaging

Introduction: The Arecibo Observatory in Puerto Rico is one of two radar telescopes that have been used to observe near-Earth asteroids (NEAs) in order to determine their physical characteristics and astrometry (Ostro etal. 2002). Radar echoes from asteroids are used to create delay-Doppler images, which are 2-dimensional maps of backscatter power with delay along the vertical and Doppler along the horizontal axis. With sufficient radar observations over multiple nights and apparitions, and observations in other wavelengths, a fully 3-dimensional model can be developed of anasteroid (Nolan et al. 2013). Because this is rarely possible, asteroid size tends to be determined by visually inspecting the delay-Doppler images. This tends to be inefficient and inaccurate, especially if the signal-to-noise ratio (SNR) of the image is low. Therefore, current methods to determine an asteroid's radius from low SNR radar imaging are not consistent and well quantified. We developed an algorithm using statistical techniques to measure the size of an object in a consistent and quantitative manner and applied this algorithm to a data set of objects to provide new preliminary size measurements for comparison with other observations.

Method: The delay-Doppler images are in the form of z-score normalized power relative to the signal noise. We used DBSCAN (Density-Based Spatial Clustering of Applications with Noise), which finds statistically significant clusters of signal within spatial-based data sets, to identify the center of the object in delay-Doppler space. This also determines where is image is just noise. The radar image is then collapsed along each axis to produce power spectrums, in units of standard deviation and maximum, as a function of delay. These power spectrums consider the fluctuations of noise within this image, from which our developed algorithm can identify the leading and trailing edge of the signal. This is done by determining where it is above one and two standard deviations of the noise. A weighted average of the two extent measurements are then taken as the estimated radius of the asteroid.

Results/Conclusion: We first tested this algorithm with delay-Doppler images generated from synthetic objects, and this testing implied that the accuracy of our algorithm was a function of the SNR of the image. However, when we tested real asteroids with a variety of SNRs, the algorithm was accurate with determining most of the objects' radii as compared to previous

estimates. The only object that the code did not accurately determine the size of was asteroid 66391 Moshup, due to its diamond-like morphology, which reflects radar differently that spherical asteroids.

Future Work: We are currently working on adapting the code to account for non-spherical objects, such as 66391 Moshup.

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Clare Chong

Mentor: Ashley Mikolajczyj

University of Louisiana at Lafayette

Industrial Wastewater Treatment using Microwave Modified Agricultural Waste

North America generates approximately 17.7 trillion gallons of wastewater annually from municipal waste, agriculture activities, and industrial waste. The concern about water resources is not because of the quantity generated but the quality of wastewater discharged. Industrial wastewater contains a multitude of constituents that cannot be treated with primary wastewater treatment (WWT) processes. The National Pollutant Discharge Elimination System (NPDES) requires industries to treat their wastewater to specific standards prior to discharge to waterways or municipal WWT plants. The most robust industrial WWT process to date is activated carbon adsorption. However, implications such as cost, large carbon footprint from producing activated carbon, and disposal of the activated carbon exist. Researchers are looking at innovative ways to overcome these challenges, namely, utilizing natural adsorbents such as agricultural waste materials. Currently, the disadvantages of these natural adsorbents are the low adsorption capacity compared to activated carbon.

This study focused on modifying cypress sawdust to increase the adsorption capacity by utilizing microwave irradiation. Microwaved cypress sawdust (MCSD) was used as a natural adsorbent to remove 2, 4-dichlorophenol from water. MCSD was subjected to different times under microwave irradiation, and batch isotherm experiments were performed to obtain the adsorption capacity. Microwave treatments doubled the unmodified cypress sawdust's adsorption capacity, making it competitive with the adsorption capacity of activated carbon for 2, 4-dichlorophenol.

