URCAF 2024

Undergraduate Research and Creative Activity Forum

April 12, 2024

Wichita State University

Schedule

8:45 – 9:30am	Student Registration, RS 266 Pike Room Judge Registration, RS 261 Olive Room
9:30a – 12:30pm	Poster Presentations: RSC First & Second Floor
12:30 – 2:00pm	Lunch, RSC One meal ticket provided to each presenter and judge.
2:00 – 2:30pm	URCAF Awards Ceremony, RS 266 Pike Room

Organizing Committee

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Associate Professor, Finance, Barton School of Business

Ikram Ahmed
Associate Professor, Mechanical Engineering, College of Engineering

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Poster Presentations

Jenna Ercolani
Faculty Mentor(s): Laila Cure
College of Engineering
Poster Presentation: Natural Sciences & Engineering

Relationship between Conventional Workload Surrogates and VACP Assessments in Emergency Medical Services
Workload surrogates commonly used in Emergency Medical Services (EMS) to evaluate the efforts of crewmembers throughout their workday have not been validated. This study investigated the relationship between workload assessments and surrogate metrics that can be calculated using conventional EMS dispatch data systems. Workload was assessed at random points in time during random shifts using the Visual, Auditory, Cognitive, Psychomotor (VACP) approach. Direct observation was used to assess the VACP scores of individual tasks commonly performed by ambulance crewmembers. Dispatch data was mapped to VACP score profiles through a trace-based simulation approach that adds random samples of tasks sequences and durations to the timestamps available in the EMS data. Pearson correlation and linear regression were used to quantify the relationship between the average time-weighted VACP workload and EMS metrics. Overall utilization and call response utilization explained time-weighted VACP the best, with strong positive correlations (0.88 and 0.89, respectively) and significant linear regression models (with R^2=0.79 and R^2=0.77, respectively). Call volume yielded the lowest correlation (0.61) and R^2 values (0.41) of the metrics studied, challenging its validity in fairly representing workload.

Jessica Lada
Faculty Mentor(s): Ted Adler
College of Fine Arts
Poster Presentation: Social Sciences and Humanities

Shaping Clay: Exploring the Intersection of Tradition and Technology
This research blends traditional wheel-throwing and hand-building techniques with 3D printed ceramics, exploring new possibilities for ceramic production. The oldest known ceramic artifacts date as early as 28,000 BCE, but the field of ceramics continues to evolve with modern innovation. The unique characteristics of ceramics–such as resistance to thermal shock and expansion–make them suitable for numerous industrial applications such as aerospace acoustic filters. This study seeks to investigate the feasibility of integrating old and new technologies, addressing the specific challenges of moisture management, shrinkage, cracking, clay adhesion, and stability throughout all stages of the process. These experiments require the coordination of challenges through both analog and digital approaches. Traditional wheel-thrown and hand-built pieces serve as a

foundation for the models designed with CAD software and extruded with Delta Wasp 3D printer. This interdisciplinary approach highlights the benefit of cooperation between STEM fields and the arts to advance technical understanding and foster creative problem solving. The findings of this study clarify potential application of ceramics in diverse industries, open up new possibilities for ceramic artists, and advance the 30,000-year legacy of ceramics.

Nico Ornelas
Faculty Mentor(s): Laila Cure
College of Engineering
Poster Presentation: Natural Sciences and Engineering

A (not so) Typical Day at Work of an Emergency Medical Services Crew Member
Tasks performed by emergency medical services (EMS) crew members are very diverse and vary widely from shift to shift. This research aims at presenting a comprehensive description of the workday of EMS crew members using a qualitative analysis of direct observation of a single workday to use as a baseline and a quantitative analysis of emergency dispatch data to investigate deviations from this baseline. The goals of this research are to provide a shared understanding of the experience of EMS crews over the course of a shift, and to identify opportunities to improve the work system of crewmembers using this information.

Kaitlyn Myers, Michael Zalewski
Faculty Mentor(s): Adam Lynch
College of Engineering
Poster Presentation: Natural Sciences and Engineering

Sustainable Redesign of an Inkjet Printer
Background: Our research aimed to improve receipt printers while enhancing functionality for eco-friendly and efficient outcomes. Current issues in the check endorsing system of the original printer, including fading and misprints due to frequent use and misalignment, prompted a detailed investigation.

Purpose/Hypothesis: Our mission involves a comprehensive redesign of an existing printer to make it more ergonomic. Therefore, we proposed that it would be more beneficial to switch from a dot matrix to an inkjet system. This hypothesis aims to correct existing defects, providing more precise and lasting printing without fading. Our study seeks to demonstrate the viability of improvements through analytical assumptions, prototype development, and cost analysis.

Design/Method: Employing the DMAIC framework, our research involved a structured approach of Define, Measure, Analyze, Improve, and Control. Analytical assumptions

guided the exploration of an inkjet system, helping to determine the cavitation force, pressure calculations, and schematics for the new system. The design process included considerations for a single-color reservoir, maintaining shell geometry, and pressure regulation during use and refilling.

Results: Our findings revealed a critical area of need in the check endorsing system. The transition to a liquid ink medium and the shift from a dot matrix to an inkjet system successfully addressed the identified issues. A 3D printed prototype, created with a Bambu Labs X1 Carbon 3D printer, highlighted accuracy within the design and collected data. Areas of improvement were identified, paving the way for future enhancements.

Conclusion: Our research study improved sustainability in receipt printers, providing an efficient solution. The prototype created demonstrated the viability of the proposed improvements. Acknowledging improvement areas, the study suggests that further research could enhance efficiency and product quality.

Anthony Ciletti
Faculty Mentor(s): Bhisham Sharma
College of Engineering
Poster Presentation: Natural Sciences and Engineering

ACOUSTIC AND IMAGE PROCESSING INVESTIGATION OF TPMS AND FIBROUS POROUS MATERIALS FOR AEROSPACE APPLICATIONS

Triply Periodic Minimal Surface (TPMS) and other bulk porous materials have demonstrated favorable broadband sound absorption properties, with the potential to be used as jet engine acoustic liners. Integration of fibers may also assist the acoustic performance of the material. TPMS and TPMS-fibrous samples with a range of porosity were designed and additively manufactured using FDM and SLA techniques at Wichita State (WSU) and NASA Langley, Virginia (LaRC). Raylometer and impedance tube testing was conducted to examine the acoustic performance of the samples. The characteristic impedance of each material was found via the two-cavity method. Two-cavity-based predictions were robust and accurate except for ‘artifacts’ at certain frequencies, which are subject to continued investigation. Sample acoustic performance was found to vary – the strongest relationship being increased broadband absorption for lower porosity samples.

