April 18th, 2024

Welcome to the 2024 Celebration of Scholarship and the 22nd Undergraduate Research and Creative Activity Forum. This event showcases research and creative activity presentations by undergraduate students, and Fain Elementary students.

The following abstracts represent hard work and dedication to research and creative work. The program has been organized by presentation type.

UNDERGRADUATE RESEARCH & CREATIVE ACTIVITY FORUM
MIDWESTERN STATE UNIVERSITY

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Sessions will run simultaneously in the Clark Student Center (CSC) Atrium and Comanche, Cheyenne, and Kiowa rooms.

Thursday, April 18th, 2024

Undergraduate Presentations- Clark Student Center

Oral Presentations

Kiowa Special Session: Guest Speaker

"Research Integrity: Regulations, Reality and Cautionary Tales"
(lunch served to RSVP attendees)

Poster Presentations

UNDERGRADUATE ABSTRACTS

Oral Presentations

Cheyenne Session I- Political Science
9:00 am-11:00 am

9:00-9:20

O4- *Carbon Dioxide Intensity, Climate Change Perception, and Environmental Actions*

Federica Manno, Jackson Redding

Mentor(s): Juheon Lee, Political Science, Prothro-Yeager College of Humanities & Social Sciences

While public perceptions are critical in climate change policymaking, social science studies on the factors that influence such perceptions and actions are still insufficient. Existing studies have focused heavily on certain individual characteristics, such as educational attainment and political ideologies that influence their perceptions of climate change; however, relatively ignored in such studies were broader social contexts that go beyond individuals and the interactions of factors at different levels. This study, therefore, examines how people's climate change perceptions and their participation environmental activities are statistically associated with (1) individual-level socioeconomic characteristics, (2) neighborhood-level exposure to environmental change, and (3) country- level political, economy, and environmental contexts. To do this, we will conduct a multi-level statistical analysis using our dataset (work-in- progress) that will merge an international survey data provided by the 2020 International Social Survey Program (ISSP) with various country-level data from international organizations. The ISSP provides a reliable survey dataset of over 15,000 respondents from 44 members countries, including their perceptions of climate change, actions adopted to mitigate the impact of climate change, and their neighborhood experiences of pollution and extreme weather. We will combine the survey data with each respondent's country information for a statistical analysis and visualization.

9:25-9:45

O5- *Adoption and Identity: Understanding Transracial and Intercultural Adoption in Rural Texas*

Emily Rowland

Mentor(s): Linda Veazey, Political Science, Prothro-Yeager College of Humanities & Social Sciences

This research examines transracial adoption from the foster care system in Texas. Adoption stories tend to focus on the adoptive parent(s) and a perceived happy ending. Research shows that long-lasting, continued needs for adoptive children and families are often unaddressed, particularly when adoptive parents and children are of different races and/or cultures. The dominant groups of adoptive families are white, heterosexual, cisgender, Christian families. Yet, children adopted from Texas foster care are much more likely to be members of racial and ethnic minority groups, particularly Black or African American children who are overrepresented in the state system. Scholars note the negative impact of transracial adoption, particularly on Black children, and that best outcomes are to achieve permanency within family and communities.

However, permanency for children in Texas foster care often depends upon unrelated adoption. What are the obstacles for transracial adoptive families? What training is offered or should be for prospective foster and adoptive parents living or planning to live with children of a different race or culture? This research assesses the obstacles identified by scholars and focuses on the resources provided to adoptive/foster parents to determine current intercultural parenting training offered and to identify training and policy gaps for intercultural and transracial adoption. The research shows shortcomings in the Texas system regarding adequate cultural competency training and follow-up post adoption.

9:50-10:10

O6- *You Need to Calm Down: Gender and Separation in Taylor Swift and Texas Rangers Fandoms*

Taylor Clark

Mentor(s): Linda Veazey, Political Science, Prothro-Yeager College of Humanities & Social Sciences

This paper explores media coverage of Taylor Swift versus Texas Rangers fans. In modern media culture, fandoms have been a massive contributor to all individuals online who show support to their favorite celebrities, television/movie franchises, and even sports teams. These fandoms have become more exclusive or inclusive over recent years, with many groups being identified and treated by the individuals stereotyped to represent their fandoms. Through content analysis of 20 articles written about Taylor Swift fans and Texas Rangers fans in fall 2023, I find gender stereotyping and unconscious bias through the language used in the articles to discuss fandoms. I argue that the devaluing of things associated with femininity or not associated with hegemonic masculinity are strong reasons for the differential treatment of these fandoms.

10:15-10:35

O7- *True Crime: A Bridge to Activism within the US Justice System*

Zetta Cannedy, Brandon Goins

Mentor(s): Linda Veazey, Political Science, Prothro-Yeager College of Humanities & Social Sciences

True crime has become a massively popular genre of media and has become an opportunity for victim advocacy and activism. True crime is a nonfiction genre (although once considered a fiction genre) taking on various forms of media such as documentaries and podcasts. True crime has become influential on public policy which together has formed an idealized victim. We created a dataset from true crime podcast episodes to analyze how they discussed the victim and perpetrator, host demographics, how did they address violence, and was there a perspective of activism. This paper argues that true crime has a system of advocacy which can be woven into public policy and media, erasing good victimhood, dehumanization, and victim blaming.

10:40-11:00

O8- *Women's Likability: Gender Disadvantages and Underrepresentation in US Politics*

C**aroline Gomez**

Mentor(s): Linda Veazey, Political Science, Prothro-Yeager College of Humanities & Social Sciences

In this paper, I examine gender biases and systemic disadvantages of women in the field of US politics, particularly in US congressional and presidential elections. This paper stresses the continued gender bias towards women despite progress, and highlights the gendered obstacles women face in elections. Bias and stigma questioning women's capability in national political office continues including gendered notions of leadership, temperament, work-life balance, and personality. In addition to exploring the gender biases, I offer potential solutions to challenge stereotypes and combat the systemic biases against women because every woman deserves to have a seat at the table where big decisions are being made.

Cheyenne Session II- Chemistry, Engineering, & Geoscience
1:00 pm- 3:00 pm

1:00-1:20

O17- ***L****everaging Membrane Protein Chaperones to Mitigate Familial Mutant Amyloid Beta Aggregation: A Prospective Therapeutic Approach for Early-Onset Alzheimer's disease*

Andrew Vann

Mentor(s): Fu Cheng Liang, Chemistry, McCoy College of Science, Mathematics & Engineering

Alzheimer's disease (AD) is a progressive and terminal condition marked by the gradual decline of cognitive function. Despite extensive research, AD remains an incurable form of dementia, commonly associated with the accumulation of misfolded proteins in the brain. Notably, Amyloid beta (Aβ) peptides, resulting from the cleavage of larger membrane proteins, aggregate to form extracellular plaques near nerve endings. Among these peptides, the arctic mutant Amyloid beta E22G (Aβ E22G) stands out as highly prone to aggregation. This mutation is linked to aggressive early-onset AD and rapid plaque buildup in the brain, yet the precise pathological mechanisms remain unclear. The amyloid hypothesis posits that the accumulation of misfolded Aβ primarily drives AD pathology, thus targeting and eliminating these aggregates holds promise for disease stabilization and potential cure. Our investigation highlights the effectiveness of an innovative protein targeting mechanism derived from the chloroplast signal recognition particle (cpSRP43). Serving as an ATP-independent chaperone for membrane proteins, this machinery adeptly mitigates the aggregation of Aβ E22G. The core focus of our research is to harness the potential of cpSRP43 as a therapeutic agent to counteract the aggregation processes prevalent in AD patients unable to efficiently clear Aβ aggregates. Our central hypothesis posits that cpSRP43, functioning as a membrane protein chaperone, can impede the misfolding and aggregation of proteins. Notably, our findings illustrate that the introduction of cpSRP43 effectively hinders the aggregation of Aβ E22G peptides, suggesting a promising avenue for the development of innovative AD treatments.