Soriah Cleveland, Illya Tietzel

Mentor: Illya Tietzel

Southern University at New Orleans

Analysis of Hypergravity on the Activity of the Ty1 Transposon of Saccharomyces cerevisiae

Transposons, which are mobile DNA elements. The activity of transposons can be altered by certain factors such irradiation or gravity and affect the genetic makeup of an organism. The research conducted was to analyze if the differences in gravitational forces by micro- and hypergravity found on Mars would change activity of transposons of Saccharomyces cerevisiae, more commonly known as yeast. To test this hypothesis, centrifugation and PCR (polymerase chain reaction) and gel electrophoresis tests were conducted to have physical conclusive results of the presence of the selected transposon and changes in transcription of yeast. The transposon selected was the Ty1 transposon. The respective primer that would target the Ty1 transposon was found via Primer-BLAST, named Ty1PRM10. A nutrient broth was made from the yeast, followed by DNA isolation via MoBio fecal kit. PCR tests with Ty1PRM10 were conducted, with the organism exposed to different amounts of g-forces, 1g and 1,000g in a centrifugation device. The preliminary results observed in the gel electrophoresis test revealed that the size of base pairs (approximately 250-290bp) matched that of the Ty1 transposon when amplified by primer Ty1PRM10, with 293bp. This concludes that when yeast is exposed to different gravitational forces, the Ty1 transposon is activated and changes the genetic code of its organism. Future research could confirm findings by comparing the transcription of housekeeping genes with the Ty1 transposon via RT-PCR.

Caitlynn Diggs, Illya Tietzel

Mentor: Illya Tietzel

Southern University at New Orleans

Role of guanylate binding proteins as defense against infection with Chlamydia

The devastating state of the serve acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has changed the world indefinitely. The global COVID-19 pandemic has sparked a rise in millions of cases around the country, leaving areas defenseless. As a result of the infectious disease spreading, research has confirmed that the transmission of the virus can infect different mammal species. It has been hypothesized that many domestic animals are likely susceptible to SARS-CoV-2. This study aims to determine the potential transmission of the infectious disease COVID-19 via zoonosis and reverse zoonosis from fecal samples of cats and dogs. To test the hypothesis, we collected two fecal samples from both dogs and cats in surrounding environments. The experimental setup required design of primers to detect housekeeping genes of the animals and virus. DNA isolation was conducted using the MoBio Fecal DNA Kit. The primers for the actin gene of animals and E. coli INS1 gene were designed. Primer for SARS-CoV-2 were designed that avoided ORF sequences for safety reasons. Testing of fecal samples of both cat and dog with PCR and gel electrophoresis, discovered no detection of DNA bands specific for the target genes. Although this study did not find the linkage of SARS-Cov-2 in the fecal samples of the chosen domestic animals, it is essential to understand the potential risk that owners with COVID-19 constitute a problem to their pets and vice versa.

Hillary English, Adrianna Pratt, and Haeyeon Yang

Mentor: Dr. Haeyeon Yang

Grambling State University

Effects of Ligands on the Optical Spectra from InP/ZnS Quantum Dots

In bio-medical applications, colloidal quantum dots (QDs) have many useful properties such as high brightness, relative stability, and color turnability compared to conventional bio-marker such as dye molecules. Typical colloidal QDs consist of core, shell, and the outermost layer of ligands. In our experiments, we obtained spectral data from QDs of two different types of ligands: Oleylamine and Oleic Acid. The spectra data from InP/ZnS QDs indicates that the ligand has impacts on the shape of spectra. Furthermore, our results show that the different ligands have different intensity degradation of the QD fluorescence. In the presentation, we will discuss how the ligands affect the emission spectra from InP/ZnS QDs along with the dependence of intensity degradation of the fluorescent spectra on the type of ligand. This project is funded by NASA LaSPACE, NSF PREM program and NSF-CIMM seed grants.

Grant Gros

Mentor: Dr. Margaret E. Cochran

Northwestern State University

Prosopagnosia in College Students: A Qualitative Analysis

Prosopagnosia, or face blindness, is a neurocognitive disorder characterized by an impaired ability to recognize faces, whether familiar or unfamiliar. Many can relate to inexplicably not recognizing at first glance someone familiar, but for individuals with prosopagnosia, this characterizes every social interaction they have. First named in 1947 by Dr. Joachim Bodamer, the disorder has severe psychosocial consequences for those afflicted. Studies in child populations have found prosopagnosia can lead to social anxiety, withdrawal from social interaction, and an impaired ability to socialize. Adults with prosopagnosia also demonstrate increased social anxiety which was compounded when they do not have a companion to aid in identifying others. College students with prosopagnosia in particular are at risk of its psychosocial consequences because of the dozens of individuals with whom students interact daily in various settings, but little research has investigated this population. A qualitative study of college students with prosopagnosia is proposed; participants will be asked in an online interview questions relating to their experience with the disorder to understand how prosopagnosia affects them and in what ways they compensate. A coding system will be utilized to analyze the answers as they relate to themes such as social anxiety, coping mechanisms, setting, and the COVID-19 pandemic. Questions include:

- How has/does prosopagnosia impact your daily life as a university student?
- What coping mechanisms have you adopted to compensate?
- What factors in social settings generally help you as an individual with prosopagnosia?
- How does your college experience with prosopagnosia compare to that of your primary and secondary school years?
- What situations pose the most social difficulty for you?
- How has your experience with prosopagnosia been throughout the Covid-19 pandemic?

Feedback from the audience is invited.

Christopher W. Guevara, Joseph Riggio, Connor Rosson, Daniel Soria, Lucas Blanchard, Ian Gaughan

Mentor: Dr. Raju Gottumukkala

University of Louisiana at Lafayette

Design of Rotational Smart Multimodal RGB-D-T Camera to Improve Robot Perception

Autonomous cameras need the ability to automatically adapt to changing environments through dynamic field of view adjustments and calibration of the integrated sensors to improve performance of object detection. This auto-calibration has applications in healthcare settings for sensing patient behavior, in industrial settings for safety inspections, and for security surveillance.

This project presents a novel low-cost design for an autonomous rotational camera capable of multimodal sensing and perception. The camera system can detect RGB, depth, and thermal infrared parameters. Two synchronized RGB sensors give depth information and increase the accuracy of object detection and tracking. An integrated FLIR thermal imaging sensor improves the systems detection performance in non-ideal conditions and allows temperature measurements to be extracted on a per pixel basis. A pan-tilt system was designed utilizing a closed loop control algorithm to give the system a dynamic field of view. This is achieved using two stepper motors to control horizontal and vertical position adjustments independently. Thrust bearings were utilized to ensure minimal friction in the mechanical systems and micro-stepping ensures smooth rotation without introducing jitter to the system. The camera has integrated deep learning modules to detect multiple objects simultaneously and monitor their temperatures and anomalous behavior. The modules will be trained to recognize abnormalities and send signals to the rotational control system to adjust position so the relevant data can be precisely measured.

Carson J Hebert

Mentors: Dr. Ritwij Kulkarni, Preeti John

University of Louisiana at Lafayette

Genotyping of Non-diabetic and Diabetic Akita Mice

Diabetic individuals are more susceptible to urinary tract infections (UTI) compared to diabetics. An important etiology of diabetic UTI is Streptococcus agalactiae (aka group B Streptococcus or GBS). GBS is a Gram-positive pathogen that asymptomatically colonizes the lower genital and gastrointestinal tracts of healthy individuals. The primary objective of my research project is to identify specific immune effectors that make diabetic individuals more susceptible to GBS-UTI. To meet this objective, I am using the Akita mouse model of lean hyperglycemia. The Akita mice carry a spontaneous, point mutation at nucleotide 1907 of insulin-encoding Ins2 gene resulting in the substitution of cytosine (C) with thymine (T). The dominant mutant allele of Ins2 causes misfolding of insulin, immune destruction of pancreatic β-islet cells, and hyperglycemia. The autoimmune destruction of β-islet cells mechanistically resembles type 1 diabetes in humans.

To generate hyperglycemic mice for experimentation, we cross male mice heterozygous for Ins2 mutation with female C57BL/6 (Wild Type) mice. The litter from this cross is genotyped to separate Ins2 heterozygotes (diabetic) from WT (non-diabetic). For genotyping, I extract genomic DNA from ear clippings from mice by alkaline lysis of mammalian cells. The extracted DNA is subjected to TaqMan® SNP Genotyping Assay to detect specific (C□T) single nucleotide polymorphisms (SNP) in the genomic DNA.