The same samples were also imaged using micro-tomography (mCT) to obtain binarized, 3D representations of the samples as-printed was extracted, and porosity and tortuosity measurements made in MATLAB. Two different approaches were used to find tortuosity, with the in-skeleton method showing the most promise. Using these digital measurements and the semi-phenomenological JCAL model, a reasonable acoustic performance prediction was made.

The results of this work show promise for both the use of the two-cavity method for bulk porous material acoustic testing, and the use of image-processing tools for digital designs and printed materials. In particular, the preliminary outcomes of the later show that the development of an all-digital method to predict the acoustic performance of materials may be possible – a technology which could revolutionize acoustic material design.

Justin Burman
Faculty Mentor(s): Heidi Bell, Brendan Clark
College of Applied Studies
Poster Presentation: Applied Sciences

DIFFERENCES IN APPLICATION DRIVEN CUED STROOP BETWEEN ADULTS WITH AND WITHOUT PARKINSON'S DISEASE: PILOT STUDY

Executive Function is a high-level cognitive skill often shown to progressively decline in persons diagnosed with Parkinson's Disease (PD). The Cued Stroop test is a neurocognitive assessment tool commonly used to evaluate executive function. With increased use of app driven neurocognitive assessment tools a better understanding of usability of testing executive function for an individual with Parkinson's Disease is necessary. PURPOSE: This study sought to identify differences in app driven Cued Stroop measures between older adults with and without PD. METHODS: 18 older adults, age 57-81 years participated and were grouped (1) PD n=12 and nonPD, n=6. Participants performed the Cued Stroop test completing a total of 9 trials (3 trials at each week 1, week 2 and week 4) on a smartphone (iPhone 12 or Samsung 13, Sway Version 5.5.6). RESULTS: A Multivariate ANOVA was administered to determine Group (PD, nonPD) differences on averagedScore, averagedTime, and averagedErrors with covariate Age. Findings reported no significant differences in Cued Stroop averagedScore, averagedTime, and averagedErrors between individuals with and without Parkinson's Disease, (p= 0.094, 0.900, 0.589), respectively. Although no significant differences were found, nonPD subject performance averagedScore (m=63.17, sd=21.78) was slightly better with fewer averagedErrors (m=3.54, sd=1.67) than a subject with PD (m=38.53, sd=31.44; m=3.70, sd=1.94), respectively. However, PD subjects tended to complete the Cued Stroop averagedTime (m=102.31, sd=29.58) task at a slightly faster pace than nonPD subjects (m=103.36, sd=13.35). CONCLUSION: These preliminary findings suggest that an app driven Cued Stroop test may be a useful executive function assessment tool regardless of cognitive skill level. Further research to increase the sample population size along with establishing test-retest reliability is necessary to better determine the appropriateness of this tool for evaluating executive function in an individual with PD.

Ny'Asia Johnson
Faculty Mentor(s): Kevin Harrison
College of Health Professions

Poster Presentation: Social Sciences and Humanities

Representation Matters: Examining Prespectives of BLack Female Physicians with Regards to Black Female Health Disparities

J. Marion Sims is considered the father of Gynecology, despite causing harm and death to countless unprotected Black enslaved female patients used for physical experiments without their consent, permission, or willingness. Though an extreme example of discrimination against Black women in healthcare, this is one of countless disparities (historical and contemporary) of racism as a factor between Black women and their White counterparts. Though less blatant today, we still see racial disparities directly linked to systemic racism. As a result, Black females suffer higher rates of most critical illnesses, including cancer, hypertension, strokes, and diabetes, along with higher infant mortality rates. There is a direct connection between the healthcare disparities and inequalities mentioned above, and the inequities that limit Black female representation as doctors. For this reason, Black female doctors are more critical than ever, as patients are more likely to develop trust and better communication with physicians who share the same gender and ethnicity intersection. This dynamic allows for a better understanding of physical conditions based on living them as opposed to solely learning them scholastically. In my journey as a Black woman pursuing the path made possible by America's first Black female physician, Dr. Rebecca Lee Crumpler in 1864 and several others since, I engaged in the present study to explore through the perspectives of Black female doctors, the challenges that they face in the profession and their perspective on why their representation in the field is critical, necessary, and valuable for ongoing Black female patient health. My hope from this research is to provide a blueprint for my career while broadening the body of research that supports the need for Black female physicians and the need for resources to better enable a growing body of Black females in this space.

Ella Kreger
Faculty Mentor(s): Atri Dutta
College of Engineering
Poster Presentation: Natural Sciences & Engineering

UNDERSTANDING THE EFFECT OF THE NEW DEORBITING REGULATIONS ON CUBESAT OPERATIONS

In 2022, the Federal Communications Commission approved the five-year rule aimed at mitigating orbital debris by limiting the amount of time satellites remain in orbit after the end of their operational lifetimes. The rule has the potential to impact small satellites the greatest owing to a lack of an active deorbiting mechanism in most cases. This study investigates the impact of including deorbiting mechanisms on the spacecraft's operating altitude and mass. Numerical simulations were utilized to quantify the effect for 3U, 6U, and 12U CubeSats, considering onboard drag augmentation and propulsion. The new maximum compliant altitudes of the satellites with the addition of the devices were

established. The mass penalty for the CubeSats from the deorbit-assisting devices was also determined.

Jose Miranda
Faculty Mentor(s): Heidi Bell
College of Applied Studies
Poster Presentation: Applied Sciences