1:25-1:45

O19- *Measurements of Dynamic Forces along an Egg-Shaped Geometry*

Daniel Stanley, Sid Ranbhise, Peter Kimani

Mentor(s): Salim Azzouz, Engineering, McCoy College of Science, Mathematics & Engineering

The main goal of this research project is to determine theoretically and physically measure the dynamic forces along the inner race surface of a bearing that is slightly damaged and deformed. This task is demonstrated on a larger scale by having a steel ball move through an egg-shaped pathway. The equation of motion of such a system can be derived and subsequently the motion of the steel ball is determined. The steel ball is propelled by an impulse force produced by four electromagnetic coils mounted along the pathway. The track is mounted on bearing casters to allow for an almost frictionless motion along the ground. This would allow for the experimenter to observe the effective motion of the track. The track is 3-D printed with clear resin and has a resin box at its center with the necessary electronics to generate the coil impulse forces. The theory will cover the equation of motion of the steel ball rolling freely on the pathway. Later, the group is planning to introduce into the equation of motion the friction generated by the trackway and the impulse force generated by the four electromagnetic coils. The goal of this project is to show the impact of the dynamic forces on a bearing. The force magnitude will be measured experimentally on the egg shape using springs. The effect on the dynamic forces and the velocity on the steel ball will be studied as a function of the applied voltage to the coils.

1:50-2:10

O20- *Wind Tunnel Testing of a Vortex Based Vertical Axis Wind Turbine*

Jada Rhodes, Elizabeth Horn, Danielle Egwim

Mentor(s): Salim Azzouz, Engineering, McCoy College of Science, Mathematics & Engineering;

This research project will test whether a vortex-generating obstacle will increase the efficiency of a Vertical Axis Wind Turbine (VAWT) or not. The idea being tested herein is if a set of blades guide the wind blowing in a VAWT, will the wind create a vortex that drives the rotor of the turbine to become more efficient? Studies show that VAWTs are less efficient than Horizontal Axis Wind Turbines (HAWT). Therefore, if successful, this research project will have the potential to solve the limited generator power that characterizes the HAWT. The obstacle's design allows two VAWTs to function simultaneously using blade profiles to guide the wind. To adequately test this model, the assembled 3D printed parts will be placed in a wind tunnel to simulate wind in nature and the generator power output will be concurrently measured. Using the incoming wind, the guiding blade profiles will create two internal vortices which will turn the turbines. The assembled apparatus will be tested for its power generation using the measured current, voltage, and the collected wind speed data. This task will be accomplished by running the wind turbine at various wind speeds and using a circuit with electrical loads. The LabVIEW software is used to collect the data, which will be used to create a power coefficient versus tip speed ratio graph.

2:15-2:35

O21- *Characterizing Tree Structural Parameters using Terrestrial LiDAR and Geometric Modelling within an Urban University*

Zantia King, Elizabeth Elkins

Mentor(s): Kashif Mahmud, Geoscience, McCoy College of Science, Mathematics & Engineering

Above-ground biomass (AGB) is an important metric used to quantify the mass of carbon storage in terrestrial ecosystems. Urban trees have long been valued for the potential to store significant AGB. However, urban environments pose various challenges for accurately recording AGB due to the plasticity of tree form, high species diversity, and heterogeneous and complex land cover. Light Detection and Ranging (LiDAR) is a state-of- the-art technology of remote sensing that offers an opportunity to assess AGB in urban trees effectively and inexpensively. Using LiDAR and geometric modeling algorithms, we can generate three-dimensional (3D) point clouds and digital tree segmentations. These 3D models can be used to estimate urban tree structural parameters such as height, diameter at breast height, volume, surface area, etc. First, we manually extract individual tree point clouds from plot-scale LiDAR data collected in an urban setting at Midwestern State University (MSU Texas). We then apply state-of-the-art digital tree segmentation and geometric modeling algorithms to estimate tree structural parameters and AGB of these urban tree species. Finally, we validate the available modeling tools by optimizing parameters and comparing the outputs from the model simulations with extensive field measurements (harvested total biomass and branch biomass) from the campus trees. The model with optimized parameters for North Texas tree species (Red Oak and Cedar Elm) would provide a more accurate estimate of the total AGB of these urban tree species. This can offer a non-destructive approach for estimating urban tree AGB which is essential for understanding the overall atmospheric carbon sink and also has practical recommendations for sustainable urban forest management strategies.

Cheyenne Session III- Engineering
2:45 pm- 4:20 pm

2:45-3:05

O22- *Autonomous Control Systems in High-Powered Rocketry*

Thad Taylor, Adolf Frederic, Dominick O'Hara

Mentor(s): Yu Guo, Engineering, McCoy College of Science, Mathematics & Engineering

The objective of this project is to produce a fully autonomous-sounding rocket designed to maintain a stable, vertical flight path in order to enable further scientific research. This objective will be accomplished in a cheap and effective manner by incorporating autonomous control fins that will maintain the rocket's orientation by countering the common forces acting against the rocket. These fins will be controlled by an autonomous stabilization system that will read sensor data, such as orientation and acceleration, and rotate the fins accordingly. Before the autonomous rocket stabilization system can be implemented, a functional rocket body must be designed and constructed, including all required electronics. We have purchased all necessary components for the initial launch of a non-stabilized rocket and have constructed its full airframe. Before we perform this initial launch, we must develop an electronic launch and recovery system.

These systems will utilize the same microcontroller used by the stabilization system. There will also be a backup recovery system in case of hardware failure. The recovery system will determine the optimal point within the flight path of the rocket to deploy both the drogue and main parachutes in order to safely recover the rocket post-flight. After this, a simulation that will take in the sensor data will be created in order to test the stabilization system before we launch the main rocket. Our current goal is to complete both the recovery system and this simulation.

3:10-3:30
O23- *Spatial Stabilization Using Controlled Magnetic Fields*
Miguel Bethel, Alex Sandstedt
Mentor(s): Yu Guo, Jeff Hood, Engineering, Mathematics, McCoy College of Science, Mathematics & Engineering
This paper investigates the utilization of magnets within a rotating system to achieve object stabilization without direct contact. The research emphasizes the fundamental aspects of theory, system design, data collection, and experimental outcomes. The rotational aspect of magnets around a magnetic object is a key feature, contributing to the generation of stable levitation. The paper specifically focuses on controlling and minimizing object motion. It explores various factors impacting stabilization, including rotational speed (RPM), distance between the object and rotating magnets, and the sequence of magnetic positioning. The systematic observation of these variables provides insights into optimizing the stability of magnetic objects in such systems.

3:35-3:55
O24- *Hybrid Drivetrain Conversions*
Dylan Peterson, Ferenc Nihof
Mentor(s): Yu Guo, Engineering, McCoy College of Science, Mathematics & Engineering
The current automotive landscape is heading toward a new era of electric vehicles. This does mean that older cars will become obsolete and unusable through new legislation. So instead of making all older cars obsolete, why not offer the ability to “update” them? Not everyone wishes to own a newer car or something purely electric. There is also the ecological aspect of Li-ion battery production and the production of new EV cars. We are working on a way to make hybrid conversion kits more available to the public for a more compromised approach to reducing the use of fossil fuels. This project stemmed off a research project done previously with a small-scale RC car to test the idea with a smaller budget. It provided results to motivate the concept further. With newfound knowledge, the research project was evolved into our senior design project to work on a larger scale. For our senior design project, the plan is to implement a hybrid drivetrain onto a go-kart, but a test rig had to be created to fit our specific needs. Having completed the testing platform, efforts have been shifted to the implementation of the Hybrid Conversion kit. Implementation of this system involves installing the electric hub motors as well as installing the rest of the electronics in the system. After Implementation has been completed more test driving and data acquisition must be completed.