The assay contains locus-specific PCR primers flanking C□T SNP in Ins2 gene and two allele specific oligonucleotide probes. The fluorescent probes have a fluorescent reporter dye (VIC®/ FAM™ dye-labeled probe) at the 5' end, a nonfluorescent quencher (NFQ) with a minor groove binder (MGB) at the 3' end. An intact probe emits a minimal signal upon excitation due to the physical proximity of NFQ and the reporter dye. The VIC-labeled probe binds specifically to the wild type T-1907 allele, while FAM-labeled probe binds mutant C-1907. The AmpliTaq Gold DNA polymerase 5' exonuclease activity separates reporter dye from the quencher resulting in a fluorescent signal. The specific (VIC versus FAM) fluorescent signal produced by the PCR amplification denotes which alleles are in the litter in the form of an allelic discrimination plot. Currently, I have genotyped 24 mice using this method.

Nicolas Hornby, Ke-Sean Peter, Yalearie Wildy, Naidu Seetala and Haeyeon Yang

Mentor: Dr. Haeyeon Yang

Grambling State University

LabVIEW Coding for Spectroscopic Data Collection

Automatic data collection is vital for today's cutting-edge research. We have successfully developed and implemented LabVIEW based coding to operate spectrometer and Lock-In amplifier as well as to collect data from the amplifier. Our LabVIEW VI produces a graph of spectra in real-time so that the intensity of detected light over the change wavelength can be obtained automatically when the parameters are typed in to the program. In addition, the VI enables us to export the collected data to an excel file for the further analysis. Spectra from quantum dots have been routinely obtained from the VI. Furthermore, additional coding to operate another spectrometer from other company is under progress. This project is funded by NASA LaSPACE, NSF PREM program and NSF-CIMM seed grants.

Thaddisha James, Lescia Valmond, John Thomas

Mentor: Dr. Paul Kim

Grambling State University

Metagenomic Analysis of Water and Soil in Grambling, Louisiana

Metagenomics, or the sequencing of genetic material collected from environmental sources, is used to research microorganisms found in soil and water. This metagenomic analysis of water and sediment from the Grambling pond and wastewater from Grambling State University (GSU) and the city of Grambling sewersheds will deepen our understanding of the local biodiversity and uncover any antibiotic resistance genes that are present. We hypothesized that the profiles of microorganisms detected in these varied contexts would be different based on our prior knowledge of microbial ecology.

Conical tubes were used to collect water and sediment samples from the Grambling pond and a 24-hour composite wastewater sample was collected from the wastewater lift stations at GSU and Grambling City. All water samples were centrifuged to obtain a pellet for DNA extraction using the ZymoBIOMICS DNA Miniprep Kit. DNA extraction from the soil samples was carried out using the DNeasy PowerLyzer PowerSoil Kit. DNA quality was assessed by UV spectroscopy and DNA concentration was measured using a Qubit high sensitivity dsDNA assay. Libraries for sequencing were prepared using the Oxford Nanopore Rapid Barcoding Kit.

Using the EPI2MEWhat's In My Pot bioinformatics pipeline, 867,885 reads were examined. Bacteria accounted for 94% of reads, 5% were classified as Eukaryota, and 1% were classified as Archaea / viruses. In overall taxonomic abundance, the top five species identified were *Escherichia coli* (111,351 reads), *Homo sapiens* (17,189), *Cloacibacterium normanense* (17,128), *Sphaerotilus natans* (6,700), *Escherichia marmotae* (4,851). Many of the identified species are enteric bacteria, which are naturally abundant in wastewater, but some were also detected in pond water and sediment. The EPI2ME Antimicrobial Resistance workflow produced 1,344 alignments to 185 genes in the Comprehensive Antibiotic Resistance Database. Future research will focus on how these microbes' antibiotic resistance affects water quality and public health.