TEST-RETEST RELIABILITY OF A NEUROCOGNITIVE MOBILE APPLICATION IN HEALTHY ADULTS

PURPOSE: This study tested the consistency and reliability of a neurocognitive mobile application to assess reaction time and cognitive function. Specifically, the test-retest reliability of the mobile application. METHODS: 49 healthy adults participated. Participation included 3 trials administered 7-10 days apart. Testing included 6 modules (i.e., Memory, Reverse Number Counting, Cued Stroop, Reaction Time, Impulse Control, Inspection Time) using a smartphone (iPhone 12 or Samsung 13) with the Sway Medical App, Version 5.5.6. Analysis was conducted on 39 subjects, M= 23.38 + 1.36, 56% female. Ten subjects were removed before analysis (1- known neurocognitive condition, 9 - missing data). Summary of RESULTS: A Repeated Measures ANOVA using Greenhouse-Geisser found no significant difference in main effect Trials, F(1.698, 64.52)= 1.647, p= .204, np2=.042, observed Power .310, across the three assessments trial 1 (M= 170.351 + SE= 4.386), trial 2 (M= 166.291 + SE= 4.529), and trial 3 (M= 164.453 + SE= 4.242), respectively. No significant Trials x Modules Interaction, F(2.578, 97.948)= 1.419, p= .245, np2=.036, observed Power .338 was found, however, the main effect for Modules was significant F(1.376, 52.306)= 530.269, p= .000, np2=.933, observed Power 1.0. CONCLUSION: Despite a lack of statistical power, the Sway neurocognitive mobile app demonstrated test-retest reliability in this study. The gradual decline in mean scores across trials, although not significant, may indicate an apparent learning effect when using this tool requiring further investigation. The significant finding across Modules, however, was anticipated because Module is an individualized test intended to assess a specific cognitive or reaction time measure. In conclusion, the Sway Mobile App may serve as a viable cognitive assessment tool, however, reliability testing on each individual assessment module along with reliability testing on other age groups and populations is needed.

Callum Cunningham, Theresa Lee, Justina Smith
Faculty Mentor(s): Daniel Bergman
College of Applied Studies
Poster Presentation: Applied Sciences

To STEM or Not to STEM: Comparing Career Plans of Grade 6-12 Students in Different School Settings

By 2031, jobs in STEM (science, technology, engineering, and math) are projected to grow

by 11% (US Bureau of Labor Statistics, 2023). Given the need for additional STEM professionals, a survey was administered to grade 6-12 students in various school settings to gauge their current career plans.

Students came from multiple school types–high school public, high school public magnet (law, art, science), high school private, and middle school public. The survey instrument ("School-to-Work") was designed for completion by middle/high school students, formatted as interest checklists, and organized into six categories of job interests (Health & Medicine, Agriculture & Sciences, Engineering & Technology–classified as STEM in this study; and Art & Communications; Business & Management; Human & Public Service–classified as Non-STEM in this study).

For the purposes of this study, analysis includes an examination of STEM versus Non-STEM-related career fields. Results will be shared both generally for all participants as well as comparing participants from different school settings. Limitations and implications will be shared, including further research studies and future educational strategies.

Ethan Grohe
Faculty Mentor(s): David MacDonald
College of Fine Arts
Poster Presentation: Social Sciences and Humanities

A Snail's Tale

My piece is written for brass quintet (2 trumpets, french horn, trombone, and bass trombone) and was inspired by the book, The Sound Of A Wild Snail Eating by Elisabeth Tova Bailey. It follows the author's experience of being bedridden for a year alongside her pet snail. Half of the book consists of comfy commentary about her experiences with the snail. The other half is highly scientific research about all facets of snail biology and importance.

Introduction Are In Order

The first movement starts with a fanfare, announcing the snail as it marches around, and the rest of the movement uses material that shows up throughout the whole piece, serving as an appetizer for things to come.

Epiphragm

Epiphragm starts quietly with unsteady and ambiguous entrances as the snail becomes sleepy. Then, the piece becomes very rhythmic, evoking a dance-like quality, as the snail dreams. The piece ends with the snail slowly waking up, blearily.

Off To Work

After sleeping so long, the snail needs to get back to work! Snails decompose organic material such as dead leaves and shrubbery allowing for our environment to maintain its healthy metabolism. I imagine the snail strutting around and dedicated to its job. This movement is by far the jazziest, with lots of crunchy chords and slick sounds. It ends suddenly as the snail notices something in the distance.

Snail Love

While work is good, the snail longs for someone to share their stories with. The first section is sorrowful but turns wistful when the snail encounters another snail! After a brief chat, the snails work together to the sound of a New Orleans style romp with a special focus on the bass trombone. As the snails end their time together, they depart, feeling a bit more connected with the world around them.

Kamran Hafeez
Faculty Mentor(s): Bin Li
College of Engineering
Poster Presentation: Natural Sciences and Engineering

Effects of temperature and thermal history on the conductivity relaxation in compression molded PVDF sheets

Polyvinylidene fluoride (PVDF) is a versatile electroactive polymer with broad applications in electronics, energy, and biological fields. Unique dielectric property is one of the many reasons for its popularity in these applications, and it brings up both opportunities and challenges. This study aimed at a better understanding of conductivity relaxation, one of the major relaxation mechanisms found in PVDF materials at elevated temperatures, indicating a transition of short-range conduction to long range conduction. Conductivity relaxation is critical to both high temperature dielectric properties and transport behaviors of PVDF based functional materials. However, it is insufficiently understood, in comparison to other relaxation processes in PVDF. Our previous study suggested that, unlike other relaxation mechanisms, conductivity relaxation exhibited high sensitivity to processing and testing parameters. As a part of the effort to gain in-depth understanding of conductivity relaxation, this study explored the effects of temperature and thermal history on the conductivity relaxation in the PVDF compression molded at 200oC. The preliminary results revealed the coupling of conductivity relaxation with Maxwell-Wagner-Sillars (MWS) relaxation, as temperature increased to melting temperature of PVDF. Decoupled conductivity relaxation and MWS relaxation were not observed in the PVDF specimens after full annealing treatment. This might suggest that the conductivity relaxation was related to the defects in the underdeveloped crystal structures which were largely eliminated in melting and full annealing processes used in this study. Such findings also showed negligible dependence on the molecular weight of PVDF and thickness of testing

specimens.

Kayla Cantu, Neema Fathi
Faculty Mentor(s): Li Yao
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Natural Sciences and Engineering

THE STUDY OF DIFFERENTIATED DENTAL PULP STEM CELLS ON ELECTROSPUN PCL-GELATIN NANOFIBER MATRICES

Regeneration of damaged cartilage tissue can be slow due to its avascular nature and challenging due to the complexity of the cartilage tissue structure. Dental Pulp Stem Cells (DPSCs) have been used to differentiate into a variety of cell types such as chondrocytes. DPSCs are an attractive source of stem cells due to their similarity in differentiation abilities to Mesenchymal Stem Cells (MSCs) and can be ethically sourced from canine baby teeth or extractions of adult molars. Nanofibers have been used in supporting cells as scaffolding in addition to being used in drug delivery and wound dressings. Determining the ability of DPSCs to differentiate into chondrogenic cells on nanofibers can assist in enhancing the recovery of damaged cartilage tissue. Using the co-axial method on an electrospinning machine, core-sheath nanofibers were spun from a PCL core and gelatin sheath dissolved from separate solutions of 50:50 (v/v) acetic acid and acetonitrile. DPSCs were cultured on top of nanofibers in a well plate. The cells were maintained for two weeks before imaging was conducted using an actin filament and DAPI staining technique. SEM was performed in addition to the visualization of cell surfaces on scaffolding. A separate combined solution of PCL and gelatin was dissolved in a 50:50 (v/v) of acetonitrile/acetic acid and spun at various speeds on a collecting drum. An SEM was conducted on samples for visualization of fiber patterns. Imaging of DPSCs revealed successful proliferation and cell differentiation on fibers. Collection of nanofiber scaffolding appeared more random at slower speeds and more aligned at faster speeds. Nanofiber technology can be used in enhancing differentiation of DPSCs into chondrogenic cells to aid in tissue repair.