4:00-4:20

O25- *Mechanism-Control Design Integration for a Gravity Compensation System for Human Lower Limb Rehabilitation*

Amber Seward, Brayden Birkenfeld, Sydney Van Noy

Mentor(s): Zeki Ilhan, Mechanical Engineering, McCoy College of Science, Mathematics & Engineering

The aim of this work is to demonstrate the feasibility of a novel suspension system as a rehabilitation device for people with lower-limb injuries through mechanisms – nonlinear controls design integration. The proposed mechanism, which combines a basic four-bar parallelogram linkage with an additional link and two tension springs, is inspired from the gravity compensation approach for space research as it provides a reduced weight experience for the suspended person. Although a series of iterations have been made to fabricate a working prototype of the proposed system since Fall 2020 semester, the main focus on this presentation is to design and fabricate a smaller working prototype to be able to implement the use of actuators to be able to counteract the weight of the moving links of the four bar linkage system so that it provides reduced weight experience for the suspended weight that will be used to represent a person in the prototype system. The proposed control system includes two Dynamixel XM-430- 210 R servo motors which will communicate with an Arduino microcontroller which is user friendly and will be used to implement the model-based nonlinear, feedback control algorithm, to be able to adjust the motor torque requests in real time.

Kiowa Session I- Radiologic Technology, & Psychology
9:00am- 9:45

9:00-9:20 am

O1- *An analysis of Compton Scatter Intensities under Different Clinical Conditions*

Myia Davis, Jessica Walla

Mentor(s): Rodney Fisher, Radiologic Technology, Gunn College of Health Sciences & Human Services

This study continues a developed pilot study from fall 2023 where the objectives were to determine radiation patterns and intensities of Compton scatter in diagnostic X-ray procedures. The goal is to apply the methodology of the fall research to current research. This includes clinical body and machine positioning and utilizing the recommended technique range. The hypothesis is that as the spring research methodology is implemented, similar findings and patterns to the fall research will be observed relating to Compton scatter. Furthermore, ballistics gel will be used to emulate different tissue densities to analyze the effects of altered exposure techniques on people of varying body habitus. The hypothesis is that as the tissue density and exposure techniques increase, the amount of Compton scatter will increase. The findings can inform technologists of the importance of decreasing both occupational and patient doses. Through applying these concepts, occupational and patient safety can be improved. This can be accomplished by conducting clinical positioning and recommended technique range. The research process includes taking exposures, correcting for a deviation index (DI) goal of zero, and measuring Compton scatter and entrance skin exposure (ESE). After the research, the data collected will be compared, contrasted, and analyzed. The research question, objectives,

methodology, and results will be formatted into an oral presentation. We aspire to publish our process for others to use in their radiologic curriculum, allowing others to visualize radiologic theories of physics and their effects. Upon completion of the research, the hypothesis and findings will be resolved.

9:25-9:45
O2- *The Impact of Chronic Illnesses on Students' Perceptions of Belongingness*
Avery Ondechek
Mentor(s): Nicholas Maxwell, psychology, Prothro-Yeager College of Humanities & Social Sciences
Chronic illnesses are linked to a wide range of physical and psychological symptoms. Although symptoms vary between individuals, prior research has revealed that individuals suffering from chronic illnesses are more likely to report decreased quality of life, struggle with their mental health, and are at an increased risk of suicide. Because previous work has noted that the negative effects of chronic illnesses on mental health are moderated by social factors, the present study tested whether perceived belongingness is impacted by individuals' chronic illness or disability status. Undergraduate students from Midwestern State University completed the General Belongingness Scale (GBS; Malone et al., 2012), which assesses individuals' perceived belongingness amongst their peers. Additionally, they completed a short screener assessing their disability/chronic illness status. Finally, individuals who self-identified as having a chronic illness or disability also completed the Illness Identity Questionnaire (IIQ; Oris et al., 2018). Because the IIQ provides separate measures of positive illness identity (acceptance and enrichment) and negative illness identity (engulfment and rejection), this measure provides a distinction between individuals based on how they cope with their illness. Overall, individuals with chronic illnesses reported lower GBS scores versus healthy peers. Importantly, GBS scores were positively correlated with IIQ enrichment scores, suggesting that positively framing one's condition can limit the negative effects of chronic illnesses on perceived belongingness. Thus, although chronic illnesses negatively impact belongingness, how individuals frame their condition may serve as a protective buffer. IRB #24200208

Kiowa Session II- Fain Elementary
10:00-10:20

FE1 4th Grade *Shape Museum*
Jaxsyne Hearn, Jordyne Hearn, Daniel Nix, Carter Kee, and Luke Van
Mentor(s): Laura Wetzel, Angelica Perkins, Darion Minor, Alyvia Cullar
How can we as exhibit designers demonstrate the important role shapes have in our world? In this project, students learn about the different geometric shapes in the world around them (e.g., rectangles, squares, trapezoids, etc.). Through a combination of photographs and art, their exhibits will serve to educate others on the attributes of shapes and how one might encounter them in the world. As the 4th grade class at Fain Elementary, we will create an EDP project with the goal of promoting awareness and designing an exhibit on a particular shape using photographs and art to show the shape in our world. Students will also design an architectural house or building based on Frank Lloyd Wright's vision. They will combine nature to a structure and convey the importance of shapes in written form. The results for this project are for students to understand, demonstrate, explain and record their evidence and provide the purpose of

shapes as they introduce to an audience during the project. With this project students will achieve higher regard and respect toward shapes and the geometric forms of math. Fain's 4th grade class will be responsible for their journal as they partake in discovering how shapes impact our world. The overall goal for this project is to learn how geometric shapes in two or three dimensions are used in design, architecture and construction of objects, buildings and art. Learning the distinctions in shapes expects for the students to concentrate on the particular attributes.

FE2- Grade 5 *Ecosystem Interactions*
TBD
Mentor(s): Alexis Cray, Audrey Simmons
The world around us is a vibrant tapestry of interconnected ecosystems, where plants, animals, and environments rely on each other for survival. In this project, fifth-grade students will embark on an exciting journey to unravel the intricate web of interactions within ecosystems. Through hands-on experiments, observations, and research, students will investigate how living organisms interact with each other and their environment, shaping the delicate balance of nature.

Kiowa Session III- Education & Finance
10:30-11:15

10:30-10:50
O3- *Strategies to Increase Connections and Belongingness in Undergraduate Classes*
Cali Barton
Mentor(s): Dittika Gupta, curriculum and learning, West College of Education
Non-completion of degree programs at the undergraduate level reveals a struggle for retention and success among students (O'keefe, 2013). Student retention is based upon many factors, one of which is students' sense of belonging (Tinto, 2002). Thomas (2012) has defined belongingness as "students' sense of being accepted, valued, included, and encouraged by others (teacher and peers) in the academic classroom setting and of feeling oneself to be an important part of the life and activity of the class" (p. 25). Students' sense of belonging was researched as one of the most significant factors in students' success and retention in higher education (Brooman & Darwent 2014; Felten & Lambert, 202; Hausmann et al. 2007; Kane et al. 2014; Larsen & James, 2022; Thomas 2012). Motivated by the need to provide support for student success, combat loneliness, and increase student access, the researchers conducted a study to examine strategies that foster a sense of belongingness in the classroom. A researcher-designed survey was sent to the faculty and students to gather the information about the different strategies done in a classroom to create a community of learners. The research study proposes that by strengthening the student-educator relationship and the student-student relationships in the classrooms, educators can contribute positively to influencing students' mental health and their sense of belonging within the university environment. The research question that guides the study is "What strategies develop belongingness in the classroom?" "What are the perceptions of different strategies used in the classroom for creating a community of learners?" Using qualitative methodology, the data was analyzed and member checking was used to generate themes of the collected responses from faculty and students. This research study aims to share some of those strategies and the rationale behind their effectiveness. This research study also aims to create a database of

strategies that foster belongingness in the classroom and provide data to support the implementation of the various strategies in the classroom. IRB#24032604

10:55-11:15

PAP1- *The Impact of Financial Literacy Programs and Incentives on Consumer Debt and Financial Status*

Romario Hughes

Mentor(s): Qian Li, finance, Dillard College of Business Administration

This research investigates the impact of financial literacy programs and incentives on consumer debt. It emphasizes the interplay between subjective and objective financial perspectives and considers the role of psychological factors in shaping financial behaviors. We employed surveys, interviews, and data analysis to understand how individuals make financial decisions. We explored how stress and mental health influence these decisions and evaluate strategies for promoting financial literacy and responsible debt management. Our findings aim to bridge the gap between subjective and objective financial perspectives. We will identify key psychological factors impacting financial behaviors, contributing to more effective financial programs that consider individual well-being. This research can enhance financial education, promote responsible financial decisions, and benefit individuals' financial well-being. It also has the potential to inform public awareness campaigns and engage with financial industry stakeholders. In essence, this study seeks to empower individuals to make sound financial decisions while addressing the emotional factors that influence them. IRB#24022007

Kiowa Special Session-Guest Speaker
11:30-1:00 (lunch included with RSVP)

Research Integrity: Regulations, Reality, and Cautionary Tales

Dr. Dawn Underwood, Vice President for Research, Oklahoma State University Center for Health Sciences

A discussion of the most important research integrity issues for today's college students and faculty mentors. The seminar includes an overview of a range of research integrity topics, such as human subjects in research, animal care and use, avoiding research misconduct and questionable research practices, and more. Hot topics at the federal level include research security, conflicts of interest, and intellectual property protection. Learn how new technologies like ChatGPT, Machine Learning, and Artificial Intelligence are transforming research and how we can use such tools responsibly.