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Christopher Jolivette, Illya Tietzel

Mentor: Illya Tietzel

Southern University at New Orleans

The Effect of Hypergravity on Ins1 Transposon in E. coli

An astronaut's health is incredibly important to NASA. Not only nutritionally, but also in terms of their immune system. We must confirm whether certain organisms are even able to survive in certain conditions. In addition, if they function in the same manner. Specifically in this case, a different gravitational environment. Changes to the gut microbes such as E. coli can impact the astronauts' health. Astronaut and microbes are exposed to hypergravity during lift-off and microgravity in space. NASA recently discovered that changes in gravity caused genetic changes in microbes involving transposons. Transposons were discovered by Barbra McClintock and found in both prokaryotes such as E. coli and eukaryotes such as humans. It is hypothesized that hypergravity is impacting the Ins1 transposon of E. coli. E. coli strain OP50was exposed to 1 g and 7,500g. Primers specific for the Ins1 transposon were designed using the genomic sequence of E. coli strain MG1665. PCR product showed a DNA band at 100 base pairs. Genomic analysis showed that the DNA sequence of E. coli OP50 and E coli MG1665 differ for the targeted Ins1 transposon impacting the binding of specific primers. Future research will re-design the primers to study the impact of gravity on Ins1.

Darlynn Marks

Mentor: Dr. Samii Kennedy Benson

Southern University and A&M College

Dolls and Roses: A look at the cultural materialism of Voodoo

Vodun is an ancient religion practiced by approximately 30 million people in the West African nations of Benin, Togo, and Ghana. Vodun means "spirit" or "god" in the Fon and Ewe languages of West Africa (Pinn 2017). Voodoo, as it is currently known, is one of the most misunderstood religions on the globe. It is an example of true syncretism, the amalgamation of different religions, cultures, or schools of thought (Takpe' 2019). This interfaith incorporates the worship of the gods their West African ancestors, the worship of the Catholic saints that enslaved Africans were taught in the New World as well as the primary Voodoo spirits called Iwa or Ioa. The purpose of this research is to identify both the material and non-material culture of Voodoo particularly as it relates to the dress customs. The utilization of material and nonmaterial culture within the Voodoo religion is also examined. For instance, Voodoo practitioners perform death and burial rituals that use various tools to complete the services. Clothing and how it is worn are also an important aspect of Voodoo material culture. Head coverings; for example, are both a spiritual veiling as well as abiding to the Teigen laws of the South and dresses made from flowy fabric represent water or wind in traditional ritualistic Voodoo dances.

This research stems from my work as a research assistant on a recent project which focused on the connection among Haitian customs and New Orleans Subculture. That project provided me with an introduction to Voodoo as not only a religion but a culture and piqued my interest to further research the cultural aspects of Voodoo. This research further explores more specifically, the material culture of Voodoo including traditional clothing, artifacts, objects and tools as well as nonmaterial culture such as norms, values, symbols, language and rituals.

Dang Khoa Nguyen, Nhan Nguyen, Prithvi R Singh, H Y Dang

Mentors: Dr Raju, Dr Barhost, Dr Darby

University of Louisiana at Lafayette

Omnidirectional Vision System for Continuous Object Tracking

Fast and accurate object detection from live video streams is an important requirement for robots that can seamlessly sense the surrounding environment. This capability allows robots to monitor the environment and perform early object detection and anticipation (such as object trajectories). Indoor environments (spaces where humans work closely with robots) are complicated, and this capability will help improve indoor tracking and localization performance. We face significant challenges in selecting the cameras that will cover the robot's 360° field of view (FOV). We have two potential cameras: The Dreamvu's PAL USB and the ZED 2i with a 2.1 mm lens.

To prevent errors caused by synchronizing multiple brands of cameras, we will use a separate purpose for each camera. PAL 360° camera always focuses on detecting the big object or human and the wall whenever they come closer to the robot and the robot needs to make avoidance. ZED 2i is used for tracking ultrafast small objects.

In one of our challenging use cases, the ZED 2i will locate and track the ball as a PAL 360° camera avoids obstacles. The ZED camera might not be able to capture all the movement the ball travels. However, we can compute and predict where the ball will arrive by identifying at least two to three points on the ball's journey. In this potential, we both conduct research and learn how to enhance the present accomplishments as well as, if practical, create new ones.