Chad Grivette
Faculty Mentor(s): Crystal Dozier
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Social Sciences and Humanities

GARDENS OF THE PAST: BISON SCAPULA HOE TOOLS

There are many ways that archaeological artifacts may inform us of the lifeways and sustenance patterns of those who lived in the past. Different materials could have been used as tools, while others could give insight into varying patterns that stand out at certain sites or regions. One artifact type that serves as a great example of these possibilities and that is overwhelmingly prevalent in the Kansas archaeological record is the bison scapula hoe. These have been recovered from a wide range of Kansas sites, including the Etzanoa

site (14CO3), where WSU has held archaeological field school at in past seasons. Yet we may ask, how exactly do we know that a bison scapula recovered from a site was implemented for use as a hoe tool? To better understand how archaeologists make this identification, and what key characteristics bison scapula hoes display, a bison scapula from a past season of excavation will be carefully cleaned and analyzed for the appropriate markers. The data yielded will be interpreted in the context of what is known about bison scapula hoes in the Kansas archaeological record to determine if the specific sample was used as a hoe tool, detailing how exactly that conclusion was reached.

Josie Sloan
Faculty Mentor(s): Erin O'Bryan
College of Health Professions
Poster Presentation: Applied Sciences

CO-CONSTRUCTED STORYTELLING FOR A PERSON WITH APHASIA FROM TRAUMATIC BRAIN INJURY

Can co-constructed storytelling help a person with aphasia from a traumatic brain injury read and share their story? This study is a continuation of how the Aphasia-Friendly Reading approach developed by Regier (2021) can help a person with aphasia share their personal stories despite their communication challenges. A 31-year old male with aphasia from a traumatic brain injury that occured 7 years ago participated in the study. His mother participated in the study in the role of care partner and co-reader. In the first phase of the study, the participant selected three topics that he would like to tell stories about. Then, graduate student clinicians supervised by a speech language pathologist worked with the person with aphasia and co-reader to develop three personalized scripts for them to practice and read aloud together. A single subject multiple baseline design was used to measure improvement in oral story reading, and a pretest-posttest design was used to measure changes in standardized test scores. Following the story practice phase, a celebration for the participant was held, and family and friends were invited to hear the participant and his co-reader share their stories. Analyses of oral story reading accuracy showed significant improvement from pre-treatment to one month post treatment with a large effect size for one story and small effect sizes for the other two stories. Results of the pre- and post-treatment standardized test scores from the Western Aphasia Battery-Revised showed an increase in Aphasia Quotient Score from 65.5/100 (type Broca's) to 70.4/100 (type Conduction, a milder aphasia type). Additionally, the participant and his co-reader reported that they enjoyed sharing their stories and progress with their loved ones. These results are consistent with a prior study that used Aphasia-Friendly Reading intervention with people who had aphasia from stroke.

Jennifer Segovia
Faculty Mentor(s): Sara Mata
Fairmount College of Liberal Arts and Sciences

Poster Presentation: Social Sciences and Humanities

How can we decrease food insecurity within our Wichita community.
The purpose of this study is to examine the services and resources available for those managing food Insecurity in the community of Wichita, Kansas. The goal of this needs assessment is to better understand the resources available and assess what gaps may prevent the adequate meeting the needs of people who are food insecure. Data was collected using an initial search of the internet and social media presences and ultimately reaching out to local food banks and pantries to collect information on services provided to the community for those managing food insecurity in Wichita.

Max Gosch
Faculty Mentor(s): Matthew Howland
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Social Sciences and Humanities

AI ARCHAEOLOGY: USING AI TO WRITE PYTHON FOR GIS
The learning curve for Geographic Information Systems (GIS) and programming languages poses a challenge despite internet access. This research asserts that leveraging Large Language Models (LLMs) can empower beginners to conduct intricate GIS analyses by constructing Python code through simple commands. Our goal is to make archaeology more accessible, significantly advancing the field technologically. GIS and LLMs represent the forefront of this discipline, and by providing easy access without extensive training, we open the door to a broader audience. This study systematically tests several variables and compares different LLMs, aiming to provide a comprehensive perspective on the role of AI in advancing archaeology. Preliminary findings show that using LLMs to generate Python significantly cuts down on the time needed to conduct various geospatial analyses, as we begin to create outlines that will narrow the time for any beginners interested in utilizing these tools to expedite their work. Moving forward, vigorous experimentation will continue to be conducted for proofs of the research as we continue to see the potential of LLMs in not only archaeology, but other fields across academia.

Luke Cole
Faculty Mentor(s): James Bann
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Natural Sciences and Engineering

INVESTIGATION OF THE PHYSIOLOGICAL FUNCTION OF CMG2
Capillary Morphogenesis Protein 2 (CMG2) is known in part for its function as a receptor to the anthrax toxin. However, little is known about its physiological function within the body. Previous studies have shown that another anthrax receptor, Tumor Endothelial Marker 8 (TEM8), is capable of binding to collagen I and collagen VI through its MIDAS domain which

indicates CMG2 may also have a similar binding quality. To test for collagen binding, CMG2 and a mutant D50A-CMG2 were purified and combined with different forms of collagen in a density gradient sedimentation. Following centrifugation, the gradients were separated into fractions which then underwent SDS-PAGE. CMG2 has demonstrated that it is able to bind to collagen type I, however it may not be dependent upon the MIDAS site for binding as the mutant strain of also demonstrated collagen type I binding. Further experimentation is to be performed to determine CMG2 binding to other types of collagens.