Brought to you by OSPR

Kiowa Session IV- History & Mass Communication
1:00-3:00

1:00-1:20

O9 - *How Baseball served as a healing mechanism between the United States and Japan post WWII.*

Ramon M Hernandez

Mentor(s): Brandon Blakeslee, history, Prothro-Yeager College of Humanities & Social Sciences

Baseball does not come to mind when thinking about rebuilding a country after a catastrophic event. However, during WWII when tensions between the United States and Japan were at an all-time high, with many Americans harboring negative feelings towards Japan, MacArthur recognized the potential of baseball to heal the relationship between the two countries. After the war, United States General Douglas MacArthur was in charge of the United States' occupation of Japan. MacArthur recognized the potential of baseball to heal the relationship between the two countries. He believed by promoting baseball to the Japanese, the Americans could help instill democratic ideologies and create bonds with one another, fostering a comradery. This historical event cannot be overlooked as baseball helped create a hub for cultural exchange and experience fostering goodwill and understanding amongst one another. To this day baseball remains a staple in Japanese culture, with millions of Japanese fans following the sport in both amateur and pro leagues. America's pastime is now a symbol of the strong bond between the United States and Japan serving as a reminder of the power of sports in history.

1:25-1:45

O10- *Evan Shelby and the Allure of Early America*

Oz Taylor

Mentor(s): Mary Draper, history, Prothro-Yeager College of Humanities & Social Sciences

Evan Shelby was a pioneer, a brigadier general in the American Revolutionary war, father of Kentucky's first governor Isaac Shelby, and frontier tradesman who held significant sway in the regions of eastern Tennessee, Kentucky, Virginia, and North Carolina. Before his Revolutionary victory at the Battle of King's Mountain, however, little is known about this enigmatic figure from America's early history. This essay explores the life of Evan Shelby who moved in 1734 from Tregaron, Cardiganshire, Wales to the Pennsylvania colony with the Quakers, a feat he undertook when he was only 15. While sources about him are rather limited, this essay pieces together scattered primary sources and secondary scholarship to show what life was like in the mid-1700s for settlers in the Pennsylvania and Maryland colonies. By reconstructing Shelby's life, showing the path he took in order to earn his accomplishments, and what the situation in the colonies was like for the average settler, Evan Shelby's life can be brought down from a pedestal. Rather than merely observing his accomplishments, we can discover the challenges of life in colonial America, what motivated Welsh colonists to immigrate, and the rhythms of everyday life in the colonies.

1:50-2:10

O11- *The Lao Perspective in the Bombing of Laos during the Cold War*

Andres Revis

Mentor(s): Mike Rattanasengchanh, Eric Lynch, history/world languages, Prothro-Yeager College of Humanities & Social Sciences

In the late 1960s and early 70s, more bombs were dropped in Southeast Asia than in any other war in history, yet the Lao perspective of the U.S. bombing is widely unknown. By analyzing a Lao French language newspaper, Lao Presse, we determined Lao perspectives towards neutrality and US involvement in the region from 1966 to 1967 during the first stages of bombings. We find that more conservative leaning media like Lao Presse did not mention the bombings as much as expected. Instead, editorial content remains focused on indirectly justifying the violence against communist Pathet Lao partisans. Not only do opinion pieces criticize communist forces in the region, but they also stoke fears of Vietminh encroachment and emphasize the perception of the Pathet Lao as aggressors. The Lao Presse Editors emphasize the value of Lao neutrality by publishing letters and speeches from both sides of the civil conflict but also provide editorial articles countering any communist sentiment. This false neutrality also extends to views of Americans who are seen as fighting a justified conflict against communist aggressors in neighboring Vietnam. Mentions of Americans are also specific towards development projects and aid to the region. Most local news focuses on internal governmental struggles and violence between the communist and royal forces, ignoring the ongoing bombings in the country. Our analysis not only reveals the intricacies of the Royalist Lao perspective during the conflict, but also questions to which extent an omittance of information becomes propaganda.

2:15-2:35

O12- "*Cause I'm a Woman": The Rise and Fall of Superwoman Advertising, 1970 through Present*

Abigail Newlon

Mentor(s): Jim Sernoe, mass communication, Fain College of Fine Arts

How women are represented in the media has not been a steady road. When advertisements first came out, women were little more than objects before becoming vital to the war effort, then back to objects before becoming powerful images. This new powerful image set up the advertising field for success with advertising to a new market, but the field seemed to look this possibility in the eyes and throw it away. The general purpose of this research project is to look at YouTube videos of old television advertisements to analyze the creation of the "superwoman" and how that image changed over time. It will first define the "superwoman" image before covering what seems to be the earliest examples of said "superwoman." This project will also look at how certain industries seemed to excel at adapting and how some never really caught onto the trend. Then, it will touch briefly on how technology changed the playing field in the 1990s. It will also cover how the superwoman seemed to take a backseat during times when the idea of a powerful, independent woman wouldn't sell. I hope this research allows future marketers to better understand how to utilize women in their marketing, without exploiting one extreme over the other.

2:40-3:00
CAO1- *Wichita Falls: A Symphony of Content*
Hunter Doughty, Marcus Morris, Cecil Witherspoon
Mentor(s): Jonathon Quam, mass communication, Fain College of Fine Arts
Using both subscription-based and publicly available Artificial Intelligence writing and production tools, we have developed, produced and are working toward completing a short documentary in the style of a traditional city symphony film. This is a style of documentary that was created by Charles Sheeler & Paul Strand in 1921 it involves the process of pushing the technical and thematic boundaries of what a documentary could be, which is what we have set out to do. Our central question focused on the intersection of AI production tools and documentary ethics. "Can an AI create an ethical documentary?" We approached this documentary head on by specifically using AI production tools in all three phases of the documentary. Our planning process and our story has been crafted using up-to-date generative AI applications. The presentation at the Celebration of Scholarship will be the final city symphony documentary produced through this process. The students will discuss their experience using AI in the production model and what they've discovered about its role in the industry moving forward.

Kiowa Session V- Engineering
3:05-4:30

3:05-3:25
O13- *Fabrication and Testing of Engine Dynamometer for FSAE Car*
Jesse Green, Theron Honoré, Elias Tezaguic
Mentor(s): Pranaya Pokharel, engineering, McCoy College of Science, Mathematics & Engineering
Dynamometers, commonly referred to as dynos, are indispensable tools in validating automotive design concepts. This study focuses on testing engines with a displacement of 710cc or less, aligning with Formula Society of Automotive Engineers (FSAE) guidelines. The dynamometer design incorporates features like vibration reduction mechanisms and customized Arduino code to simulate one FSAE driving scenario: steady state driving. At the core of the dynamometer's operation is an eddy current brake powered by an AC source, employing Faraday's Law of electromagnetic induction to mimic dynamic resistance. Engine power is transmitted to the eddy current brake through a meticulously analyzed shaft, engineered to withstand torques of up to 65 Nm. The dynamometer's design emphasizes modularity, facilitated by adjustable front and rear mounts securely fastened with bolts and nuts. The frame is built to house electrical components, and adjustable mounting regions to connect the eddy current brake with the engine via the designed shaft. Once operational, our engine dynamometer will serve as a valuable tool for monitoring various engine parameters, including power output, torque, engine speed, fuel consumption, exhaust gas composition, as well as coolant and oil temperatures. This comprehensive data collection will significantly aid in evaluating engine performance under various FSAE driving conditions.