Bethany Ann Nichols

Mentor: Dr. Jeannie Gauthier

Louisiana Christian University

Ironic Roles in the House of the Seven Gables

Nathaniel Hawthorne uses irony in his novel, *The House of the Seven Gables,* to expose his characters against expectation. Hepzibah Pyncheon acts like a child despite her "superior heritage," and Clifford Pyncheon remains stuck in a childish fantasy even though he should act as man of the house. Phoebe's Pyncheon qualities are limited to her name, yet she possesses more maturity than her elderly cousins for whom she cares. Despite Judge Jaffrey Pyncheon's appearance of power and wealth, his pride exposes him as ridiculous, and while tormenting his cousins to gain more riches, Jaffrey unintentionally surrenders his wealth to them. Clifford then figuratively comes to life upon Judge Jaffrey's literal death. Finally, the underlying conflict between the Pyncheon and Maule families ultimately dissipates through Jaffrey's death and the marriage of Phoebe and Holgrave. This essay explains how each character in Hawthorne's novel rebels against prediction, producing ironic humor. Furthermore, the author seems to purposely stray from expectation only to conclude his story with a typical sentimental ending.

Ke-Sean Peter and Haeyeon Yang

Mentor: Dr. Haeyeon Yang

Grambling State University

Carbon Nanoparticles by Laser Ablation in Liquid

Nanoparticles (NPs) typically synthesized by chemical method which often requires expertise and heavy use of toxic and hazardous chemicals, which sometime becomes expensive due to the cost related with chemical hazards. Laser ablation in liquid (LAL) is a relatively new method to synthesize NPs. We have successfully synthesized carbon NPs by LAL method. Recently we has discovered a faster route of synthesizing NPs by a simple adjustment to the conventional LAL method. In this presentation, we discuss the properties of carbon NPs synthesized by the new approach as well as the impact of confining laser plume in a smaller volume on the synthesis of NPs by LAL technique. This project is funded by NASA LaSPACE, NSF PREM program and NSF-CIMM seed grants.

Meghan Quaglino

Mentor: Dr. Dean Kostantaras

Northwestern State University

Woolf and History: Proving the Room Hypothesis across Literary History

Virginia Woolf's *A Room of One's Own* focuses on the intersection between literature and writing. The titular crux of her essay, that women need a room of their own in which to write fiction, makes the arguably bold claim that men push down women to embolden, enlarge, and otherwise infatuate the readers with the male character. While this idea may seem self-explanatory to some, gender in writing is also a highly debated field that requires proof of such bold claims. Several works from across history support Woolf's hypothesis, with female characters constantly being subjected to the same treatment that Woolf claims both modern characters and modern women tolerate. Starting with the *Epic of Gilgamesh*, this evidence can be traced across history with works such as *The Iliad, The Consolation of Philosophy,* and *The Communist Manifesto*. Counterexamples can be found in contemporary works written by women, such as *The Awakening*. This evidence asserts that Woolf was far from incorrect in her argument; rather men across history use women and female characters to serve as buffers, stepping stools, and otherwise enlarging tools for the male characters and thus their male authors. Further, rather than simply proving Woolf's hypothesis, these examples also show exactly how far-reaching the impact of outdated and sexist ideals can be.

Samantha Ray

Mentor: Jeannie Gauthier, PhD.

Louisiana Christian University

Othello and Macbeth: The Indisputable Likeness of Iago and Lady Macbeth

Shakespearian tragedies *Othello* and *Macbeth* chronicle the carefully orchestrated destruction of their respective title characters. Othello and Macbeth are certainly guilty of their heinous crimes, but neither man acts on his own motivations. No, Othello and Macbeth are fed endless lies by their most trusted partners and driven into an abyss of madness and murder.

Through character analysis and research on the effects of psychologically abusive relationships, this essay examines the masterful methods of manipulation with which Iago and Lady Macbeth, disguised as worthy confidants, prod their prey beyond the boundary of self-control, bringing to the forefront their indisputable likeness and exposing them as the true villains.