Hope Dimick
Faculty Mentor(s): Smita Srivastava
W. Frank Barton School of Business
Poster Presentation: Social Sciences and Humanities

Gender, Education and Entrepreneurship

This research paper investigates the influence of entrepreneurial education on gender disparities within the entrepreneurial landscape. Drawing from a synthesis of existing literature and local interviews, the study examines how access to and engagement with entrepreneurial education programs may contribute to or mitigate gender-based discrepancies in entrepreneurial endeavors. By exploring the experiences and perspectives of local entrepreneurs alongside insights from academic sources, this paper aims to shed light on the complex interplay between gender, education, and entrepreneurship. The findings underscore the importance of tailored educational interventions and support mechanisms in fostering gender equity and inclusivity within entrepreneurial ecosystems. This research contributes to a deeper understanding of the role of entrepreneurial education in shaping gender dynamics in entrepreneurship and offers practical implications for policymakers, educators, and practitioners striving to promote diversity and equality in entrepreneurial pursuits.

Arland Wallace, Vanessa Carey, Samantha Hoppe, Christine Nickel
Faculty Mentor(s): Crystal Dozier
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Social Sciences and Humanities

Site Formation Processes at Etzanoa (14C03): Preliminary Geoarchaeological Flotation Investigation

Etzanoa, also known as the Cowley County Country Club Site (14CO3), was occupied by the Ancestral Wichita throughout the Great Bend aspect, also known as the Lower Walnut focus dating, approximately 1425-1700 CE. Wichita State University has been excavating a portion of the site with a high density of domestic features, especially storage pits, since 2016. The four baulk walls, N2E3, N3E3, N5E3, and N7E3, were excavated from the surface to approximately 120-centimeters below datum; utilizing geoarchaeological flotations of samples collected from these walls allowed analysts to recover micro-artifacts. By

observing and analyzing the profiles of each wall, this project intends to identify areas of anthropogenic activity and stratigraphic variation. Through the analysis of these recovered micro-botanical and material remnants, researchers are better enabled to understand the depositional history of the locale.

Alice Ukoha, Ellie Buresh
Faculty Mentor(s): Jim Bann
College of Health Professions
Poster Presentation: Natural Sciences and Engineering

AsCy3 AS A PROBE OF PROTEIN CONFORMATION IN THE PROTEIN ANTHRAX LETHAL FACTOR

Anthrax toxin is an AB toxin constituted by three distinct proteins: the B component protective antigen (PA), the A component edema factor (EF), and lethal factor (LF). PA forms a membrane-spanning pore that allows either LF or EF to translocate into the cell. The pore includes a narrow iris called the phi-clamp that is only 6 Angstroms wide. Since the pore is very narrow, LF and EF need to completely unfold their protein structure to pass through the pore and enter the cell. Once EF and LF enter the cell, the proteins are able to refold back into their original structure. The process of unfolding, translocation, and refolding in the cell is not understood. To understand these processes, we have mutated residues 53, 54, 60, and 61 to cysteine (LFNC4), which will allow the binding of the fluorescent dye AsCy3. Although these residues are found outside the binding site for PA interaction, it is expected not to have any influence on stability or binding. AsCy3 is known to have a fluorescence emission maximum at 568 nm; however, when AsCy3 binds to 2 cysteine (Cys) pairs across two helical turns of an alpha-helix, the intensity of the fluorescence increases by a factor of six. The emission peak also is red shifted to 576 nm. These characteristics of AsCy3 provide the ability to investigate how LFn is able to refold in the cell because of the high fluorescence intensity from AsCy3. Our initial experiments show that AsCy3 can bind to LFNC4, which significantly changes the AsCy3 fluorescence. This probe can now be used in unfolding and refolding experiments and, because of its reversibility, in translocation experiments across lipid membranes.

Jaida Sims
Faculty Mentor(s): Dinorah Azpuru
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Social Sciences and Humanities

POSSIBILITIES OF PEACE: EXPLORING THE IMPACT OF POWER-SHARING AGREEMENTS ON DEMOCRATIZATION AND STATE CAPACITY

In the aftermath of the Cold War, power-sharing agreements have been increasingly used as possible solutions for civil wars and post-conflict societies that began to emerge with the fall of the bipolar world order. This paper examines how different types of power-

sharing agreements impact state capacity and democratization in post-conflict societies through quantitative analysis. Building upon existing literature in conflict studies, this research analyzes power-sharing agreements through a four-part typology: political, territorial, military, and mixed agreements. There is some consensus within the field that power-sharing agreements help prevent the recurrence of war, but little agreement about what this means for a society. I have attempted to investigate this by measuring the impact of different kinds of power-sharing agreements as independent variables on state capacity and democratization as dependent variables. This process involved constructing a dataset of 79 power-sharing agreements and running eight statistical tests through Ordinary Least Squares (OLS) Regression, with each type of power-sharing agreement tested separately from one another, using the time since each agreement as a control variable. The results of these tests showed military power-sharing agreements and territorial power-sharing practices had a significant impact on both dependent variables. In other words, military agreements, not necessarily the actions of those agreements, are associated with a significant decline in democracy and an increase in state instability, while territorial power-sharing practices are associated with an increase in democracy and a decline in state instability. These findings reinforce previous studies that argue agreements should be considered separately than their implementation (or lack thereof) and that different kinds of power-sharing can have noticeably different results. It also demonstrates there are more factors to the "success" of power-sharing agreements than whether war recurs: it takes more than an absence of war for peace to be meaningful.

Kazune Tazawa, Aiden Holt
Faculty Mentor(s): Suresh Keshavanarayana
College of Engineering
Poster Presentation: Natural Sciences and Engineering

Analysis of Basswood Sheet Specimens Under Varied Grain Direction Angles Using Tsai-Wu Criterion

Wood sheets are fundamental materials in engineering applications, and their mechanical properties are influenced by the grain direction angle. In this study, basswood sheet specimens were tested at grain direction angles of 0°, 10°, 30°, 45°, and 90° to the loading direction.

The Tsai-Wu criterion, a widely adopted method for predicting composite material failure, was employed to analyze the mechanical behavior of the specimens. This criterion incorporates tensile and compressive strengths along different material directions.

By fitting experimental data to the Tsai-Wu model, the relationship between grain direction angle and mechanical properties was investigated. The aim was to gain insights into how wood sheets respond to varying loading conditions and fiber orientations. During experimental testing, an interesting observation was discovered that off-axis testing at 30˚ and 45˚ produces a negative Poisson's ratio.

The study contributes to understanding the mechanics of wood-based materials, offering a basis for optimizing their performance in engineering applications. Future research can build upon these findings to design wood structures resilient to diverse mechanical stresses.