3:30-3:50

O14- *Robust Flexible Drilling and Reaming Work Cell*

Devyn Quintero, Tyler Thames, Chris Garcia

Mentor(s): Jan Brink, engineering, McCoy College of Science, Mathematics & Engineering;

This project is a continuation of an existing robotic work cell that needs improvement and expansion. The robotic work cell was designed to perform drilling, reaming, and stamping operations of a wooden block. The main equipment used in this project includes a Kawasaki RS005L electric servo robotic arm, pneumatic actuators, and a variety of sensors. Various safety precautions were taken in designing and developing the work cell to protect both the equipment and operators, including multiple guard doors, photo eyes and manual override buttons. The work cell is entirely isolated from human interaction between the loading of the initial conveyor and the removal of parts from the pallet. The project has taken on a lean manufacturing approach for robust improvements. Using key concepts from lean manufacturing, the project aims to cut down on the lead time as well as reduce the wasted movement of the robot added by various projects over the years. Some of the areas that are targeted for improvement are the input of blocks into the system, to decrease loading time; the vacuum, to reduce time spent cleaning out the hopper when the vacuum fails to contain wooden chips, and wasted robot arm movement in general. The project also includes QC analysis; sound studies, manufacturing lead time comparisons as well as an increase in safety measures. Integration of the vision system using a Cognex camera will perform multiple inspections on the hole. Code will also be created to palletize and calculate all points of flexible size pallets.

3:55-4:15

O15- *Analytical, Computational, and Experimental Characterizations of Controlled Delivery of Non-Newtonian Fluid with High Pressure Difference*

Mary Nall, Amit Yonjan, Ethan Shumaker

Mentor(s): Sheldon Wang, engineering, McCoy College of Science, Mathematics & Engineering

As our society is advancing, robotics is becoming more common in the automotive industry. Specifically, at General Motors they are using robotics to assemble their new cars. We have been assisting General Motors by investigating the non-Newtonian flow of a highly viscous adhesive because they are having a high error rate and that is costing them more money. We picked up where we left off last semester by now fully putting our simulations in non-Newtonian flow using StarCCM and Adina. The pressure drop within the system is high, however due to the high dynamic viscosity of the adhesive, the volume flow rate of 1ccs is still reasonable. We started theoretical calculations to find the forces and stepper motor RPM required for the hydrodynamic screw to squeeze the viscous fluid through a pipe in the fluid delivery system. Instead of building an experimental setup, we traveled to the General Motors factory and used their setup to gather analytical data that we could not collect ourselves due to budget constraints.

4:20-4:40

O16- *Effective and Efficient Design of Human Powered Vehicles on Land and Water*

Tyler La, Augustine Ezenagu, Charles Ogunmoyin

Mentor(s): Sheldon Wang, engineering, McCoy College of Science, Mathematics & Engineering

The effective and efficient design of human-powered vehicles for both land and water presents a captivating challenge in the realm of sustainable transportation. This abstract explores the multifaceted aspects of creating such vehicles, considering factors like energy efficiency, ergonomic design, materials selection, and propulsion mechanisms. Achieving a harmonious balance between these elements is pivotal in minimizing the environmental footprint while ensuring user comfort and safety. Furthermore, this abstract delves into innovative technologies and design principles that are revolutionizing the field, from lightweight composite materials to streamlined hull shapes. By investigating these design nuances, this research aims to contribute to the development of human-powered vehicles that offer a practical and eco-friendly mode of transportation for a more sustainable future This is characterized by a holistic and multidisciplinary approach. We understand that this project necessitates the fusion of knowledge from several disciplines, including mechanical engineering, materials science, and sustainable design principles. Our approach is based on an organized and iterative procedure that blends theoretical study with practical experimentation. Up until this point, we have created a visual design of the bicycle design with the water and land interactions. The components have been ordered and currently in the process of getting our design built. During this time, we perform a comprehensive analysis of the strengths and weaknesses of the existing human-powered and amphibious vehicle designs. A design phase where creative solutions are developed while considering elements like buoyancy, stability, and energy efficiency.

Poster Presentations

Comanche Session I Exercise Physiology, Radiology, & Respiratory Care
9:00 am- 10:00 am

P1- *The Perception of Third-Hand Smoke Exposure Among College Students*
Amanda Hohlt, Adrian Velazquez, Tyler Thomas, Eleonora Duran
Mentor(s): Randy Case, respiratory care, Gunn College of Health Sciences & Human Services;
Although often referred to as a common pastime, cigarette smoking is now commonly known to cause many adverse health consequences. With minimal studies regarding the general public's perception of third-hand smoke, no studies were identified that specifically targeted college students in the United States. This study aimed to target and identify the understanding of third-hand smoke among college students. Forty college students were randomly selected at the Midwestern State University campus and asked to complete a paper survey consisting of 9 questions about their beliefs regarding third-hand smoke. On all questions, most participants either agreed or were unsure. The most uncertainty centered around questions about transferring smoke-related particles through skin, through touch, and whether third hand smoke may lead to cancer. From the survey, it was concluded that students attending Midwestern State University have varying knowledge on the effects of third-hand smoke. With more education and awareness, college students will have a better understanding of the health risks that are associated with third-hand smoke exposure. IRB#24022004

P2- *Addressing Marijuana Misuse*
Gabriela Guttierez, Jennifer Herrejon, Khalil Blackwood, Felistas Gichaba
Mentor(s): Randy Case, respiratory care, Gunn College of Health Sciences & Human Services
Among college students, marijuana use has been a subject of increasing concerns on academic performance, depression & anxiety, and the influence among peers. It was hypothesized that a majority of participants would confirm that they currently smoke or have previously smoked marijuana. The purpose of this study was to understand the impact of marijuana use among college students and how it affected the participants in different aspects. Forty students were randomly selected from the Midwestern State University campus to participate. The participants were asked to answer a survey containing a series of questions relating to their use of marijuana, when it is most used, and how peers influence its use. After completing the research, it was concluded that 44% avoided the use of marijuana during depression/anxiety, 61% used marijuana based on peer influence, and 65.8% used marijuana prior to work, school, or big event. The findings demonstrate that the majority of the participants were non-marijuana smokers. The results also indicated that the majority of those who do smoke marijuana, do so during depression/anxiety, smoke based on peer influence, and prior to work, school, or big events. IRB#24022003

P3- *Health Science Faculty Perceptions of Interdisciplinary Education*

Delaney Mitchell, Jennifer DerMargosian, Christal Miranda, Amani Augustine

Mentor(s): Randy Case, respiratory care, Gunn College of Health Sciences & Human Services;

Our team conducted research on the faculty's perception of interdisciplinary education in health sciences. Throughout this research, we discovered and examined different opinions of the faculty and how they feel about the work students do in these events. Purpose: The purpose of this study was to survey the faculty's perspectives on interdisciplinary education in the health sciences. Methods: Sixty faculty members from Midwestern State University's Health Sciences were asked to complete a digital survey. Of the sixty asked, twenty-four faculty members participated. The survey included 10 statements pertaining to the value and importance of interdisciplinary education in the undergraduate health science programs. Results: Twenty-four Midwestern State University Health Science faculty members participated in the digital survey. The majority of faculty members found interdisciplinary education to be beneficial to the students. The faculty believe these events help students think positively about other healthcare professionals. Not only does interdisciplinary education help student's learning and attitude, they all agreed it would benefit future patients as well. Conclusion: The majority of the research gathered from MSU's Health Science faculty members determined they do in fact support interdisciplinary education. The faculty believe students learn teamwork skills, have a more positive outlook on other health care professions, and that patients would benefit from students working together to solve patient problems. IRB#24022002

P4- *Modified Torque Output and Lower Leg Muscle Electromyography after Passive Stretching*

Brittany Coltrain

Mentor(s): Michael W. Olson, athletic training & exercise physiology, Gunn College of Health Sciences & Human Services