Koral Richard

Mentor: Dr.Adonnay Sissay and Dr.Daniel Rivera

Northwestern State University

Elucidation of potentially bioactive compounds from *Erythrina herbacea*- the Mamou plant

Erythrina herbacea, the Mamou plant, grows naturally in the southern United States and has cultural relevance in Louisiana due to its historical use as an herbal medicine. Tea was made from the leaves, roots, and seeds of this plant to treat symptoms of the flu, pneumonia, bronchitis, and respiratory illnesses (Louisiana Medicine). Plants in the genus *Erythrina*, from the family Fabaceae or Leguminosae (legumes), 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 peroxynitrite *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 in herbal medicine 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, and HNMR. Current attempts at elucidating the phytoconstituents in our extract have narrowed potential results to the 16 known compounds of interest found in the work of Tanaka et al., 2010 and Garin-Aguillar et al., 2005. Future research on *E.herbacea* acetone leaf extracts will further identify these phytoconstituents through GCMS, analyze their antioxidant activity and nitric oxide radical scavenging potential, and test for antibiotic activity against *E.coli* through MIC and MBC plates.

Skylar Sanders

Mentor: Dean Kostantaras

Northwestern State University

The Self in Dr. Jekyll and Mr. Hyde

Some important social concepts that Victorian Britain struggled to come to terms with during the nineteenth century were the interconnectedness of the self, body modification, and deviance, specifically, how the perception of self was altered by body modification and deviance. The struggle with deviance and identity can be seen in other Victorian literature. The struggle with self and body modification can be seen in legal cases. *The Strange Case of Dr. Jekyll and Mr. Hyde* by Robert Louis Stevenson takes these multiple large issues society grappled with and over exaggerates them to emphasize the importance of the issues. An analysis of this work of literature intends to highlight the impossible task of separating these issues from the society in which this work originates. *The Strange Case of Dr. Jekyll and Mr. Hyde* serves as an effective example of how body modification and deviance alters both the internal and external perceptions of self. The co-dependent existence but individual appearances and morals of Hyde and Jekyll is the ultimate question of what constitutes the self. It raises question such as: where does morality end and deviance begin; why is Hyde, who is Jekyll's hidden desires personified, repulsive to others, but Jekyll is a respected man; and finally, why is Hyde shamed for his deviant actions when Jekyll is the blueprint for them? *The Strange Case of Dr. Jekyll and Mr. Hyde* is a work of literature that is the ultimate expression of the interconnectedness of self, body modification, and deviancy.

Taylor Thibodaux, Shana Walton, Gary LaFleur, Jr.

Mentor: Gary LaFleur, Jr.

Nicholls State University

Developing a Database with MAXQDA and Compiling Reports on Chemical Exposure Incidents at Grand Bois

This project aims to create a database containing coded literature in relevance to coastal communities from Louisiana to Florida. My section of the project will be targeting Grand Bois, Louisiana and the waste facility established there. Comparisons to other similar facilities across Louisiana will be made along with potential health correlations of parishes located within the area of those facilities. The project will be completed in collaboration with the Bureau of Ocean and Energy Management and the Center for Bayou Studies at Nicholls State University. All members of the team will be trained in a workshop on the MAXQDA program that will be used to code the literature that will be uploaded into the database. All members will also obtain a MAXQDA license to properly use the software. The completed database will provide coded literature for those researchers and companies who may need sources to use for composing Environmental Impact Statements (EIS). These EIS statements are needed for the federal review of any construction projects that will affect ecological parameters, such as building a new canal through a cypress swamp. Upon completion and submission of the final database, there will be public access for academics, policy makers, and community stakeholders. My specific project will concentrate on incident reports regarding an oilfield waste facility that was installed at Grand Bois, La. By comparing incidents reports between the Grand Bois location and several other facilities, my project will bring awareness to the struggles the residents living there have experienced. My project will also highlight the many health effects that are associated with oil and gas waste facilities, and how these can create repercussions within coastal communities.

Lescia Valmond, John Thomas, Thaddisha James

Mentor: Paul Kim, Ph.D. and Audrey Kim, D.V.M., Ph.D.

Grambling State University

Genomic Surveillance of SARS-CoV-2 in Northeastern Louisiana

The rapid spread of the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) led to the Covid-19 Pandemic. Variants of SARS-CoV-2 evolved as a result of mutations in the viral genetic code during RNA replication. These mutations may increase viral transmissibility, evasion of the human immune system, and decrease vaccine efficacy. Genomic surveillance is used for monitoring and reporting these viral mutations. However, in low-resource environments, there has been limited sequencing of SARS-CoV-2 variants (1). This project aimed to track and report SARS-CoV-2 variants in underrepresented communities in Northeastern Louisiana from August 2021 to September 2022.