David Hathaway
Faculty Mentor(s): Christopher Green
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Natural Sciences and Engineering

Computing the Harmonic Measure Distribution Function for Doubly Connected Unbounded Circular Slit Domains

The harmonic-measure distribution function, or h-function, is a function which gives the probability that a Brownian particle reaches the boundary of a planar domain within a certain distance from its point of release. In this work, we focus in particular on the h-function associated with an unbounded doubly connected circular slit domain and a type of inverse problem: given the graph of one of these h-functions, can one determine the particular slit domain associated with it? We resolve this inverse problem using conformal mapping theory and a special function known as the Schottky-Klein prime function.

Dylan Stone
Faculty Mentor(s): Robert Zettle
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Social Sciences and Humanities

ASSESSING THE RELATIONSHIP OF MENTAL VISUAL IMAGERY AND PERFORMANCE ON VISUALIZATION EXERCISES

This study sought to examine the relationship between levels of visual imagery, especially for those who lack the ability to create visual images (aphantasia), and performance on two tasks relying on this ability. It was hypothesized that individuals who self-report lower levels of visualization abilities; as assessed by the Vividness of Visual Imagery Questionnaire (VVIQ) and a new questionnaire designed for this project, the Visual Imagery Scale (VIS); would, compared to their high level of visualizing counterparts, perform worse on a visual recall task and be less responsive to an imagery-based mindfulness exercise designed to reduce negative thought-related distress (e.g., “My life is a mess”). Participants (N = 69) were WSU students enrolled in sections of Psychology 111 who received course credit for their participation. The sample predominately self gender-identified as female (70%) and White (71%) with a mean age of 21. Contrary to expectations, neither measure of visual imagery significantly correlated with the two criterion measures, which seems largely attributable to an absence of participants with aphantasia (or those who would be considered to have low imagery as determined by cutting scores of previous studies utilizing the VVIQ within) within the study sample.

Implications for further research investigating the question addressed by this project are discussed.

Andriana Rajagopal, Rahul Madhavan, Elsie Clark, Divya Padamati, and Rajprasad Loganathan
Faculty Mentor(s): Raj Logan
College of Health Professions
Poster Presentation: Applied Sciences

Testing the role of exercise training in aging-related stem cell dysregulation
The effects of exercise and its roles in the regulation of stem cell maintenance and function are unknown and could have profound implications for our understanding of stem cell health. This project aims to investigate the response of the JAK-STAT signaling pathway, a pro-stem cell homeostasis pathway in the testis niche, to exercise training. We have built an exercise apparatus for fruit flies, Power Tower version 2.0, to allow the flies to undergo three weeks of exercise training. Their exercise intensity will gradually increase from weeks 1 through 3. The training protocol takes advantage of the Drosophila's innate negative geotaxis ability (the directional movement against gravity) by forcing them to climb continuously in the container or until the apparatus is turned off. We expect to test the hypothesis that exercise training will correlate with an upregulation of JAK-STAT signaling and an increase in testis stem cell viability within the treatment group. In addition to building the apparatus, we have also optimized the protocol for antibody staining and evaluation of cell types in the Drosophila testis stem cell niche. We will provide an overview of the experimental plan designed to test our hypothesis that exercise attenuates aging-related stem cell dysfunction and present the preliminary data obtained from this ongoing investigation.

Cadence Pfaff
Faculty Mentor(s): Natalie Delacruz
College of Health Professions
Poster Presentation: Social Sciences and Humanities

EDUCATING RURAL HIGH SCHOOL SENIORS ON CONTINUING ORAL HEALTH
Purpose: This project's purpose is to equip high school seniors in rural areas with oral health education to help them make an informed decision about their care in the future. Emphasis will be on oral hygiene instruction, nutrition, oral and systemic disease, and prevention.

Methods: The target population was high school seniors attending Harper County's Chaparral High School in Anthony, Kansas. Verbal questions were asked to the students to assess their initial level of knowledge about oral health-related subjects. A PowerPoint presentation, mouth models held by the presenters for demonstrations, and individual

hygiene kits for the students that included floss, toothpaste, and a toothbrush, were all used to provide education. At the presentation's end, students' knowledge was found to have increased based on responses to verbal questions. The independent variable was the oral health education presentation, and the dependent variables were the knowledge levels of high school seniors regarding teeth care, nutrition, and preventive measures. The project conditions involved a one-time educational presentation to the target population.

Results: Pre and post tests were not able to be given due to Institutional Review Board (IRB) restrictions. This age group has a critical need for oral hygiene education. Through verbal responses from the target population, it was affirmed educational intervention is effective in positively influencing the knowledge and awareness of rural high school seniors' oral health.

Implications: An area of concern in young adults that could be further researched is the effects of their daily diets on the oral cavity. The presentation allowed brief time for the topic of making informed dietary and lifestyle choices with only one slide, but this could be expanded to directly relate to this population.

Lauren Hughes
Faculty Mentor(s): Moriah Beck
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Natural Sciences and Engineering

WHAT'S LINKER HAVE TO DO WITH IT? EXAMINING THE STRUCTURE & STABILITY OF PALLADIN'S IG3-4 LINKER REGION

The protein actin is integral to movement, cell adhesion, and cytoskeleton support within the human body. Actin is the most prominent protein within cells, and it participates in more protein-protein interactions than any other known protein; one such relationship involves palladin. Palladin is comprised of five immunoglobulin-like domains (Ig), each connected via an unstructured linker region. Previous research has proven that the Ig3 domain is the minimal actin-binding domain, meaning it is the only domain required to facilitate binding between palladin and actin; however, binding affinity is significantly increased when the Ig3-4 linker domain is present. To examine the effects of this Ig3-4 linker on overall actin binding, the Beck lab introduced several mutations into the regions. When all the arginines within Ig3-4 were converted to alanine, the binding ability of actin was completely disrupted. Our current research seeks to determine how mutations within the Ig3-4 linker region will affect the overall structure and stability of palladin. Our study was conducted with both wild-type and mutant arginine to alanine linker proteins. These proteins were purified from pellets and then examined using circular dichroism (CD) spectroscopy. Our proteins were placed under wavelength scans of 185-250 nanometers, as well as thermal denaturation conditions, both of which revealed slight differences between the curves of wild-type and mutant palladin. This information was then analyzed using DichroWeb software, which uses input data to create charts detailing folding,

structure, reconstructed data curves, and suspected wavelength impacts. A preliminary review of this data indicates that the folding of mutated Ig3-4 linker contains more random coils and alpha helix structures while forming significantly fewer beta-sheet folds. Future research will involve protein comparisons of these structures using the PCDDB database, a public site where the structure of wild-type and mutated Ig3-4 linker regions will be published.