To examine the force output and muscle electromyography activity of lower leg muscles to a prolonged passive stretch. Five participants performed maximal plantar and dorsi flexion isometrically while secured to an isokinetic dynamometer. The knee was fixed at ~30 deg. Participants performed three maximal voluntary isometric efforts (MVIE) of plantar and dorsi flexion, respectively, in +15 deg (plantar flexion) and -15 deg (dorsi flexion) position. Passive stretching of the plantar flexors was performed while the ankle joint was positioned at -30 dorsi flexion for 10 min. Immediately after the 10 min passive stretch MVIE were performed in plantar and dorsi flexion. Surface electromyography (EMG) were collected from medial gastrocnemius (MG), lateral gastrocnemius (LG), soleus (SOL), peroneus longus (PL), and tibialis anterior (TA) muscles. Surface EMG signals were normalized (NEMG) to the maximum values in the pre MVIE tests. Torque and NEMG values were compared between pre and post-stretch tests, and between ankle positions, while relative passive torque (RPT) values were compared over the 10 min stretch. RPT significantly decreased over time ($p < 0.01$). Peak and average torque both had significant position x test interactions ($p< 0.001$). Only the TA and SOL NEMG were significantly different between MVIEs ($p < 0.001$ and 0.005, respectively). Torque output after passive plantar flexor stretch significantly reduces force transmission of the plantar flexor muscles. Although force output was reduced, most of the plantar flexor muscles were able to maintain the EMG levels of activation. IRB#21111003

P5- *Measures of Center of Pressure and Lower Leg Muscle Electromyography during Landing before and after Plantar flexor Stretch Stretching*

Connor Hill

Mentor(s): Michael W. Olson, athletic training & exercise physiology, Gunn College of Health Sciences & Human Services

This study is intended to further explore the response of the lower extremities to plantar flexor muscle stretch in an effort to understand its impact on potential injury.: Five participants performed drop landings from a 30 cm box onto a force platform before and after 10 min of passive plantar flexor stretch. Surface electromyography (EMG) was collected from tibialis anterior (TA), medial gastrocnemius (MG), lateral gastrocnemius (LG), peroneus longus (PL), and soleus (SOL) muscles. EMG were normalized (NEMG) to maximum values during maximal isometric efforts. Variables of interest were NEMG at landing and center of pressure (COP) measures. NEMG were assessed 300 ms prior to and after landing onto the force platform. An inertia measurement unit (IMU) was fixed to the tibia to record landing. Comparisons were performed at landing for NEMG and COP/COP velocity up to 5 sec after landing to measure COP/COP velocity variability. NEMG signals differed over time for all muscle from -300 to 300 ms (all $p < 0.01$). Significant differences in NEMG amplitude were present in MG, LG, and SOL (all $p < 0.05$) before and after stretch. COPx and COPy variability measures were significant reduced over time ($p < 001$). A significant time x condition interaction was present for COPx velocity variability ($p < 0.049$). Passive prolonged stretching of the plantarflexor muscles can modify a functional dynamic activity, such as single-leg drop landings. Although COP was not different between the landings, the control of the balance at landing was different. IRB# 21111003

P6- *The Impact of Artificial Intelligence on the Detection of Anterior Cruciate Ligament Tears*

Sydney Cooper

Mentor(s): Rodney Fisher, radiologic technology, Gunn College of Health Sciences & Human Services

Anterior cruciate ligament (ACL) tears have become more common with the increasing use of magnetic resonance imaging (MRI) of the knee. Physician errors due to external factors can result in unnecessary treatment and procedures. This leads to the need to implement deep learning methods to improve the accuracy of positive ACL tear detection. The study objectives were to create a pilot study protocol to provide a more realistic clinic model to test the deep learning architectures. The researchers' approaches varied widely, involving class balancing, arthroscopic verification, and prior physician findings. This had no effect on noticeable trends in the accuracy and area under the ROC curve (AUC) results. The application of deep learning methods showed improvement in ACL tear detection, with every study having an accuracy above 86%. Beyond the high accuracy results, there are missing variables that need to be
addressed. A protocol was established to simulate a clinical environment for the algorithm to run. Implementing these architectures is a growing part of radiology departments. As research continues, protocols should require increased diversity of MRI images, improved grading scales and reliable reference standards.

Comanche- Session II Education, Management, & Philosophy
10:00 am- 11:00 am

P7- *Authority and Morality in the Classroom: How Theatrical Pedagogy Encourages Critical Growth*

Sunny Scabora

Mentor(s): Tyler Williams, philosophy, Prothro-Yeager College of Humanities & Social Sciences

Philosophers and practitioners of Critical Pedagogy argue that students receive more than just information in a classroom; they also receive moral, social, and political lessons (even if implicitly and unintentionally) about what it means to be a "good" member of society. These lessons are embedded in the performance of the classroom itself, from the arrangement of desks to the teaching methods displayed. Our current mode of education, while being voiced as apolitical, actually creates highly uncritical students obedient to a status quo. This research project studies how "authority" comes to be an accepted fact of our social lives through the implicit things we learn in our classroom environments. What authority should teachers have? Is any authority justified? Can the freedom of education exist within the constraints of an authority-dominated classroom? Most importantly, what would an alternative classroom actually look like? Theater pedagogy maintains similar commitments, so I argue that the best way to build an engaged student community is by joining Critical and Theatrical pedagogies to level the relationship between student and teacher and encourage a problem-solving environment in which "teaching community" takes place.

P8- *Exploring Forms of Communication within Professional Organizations: Member Preferences for Receiving Information*

Raychel Anderle

Mentor: Suzanne Lindt, Undergraduate Education, West College of Education

As large professional organizations seek to adapt to an ever-changing society, the need to adapt information should also change. As professional organizations have seen a generation shift in membership, the methods to disseminate information and the language used to share information may need to change. To facilitate this change, research into member preferences is required. The current research project aimed to better understand members' preferences within a professional organization for receiving information from their organization. Researchers first analyzed the websites of professional organizations to determine how organizations disseminate information to members. Then, researchers conducted a mixed-methods study that concurrently gathered quantitative and qualitative information from participants First, 29 education websites were analyzed, revealing that social media is the most common type of communication, with journals closely behind. Using a Chi2 analysis to compare age to preferences for communication, researchers did not find a significant difference. However, results revealed that most participants preferred the organization's website and email for receiving information. Three themes were also revealed:1) International opportunities, 2) Short webinars (low cost and asynchronous), and 3) Opportunities for networking/collaboration. Results offer important information for professional educational organizations to disseminate information to members. While most organizations utilize a variety of social media to share information, members may prefer looking

on the website or receiving email communications directly from the organization. Therefore, more time should be spent developing an organization's website to provide webinars, networking, and international opportunities. IRB#24022010

P9- *Work Smarter not Harder: Utilizing AI to Enhance Elementary School Lesson Plan*

Christene Bokutu, Brisa Jimenez Soriano

Mentor(s): Stephanie Zamora-Robles, Kelly Medellin, undergraduate education, West College of Education

The purpose of this project was to investigate artificial intelligence (AI) platforms built for teachers, analyze the tools they provide for educators, and synthesize the benefits and limitations of using AI for lesson planning. In this research project, we generated 3rd grade and preschool math lesson plans using identical keywords on fourteen different AI lesson-planning platforms. We used qualitative document analysis as our research methodology. Utilizing a reflexive approach, the lesson plans generated by the AI platforms were examined using the theoretical framework of universal learning design (ULD) and the West College of Education Lesson Plan rubric (Braun et al., 2019, as cited in Morgan, 2022). The initial findings revealed that most platforms are cost friendly, comply with ULD, and they provide a clearly defined outline using the best practice of gradual release of responsibility. The issues were that the AI platforms generated lessons with minimal technology integration, lacked specifics for differentiation of instruction, only a few platforms generated plans that included instructions for specific activities, resources, and materials, and the majority had difficulty with creating developmentally appropriate lessons for prekindergarten. Similarly, to the work of Mondal, Marndi, Behera, and Mondal (2023), overall it was found that AI platforms can be beneficial for teachers but should be used with caution due to possible errors and inaccuracies. Teachers can use these resources for supplements to lessons or to jumpstart a lesson plan, but teacher's knowledge of diverse students, teacher ingenuity and creativity cannot be replaced or replicated with artificial intelligence.