Individuals who tested positive for COVID-19 using rapid antigen tests at local clinics were recruited to the study. Using the Zymo Quick DNA/RNA Viral Magbead kit, viral RNA was extracted from the nasal swabs. The Oxford Nanopore MIDNIGHT Expansion kit was used to reverse transcribe the viral RNA and create overlapping cDNA tiles of 1200 nucleotide bp (2). The amplicons were tagmented using the Oxford Nanopore Rapid Barcoding Kit 96 and then pooled for sequencing in the MinION. The MinKNOW software provided the raw sequenced genomic data. The raw data obtained underwent quality control, alignment, and variant calling to identify the mutated region(s). Finally, the genomes were uploaded to GISAID along with patients' metadata.

Over two hundred SARS-CoV-2 genomes were recovered at Grambling State University. We hypothesized that most mutations would occur in the glycoprotein S gene (spike protein), and the population of variants found in this region would follow national trends. Most SARS-CoV-2 detected from July 2021 to December 2021 was Delta until the first Omicron variant, B.1.1.529+BA.1 was collected on the 20th of December 2021. From then on, Omicron quickly replaced Delta as the dominant variant.

References:

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Claire Werther, Karl Young and Seonhee Jang

Mentor: Dr. Seonhee Jang

University of Louisiana at Lafayette

Dual Sintering of Metal Nanoparticles for Application of Flexible Electrical Circuits

The flow of electricity is an important part of any electronic devices. There are many ways to create a path for the electricity, including using metal nanoparticle inks which allow for any design to be created. To create the electrical path, the metal ink is printed onto a substrate and heated to merge the particles together. This is known as sintering and creates a conductive path. Copper is a conductive material used in this application, but the sintering process causes copper to oxidize. This oxidation restricts the conductivity. To help decrease these reactions, formic acid atmospheres are bubbled into the sintering process which allows for shorter sintering times and lower temperatures. There are two types of sintering, including thermal sintering and laser sintering. Thermal sintering involves heating the substrate on a hot plate while laser sintering involves heating the ink by exposing it to a laser. The purpose of this experiment is to evaluate how different sintering processes affect the sintering behavior of the copper nanoparticle. The four sintering conditions involve (1) thermal sintering, (2) laser sintering, (3) thermal sintering followed by laser sintering, and (4) laser sintering followed by thermal sintering. For thermal sintering, formic acid atmosphere was used to aid in reducing oxidation. Different characterization tools were used to analyze the material properties of sintered copper nanoparticles. Fourier transform infrared spectroscopy determined the chemical bonds in the sintered copper samples. The scanning electron microscope provided images of the microstructure while the atomic force microscope measured the surface roughness. Using X-ray diffraction, the crystalline planes were analyzed. The folding test and adhesion test were used to measure the mechanical stability of the samples. To measure the resistance, a two-point probe was placed on each edge of the sample.

Yalearie Wildy, Hillary English, Adrianna Pratt, Nicolas Hornby, and Haeyeon Yang Advisor:

Mentor: Dr. Haeyeon Yang

Grambling State University

Spectra from InP/ZnS Quantum Dots

Quantum dots (QDs) are ubiquitous. They can be found in almost all aspects of our life, ranging from TV displays and energy conversion devices such as QD TV and solar cells, to biological applications such as research on imaging stem cells and cancer cells. Compared to the well-known, conventional CdSe QDs, the synthesis of InP/ZnS QDs are mainly driven by the need of QDs of less toxic, environmentally friendly, and benign to human body. They have been welcomed in many applications including bio-medical applications. In this presentation, we discuss the fundamental aspects of QDs such as QD size, electronic properties of QD and their impacts on fluorescence, structural properties such as core, shell, and ligands using InP/ZnS QDs as an example. The optical spectra from InP/ZnS QDs will be discussed. This project is funded by NASA LaSPACE, NSF PREM program and NSF-CIMM seed grants.