Ayse Yildirim, Siva Sai Reddy Gudepu
Faculty Mentor(s): Eylem Asmatulu
College of Engineering
Poster Presentation: Applied Sciences

Recycling Advance Engineering Materials

Future applications for additive manufacturing have a lot of promise and are growing due to the gradual elimination of technological and financial restrictions. A method used in additive manufacturing (AM) called direct metal laser sintering (DMLS) involves melting and fusing layers of metallic powder to produce 3D objects. Life cycle analysis (LCA) is a technique used to assess a product's environmental effect throughout its life cycle, including the extraction and processing of raw materials, manufacture, distribution, usage, recycling, and final disposal. The goal of this study is to compare the manufacture of metallic scaffolds using additive technology, and DMLS to more traditional methods (metal injection molding process), and to evaluate the environmental, economic advantages (energy and raw materials used), and useful service life of scaffold over the course of the whole life cycle. Generally, the metal injection molding (MIM) process has been used to produce biocompatible titanium scaffolds; however, this technique does not entirely control shrinkage, density, and scaffold porosity. Furthermore, some of the drawbacks of the MIM process include requiring high capital investment and processing costs, suitable for small to medium-sized parts and complicated for some metal products. Thus, there is a need for alternative techniques that are defect-free, provide longer service life, and economically and environmentally viable biocompatible scaffold production.

Zachary Walker, Marcus Ang, Felipe Lima
Faculty Mentor(s): Gisuk Hwang
College of Engineering
Poster Presentation: Natural Sciences and Engineering

3D Printed Novel Wick Structures for Enhanced Capillary Flow

This study delves into the usage and creation of wicks for high heat flux evaporative cooling systems. One of the main challenges in traditional evaporative cooling systems is a premature coolant dryout under high heat flux heat demand due to the limited capillary flow through wick structures. A desired wick structure requires good capillary pumping capability and larger permeability, i.e., enhanced wickability; however, it typically needs

complex microstructures that are not compatible with conventional manufacturing approaches. The recent advancement of 3D printing technology enables us to print unique microstructures, and this study aims to create a new microstructure to 3D print as a wick for high heat flux evaporative cooling systems. To improve the wickability, this study examines two designs. One design is a triangular channel having internal iso truss structures, and the other is an internal isotruss built-in cubic lattice structure. These structures are designed by postulating that the smaller pores near the isotruss structures increases capillary pumping capability, while the large permeability is offered near the triangle channel walls or open cubic lattice structures. The two different strut diameters, 600 and 900 um, are printed to understand the effects of the strut diameters. The designed wick performance is experimentally characterized using the rate of rise test, and the enhanced wickability is compared with the reference structures such as the triangular channel and cubic structures without the isotruss structures. The triangular channel with the isotruss structures, both 600 and 900 um diameter struts, increased the maximum liquid height by 100% compared to that without the internal isotruss structures.

Lucas Hofer-Holderman
Faculty Mentor(s): David MacDonald
College of Fine Arts
Poster Presentation: Applied Sciences

Oasis

Originally created for a lesson on text painting, ‘Oasis’ became an exercise in forgiveness. From the initial melody in the altos, there is a pull between hurt and health. At first, the wound is fresh, and even singing is taxing and sorrowful. As time goes by the pain builds to a form of spite, “bleed my heart before it runs dry / as if it could run dry!” and here is the climax of the song, breaking into infinitely renewable love amid such agony— an oasis that will never run dry.

This piece was incredibly cathartic to make, and reflects my own journey in forgiving a former friend of mine. Unfortunately, there was no reconciliation, so the peace ends abruptly yet happily, representing the end of that relationship but the continuation of love as a philosophy.

Riley Prater, Jace Francis, Kyle Easley
Faculty Mentor(s): Atri Dutta
College of Engineering
Poster Presentation: Natural Sciences and Engineering

Active Flight Path Stabilization and Roll Reduction System for Use in High Power Rocketry

For high-altitude attempts within the high-powered rocketry community, many factors in

flight reduce the apogee. Chief among these is a miss-aligned flight path. A flight path can be altered through weathervaning or coning. The system developed in this paper helps to reduce the effect of weathervaning through flight path correction and that of coning by regulating the roll rate.

Ciara Keeler
Faculty Mentor(s): Sally Elledge
College of Health Professions
Poster Presentation: Applied Sciences

A Lifelong Smile

Purpose:

A Lifelong Smile is geared towards educating nurses, nurse aides, and family members how to provide oral hygiene care for older adults with impairments. The topics covered will include oral cancer screening, oral hygiene aids, and individualized patient care.

Methods:

This project was conducted in a memory care assisted living facility at Chisholm Place in Wichita targeting the caregivers of senior residents sixty-five and older. The staff were asked questions throughout the presentation to gauge their understanding. For example: “Why is oral health important? Does it relate to systemic health?” Or “What are some things we can do for those who have dentures and need assistance taking care of them?” Afterward, the staff were asked the same questions again to see if their knowledge had increased.

Results:

After completing thorough research relating to oral hygiene in nursing homes, it was evident that dental neglect is prevalent in nursing homes. Residents are not receiving proper oral care due to a lack of knowledge among caregivers regarding oral health. It is evident that the success of our program lies in effectively delivering information to empower employees. Measuring the results of the presentation was done through two different methods. A verbal questionnaire was given before and after, as well as answering numerous queries from the staff. The results of the questionnaires reinforced the knowledge absorption of the faculty after the necessary information was presented.

Implications:

The lack of oral hygiene care given to older adults in nursing homes is due to the misunderstanding of oral health literacy. By giving an interactive and educational presentation, caregivers will be able to contribute to improved oral health among

residents. Furthering the study may include revisiting Chisholm Place in 4-6 months to evaluate the progress of the suggested care.