P10- *The Challenges and Potential of Business Development in Downtown Wichita Falls*

Brittany Jackson

Mentor(s): Scott Manley, Management, Dillard College of Business Administration

Being born and reared in Wichita Falls has given me the passion of wanting to see downtown business thrive. I am always drawn to other cities' downtown areas when traveling through, and I want the same experience here. My research titled, "The Challenges and Potential of Business Development in Downtown Wichita Falls," aims to analyze the challenges and potential of business development in downtown Wichita Falls, Texas. I have spoken to several business owners downtown to get insights from the ones who are in the heart of downtown. By interviewing these owners, I can better understand what it is like to operate a business downtown, and hopefully, I can help other business owners enter the market as well. My methodology includes using a mixed methods approach. I started with a qualitative survey, in which I conducted interviews with various business owners downtown. After speaking with these business owners, I designed a quantitative survey method and sent it to a sample of Wichita Falls business owners to collect their opinions. With that data, I analyzed the descriptive statistics and correlations revealed through the surveys. Thus far, it is a common finding that there is a lack of

marketing for downtown businesses, an overall negative appeal, and a lack of support from local Wichitans. I hope my research can inform policy and marketing decisions at the downtown, city, and county levels to improve the attractiveness to individuals who want to start a new business or relocate an existing one. IRB#24022009

Comanche- Session III Biology & Chemistry
1:00 pm- 2:00 pm

P11- *Resistance Reversion in* E.coli

Luis Tamez

Mentor(s): James Masuoka, Biology, McCoy College of Science, Mathematics & Engineering;

A proposed approach to addressing antibiotic resistance is to alternate drugs. Previous studies suggested that long-term exposure of a tetracycline-susceptible, erythromycin-resistant strain of *E. coli* to sub-inhibitory concentrations (0.5x minimum inhibitory concentration, MIC) of tetracycline increased susceptibility of the strain to erythromycin. The aim of this project was to answer two questions: 1) was the originally observed effect due to long-term culturing alone? 2) would the effect be seen sooner if a higher concentration of the drug was used? The tetracycline exposure experiment (0.5x MIC) was repeated in parallel with cultures with no added tetracycline of tetracycline added at 0.9x MIC. Samples were taken every 24 hours and tested for tetracycline and erythromycin susceptibility. We saw no change in susceptibility to tetracycline. There was an apparent upward trend in erythromycin susceptibility. This change at day 10 was comparable to previous results, but inhibition diameter fluctuated throughout the culture period. Furthermore, after day 10, the susceptibility to erythromycin seemed to return to baseline. Subsequent replica plating of selected timepoints suggested that all cells were equally affected by culture conditions. Current efforts are trying to determine the differences between the isolates with increased erythromycin susceptibility and the original strain. The results of these studies will help us further understand mechanisms by which treatment with one antibiotic affects resistance to another.

P12- *Unraveling the Bi-directional Relationship between Periodontitis and Diabetes: Strategies for Effective Treatment*

Crae Jackson

Mentor(s): Dr. Fu-Cheng Liang, Biology, McCoy College of Science, Mathematics & Engineering;

Periodontitis and type 2 diabetes are two diseases that have a unique bi-directional relationship that if not treated can lead to serious health complications. Type 2 diabetes (non-insulin-dependent diabetes mellitus) is caused by impaired insulin secretion and increased insulin resistance. This causes less insulin to be produced in the body and causes body cells to be increasingly resistant to the effects of insulin, leading to hyperglycemia because insulin signals body cells to take in glucose from the blood. Periodontitis is a chronic inflammatory disease in the mouth that is initiated by the accumulation of dental plaque biofilm, within which microbial dysbiosis leads to a chronic, non-resolving and destructive inflammatory response. Risk for periodontitis is increased two to three times in people with diabetes compared to individuals without, and the level of glycemic control is key in determining risk. In people with type 2 diabetes, periodontitis is associated with higher HbA1c (glycated hemoglobin) levels and worse

diabetes complications. The bi-directional relationship between periodontitis and diabetes is a cycle where the negative effects of diabetes cause negative effects on the gums in the mouth, which loop around and cause worse negative effects on the diabetes. However, there are treatments that can help prevent type 2 diabetes and also dental treatments that can help prevent periodontitis. By engaging in both of these treatments a person with type 2 diabetes can break the negative cycle between the two diseases, which leads to a healthier body and prevention of more serious complications.

P13- *Challenges in Genomic DNA Extraction from Environmental* E. coli *Isolates*

Zaniya Medlin

Mentor(s): James Masuoka, Biology, McCoy College of Science, Mathematics & Engineering;

Antimicrobial resistance is a major global public health threat. Genetic transfer between cells can spread antimicrobial resistance and other virulence factors, resulting in difficult-to-treat multidrug-resistant strains. Migratory birds can act as bacteria carriers, introducing new strains into their seasonal habitats. We hypothesized that gulls arriving in Wichita Falls each winter play such a role and that the virulence factors present would change each time the gulls arrive. Fecal samples were collected from resident Canada geese (Branta canadensis) for a year, and bacterial isolates, presumptively identified as Escherichia coli, were selected. The presence of virulence factors was screened by multiplex PCR. While initial results suggested that virulence factors were present in some isolates, absence of an expected amplicon for the uidA gene suggested that these bands may have been artifacts. We tested each parameter separately using a single primer set (16S rDNA). Extracted DNA served as a control for PCR template. A Staphylococcus aureus strain was used to determine if problems were constrained to gram-negative organisms. Results suggested that the cell lysis procedure worked well with S. aureus but wasn't releasing DNA from *E. coli*. Once we can consistently get amplification of the 16S rRNA gene, we will use these preparations for multiplex PCR. The pattern of gene sequences present will allow us to group the isolates by pathotype and to determine pattern changes over time. Understanding how genes associated with virulence are introduced to our local environment will help inform decisions related to public health and antibiotic stewardship.

P14- *Membrane Protein Chaperone Modulates the Kinetics and Morphology of Tau Aggregation: A Potential Treatment for Alzheimer's Disease*

Kara Rodgers

Mentor(s): Fu-Cheng Liang, Chemistry, McCoy College of Science, Mathematics & Engineering;

Alzheimer's disease (AD), the most prevalent form of dementia, is a progressive neurodegenerative disorder characterized by initial mild memory impairment and eventual loss of communicative and environmental responsiveness. Central to its pathology is the aggregation of Tau, a microtubule-associated protein, which leads to neurotoxicity and, ultimately, neuronal demise. This aberrantly hyper-phosphorylated Tau forms toxic neurofibrillary tangles, driving cell death. The amyloid hypothesis posits that the accumulation of protein aggregates in the brain is the primary driver of AD pathogenesis. Counteracting protein aggregate accumulation emerges as a promising therapeutic strategy. However, a significant knowledge gap pertains to the potential of membrane protein chaperones in preventing and/or disrupting protein aggregation. Notably, the recently discovered protein targeting machinery from chloroplasts, chloroplast

signal recognition particle (cp43), serves as an effective membrane protein chaperone. It not only prevents the aggregation of its substrate, the light-harvesting chlorophyll-binding protein (LHCP), but also efficiently reverses aggregation. Through selective binding to hydrophobic amino acids, cp43 stabilizes interactions, impeding aggregation without requiring ATP or co-chaperones. To evaluate its impact on Tau aggregation, we employed Thioflavin T (ThT) dye to assess aggregation kinetics. Our results demonstrated that cp43 inhibits aggregation in a concentration-dependent manner. Further validation through electron microscopy reinforced these findings, highlighting the potential of cp43 in mitigating Tau aggregation. These findings unveil a novel approach to prevent Tau aggregation by harnessing cp43's unique anti-folding and disaggregation capabilities. Moreover, they underscore the pivotal role of membrane protein chaperones in addressing protein aggregation-related diseases.

ERP1-*Deciphering the Binding Profiles of Lecanemab, Aducanumab, and Gantenerumab to Various Amyloid-Beta Forms: Insights into Efficacy and Side Effects in Alzheimer's disease Clinical Trials*

Sydney Macdonald, Zaniya Medlin

Mentor(s): Fu-Cheng Liang, Chemistry, McCoy College of Science, Mathematics & Engineering

Alzheimer's disease is a progressive form of dementia that affects memory, language, and higher-order processing areas of the brain. According to the CDC, an estimated 5.8 million Americans were suffering from Alzheimer's disease in 2020, and this number is expected to triple by 2060. Many forms of immunotherapy are in the works for this debilitating disease, and they have had varying degrees of success. Therapies such as Bapineuzumab, Solanezumab, and Crenezumab have all been discontinued due to their limited effectiveness during clinical trials. However, other treatments against amyloid beta, the primary integrant of the extracellular plaques found in Alzheimer’s disease, have demonstrated the potential to treat plaque buildup. Amyloid beta exists in the brain in forms such as protofibrils, monomers, oligomers, and insoluble fibrils in plaques. The deposition of these plaques was hypothesized to jumpstart the disease process, which makes amyloid beta an ideal therapeutic target. The binding properties of immunotherapies such as Lecanemab, Aducanumab, and Gantenerumab were characterized in this study. ELISA, surface plasmon resonance, and immunodepletion were all used for analysis. Lecanemab and Aducanumab were found to bind weakly to amyloid beta monomers, while Gantenerumab exhibited stronger binding affinity. When Lecanumab was characterized, it showed tenfold stronger binding to protofibrils over fibrils. Gantenerumab and Aducanumab bound preferentially to fibrils over protofibrils. These different binding profiles of Lecanemab, Aducanumab, and Gantenerumab may explain the clinical results of these antibodies regarding side effects and efficacy.

Comanche Session IV- Computer Science, Engineering, & Geoscience 2:00-3:00pm

P15- *Alteration of the Carlton Rhyolite Group by the Wichita Granite Group, Eastern Wichita Mountains, Southern Oklahoma*

Jordan Swearingen

Mentor(s): Jonathan Price, Geosciences, McCoy College of Science, Mathematics & Engineering

The Wichita Mountains in southwestern Oklahoma expose Cambrian intrusions of the Wichita Granite Group into the base of the Carlton Rhyolite Group. We examined in-place rhyolite from the Fort Sill flow package to compare to 1.) granite-hosted rhyolite xenoliths, 2.) granite-contacted, largely unaltered rhyolite, and 3.) granite-contacted hornfels (strongly altered felsites mapped as Davidson Metarhyolite). These were characterized through optical and electron microscopy, the latter coupled with EDS microanalysis. As part of optical work, we digitized 19mm2 areas of thin sections on a flatbed scanner at 6400 dpi in plane- and cross-polarized light. The plane-polarized images were analyzed in ImageJ and WEKA Trainable AI software to determine the concentrations of quartz, feldspar, and mafic silicates and oxides.

Preliminary results suggest that mineral content (perthite and rounded quartz phenocrysts in a matrix of quartz and perthite, with fine hematite) is similar in all materials. The quartz: feldspar ratio is highest in samples of in-place rhyolite and samples of largely unaltered contact rhyolite. Xenoliths and unaltered contact rhyolite are each indistinguishable in the field from in-place rhyolite, but produce lower quartz modes. Despite obvious alteration-induced differences, Davidson Metarhyolite quartz modes are similar those in the xenoliths. Microstructure varies strongly. Xenolith matrix is coarser than in-place rhyolite. SEM-CL imagery reveals that xenolith quartz phenocrysts are permeated by healed fractures, whereas in place-rhyolite exhibits continuous oscillatory zoning. Metarhyolites are marked by a granoblastic matrix and disaggregated phenocrysts.

P16- *Controls Architecture for Autonomy-Ready Battery-Electric Passenger Vehicle*

Sharome Burton, Ethan Bailey

Mentor(s): Yu Guo, Computer Science/Mechanical Engineering, McCoy College of Science, Mathematics & Engineering

This project is aimed at developing a comprehensive control system for an electric vehicle (EV) that integrates driving functions, optics, charging capabilities, and passenger safety. This project seeks to bridge the gap between software and mechanical engineering by designing a prototype control architecture that enables the seamless operation of various vehicle systems. The primary objective of this research is to develop a control architecture using Python, allowing for efficient management and coordination of the EV's key functionalities. The architecture will be designed to facilitate the transition to autonomous driving in the future, considering the increasing importance of self-driving technologies in the automotive industry. To validate the proposed control architecture, a small-scale battery-operated test vehicle will be constructed. By integrating the control software with the hardware components, the researchers will assess the performance and functionality of the control architecture in real-world conditions. To mimic the Electronic Control Unit (ECU) of a commercial vehicle, a Raspberry Pi 5 microcomputer, and sensors, including cameras will be utilized. This approach aims to provide a cost-effective and flexible platform for the control system development, ensuring compatibility with the EV's specific requirements. By the completion of this project, the research team aims to demonstrate the feasibility of the control architecture, its adaptability to autonomous driving technologies, and its potential to enhance the overall performance and safety of battery-electric passenger vehicles.

P17- *Investigating the Nonlinear Effect of Temperature on a Constrained Flat Plate*

Calvin Walmer

Mentor(s): Salim Azzouz, Engineering, McCoy College of Science, Mathematics & Engineering

Faster aircrafts for use in military and business operations are becoming a critical necessity.

This quest for supersonic and hypersonic aircraft is faced with many challenges. At faster speeds, the temperature of the panels will increase due to air friction. This increase in temperature could lead to the panel buckling or a loss of stiffness in the skin of the aircraft. The use of the nonlinear Finite Element formulation will be focused on the determination of the first and second order nonlinear stiffness matrices using the von-Karman strain approximation. The application of the temperature load will introduce into the formulation a novel stiffness matrix that accounts for the effects of temperature on the plate. This nonlinear formulation will be applied to both isotropic and composite plates. For composite plates, the theory of composite material will be introduced into the finite element formulation as well. All the finite element matrices including in-plane, bending, and shearing matrices, will be calculated at the element level then will be assembled for the whole plate. After the assembly process, the boundary conditions of the plate will be introduced into the formulation to obtain the final form of the linear and nonlinear matrices. The current finite element formulation uses the MIN3 finite element proposed by Tessler and Hughes. A modal transformation will be applied to the structural degree of freedom equation of motion to reduce the size of the matrices.

ERP2- *The effectiveness of a surfactant/alkaline on enhanced oil recovery (EOR) on a mature reservoir*

Kelton Brown, Gerrit Nemec

Mentor(s): Mahmoud Elsharafi, Mechanical Engineering, McCoy College of Science, Mathematics & Engineering;

The purpose of this work is to understand the effectiveness of a surfactant/alkaline on enhanced oil recovery (EOR) on a mature reservoir. The aim is to find out how different concentrations of surfactants/alkaline change the wettability of mature reservoirs. Wettability is the tendency of a fluid to adhere to a surface. There are two main types of wettability: oil-wet where oil adheres to the rock and water-wet where water adheres to the rock. Surfactant/alkaline flooding is the injection of a surfactant/alkaline that changes the wetting phase of a formation. The approach for this project is to saturate a core sample 100% with oil and then put it into an Amott Cell with a surfactant/alkaline solution. Several chemical solutions were used with various concentrations of surfactants/alkaline. Core samples were collected from different locations. The expected outcome is that as surfactant/alkaline concentration increases oil recovery also increases logarithmically.

Fain Elementary Supply Drive

Help the Office of Undergraduate Research support the Fain Elementary PBL program by donating supplies to the FE Maker Space Supply Drive! This is short list of some of the items they use to create their research projects. A donation box is set up by the Office of Undergraduate Research, CSC 161.

- Markers/Pencils
- Trifold Presentation Board
- Standard Poster Board-white
- Construction Paper or Cardstock
- Paint-non-toxic Tempura or Acrylic
- Paint Brushes
- School glue
- Styrofoam shapes
- Popsicle sticks/small wood balls, pegs
- Recyclable materials- clean plastic containers/jars. Cardboard tubes, packaging, boxes
- Fiber- string, yarn, cording, felt, pom poms, fabric
- Books-Age Appropriate Learning or How-to

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