Aiden Holt
Faculty Mentor(s): Vijay Matheswaran
College of Engineering
Poster Presentation: Natural Sciences and Engineering

AERODYNAMIC ANALYSIS OF VARYING TAIL ANGLES OF A BARN SWALLOW MODEL

Avian tails can perform a variety of functions, from providing directional control and stability, forming a supplementary lifting surface, and reducing induced drag. Barn swallows vary sweep and angle of attack of their tails during flight. At low speeds, their tails spread out more, providing a larger surface area, while at higher speeds, the tail is furled to a narrow profile. These vast changes in the tail angles affect aerodynamic loads on the bird, such as lift, drag, and pitching moment. Previous research has shown these values for a variety of air speeds based on testing real birds in a wind tunnel. This research focuses on the design of a model plane featuring interchangeable tails imitating the different angles of a barn swallow tail. With a variety of tail designs created to simulate a barn swallow, a model was designed in OpenVSP and created out of wood to test in a subsonic wind tunnel. The goal is to build a semi-empirical model showing the effect of tail sweep on barn swallow aerodynamics and stability, and additionally gain an insight on what tail angles provided optimized loading on the model. Trends in this research showed that a narrow swept tail with a smaller surface produces slightly less lift, but, in turn, produces significantly less drag. On the other hand, a wide swept tail with a larger surface area produces much more lift and only slightly less drag.

Chantel Schuster, Jenn Williams, Alyssa Dooms, Lexi Wilson
Faculty Mentor(s): Sally Elledge
College of Health Professions
Poster Presentation: Applied Sciences

Safety in Special Smiles

Purpose

This paper shows the need for oral hygiene education among children with developmental disabilities, particularly focusing on the children of Sedgwick County, Kansas. Resources provided through the U.S. Census Bureau and local health departments allowed evidence and research to contribute to the prevalence of decay in Sedgwick County. The lack of adequate oral health resources in the community highlights the prevalence of untreated decay. Children with developmental disabilities are at a higher risk because of lack of understanding and resources (American Academy of Pediatrics, 2013). This paper aims to

inform and address oral health disparities and solutions to embed them into the community.

Methods

This project was conducted to target children with developmental disabilities and their caregivers. A scholarly article search interpreted local census reports from Sedgwick County, Kansas, found data concerning the prevalence of childhood caries and proper oral health in those with developmental disabilities. The method of delivery included a slides presentation delivered in person at Rainbows United in Wichita, Kansas. This presentation was given in small groups to the children and their caregivers. The presentation included a demonstration given to the children on proper brushing technique to test their increased understanding.

Results

The National Library of Medicine, showed the results of fostering oral hygiene in children with developmental disabilities had successful results compared to those that didn't have OHI. These studies showed that lower socioeconomic status has a higher prevalence rate. By educating the targeted population we provided beneficial information that assisted the population to be able to improve their oral hygiene.

Implications

It is important to ensure that children with developmental disabilities have access to education and resources to prevent dental diseases. Instilling an oral hygiene routine in these children at a young age can help build healthy oral habits and proactively prevent oral diseases. By enhancing awareness about essential resources and promoting oral health education, it establishes a positive dental environment for children with developmental disabilities (DHHS, 2021) . In the future we can make oral health more accessible by adapting oral hygiene instructions and incorporating more inclusive oral hygiene aids for these patients.

Diego Fuenteal, Jack Dahn
Faculty Mentor(s): James Steck
College of Engineering
Poster Presentation: Natural Sciences and Engineering

Robust Implementation of a Repeater Node using a Quantum Neural Network

A crucial component of computer algorithms is the ability to swap information in two bits. For quantum computing, this is even more crucial, because it is the only way to transmit information, since quantum states cannot be copied. Indeed, the SWAP gate is the basis of all quantum communication. Unfortunately, current quantum computers and communication systems are not robust. Classically, we can protect against noise by

making many copies of the information but of course this is not possible quantum mechanically. An algorithm that swaps two entangled quantum bits, or qubits (a SWAP) exists, but it is sensitive to noise and becomes increasingly difficult to implement as the number of qubits in the system grows. This research, building on previous work by Jack Dahn, shows that a Quantum Neural Network (QNN) can be used to perform the swap without having to create a complicated algorithm by hand and with considerably more resistance to noise. This is achieved by training the neural network on small systems and then using the obtained parameters to scale up the system to more qubits (called bootstrapping). The system can be trained with or without noise, with the goal making it as resistant as possible to it.

Alondra Valle
Faculty Mentor(s): Rhonda Lewis
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Social Sciences and Humanities

CULTURALLY EMPOWERED: TESTIMONIALS FROM WICHITA'S SPANISH SPEAKING NORTH END

Background: Despite the growing population of Latinos in the United States, access to culturally responsive non-profit services remains a challenge (Migration Policy Institute, 2022; Kim et al., 2021; Joassart-Marcelli 2013). Latino entrepreneurs, in particular, face barriers such as language, cultural differences, and lack of formal business registration, hindering access to essential resources and support (Orozco, 2020; Pisani, 2022). This study addresses these challenges, focusing on the provision of culturally responsive services provided by Empower Evergreen a local non-profit organization, and the experiences of Latino entrepreneurs in Wichita's North End. The current study gathers the testimonials of Spanish-speaking small business owners in the North End and the impact of Empower's services on the community.

Method: A qualitative study design was conducted. Four one-on-one interviews, lasting 15 to 30 minutes each and in Spanish. Participants were briefed on audio recording and provided with a consent form outlining the interview's purpose. Interviews covered demographic information, experiences with Empower, and improvement suggestions. Recruitment, facilitated by Empower Evergreen, targeted Spanish-speaking individuals aged 18 and above using Empower's services for their small businesses. Participants ranged in age from 28 to 55. Thematic analysis was guided by Braun and Clarke's (2016, 2022) framework to identify key themes and patterns transcribed and translated from interviews.

Results: The findings indicated that, overall, participants found the services provided by Empower were culturally responsive. Participants were asked about whether they felt the services they received were related to their cultural values, and responded unanimously.

Participants reported feeling: Respected, Supported and Welcomed by Empower. Participants did have suggestions, but overall were extremely satisfied.

Conclusion and Implications: There was unanimous affirmation from participants regarding the alignment of Empower with participant cultural values. Small business owners felt respected, welcomed, and supported by Empower Evergreen's services. However, other areas of the organization should be evaluated to find similar results. The information from this study suggests that similar organizations could benefit from adopting Empower's approach of employing staff who are Spanish speakers and respect the culture and language of those they serve. Further research should explore specific strategies used by nonprofit services in this sphere.

Yousaf Khan
Faculty Mentor(s): James Bann
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Natural Sciences and Engineering

INVESTIGATING THE BINDING CAPABILITY OF PA-SPY0469 CONJUGATE, CANDIDATE VACCINE FOR S. PYOGENS

The anthrax toxin is an AB toxin. The B component, protective antigen (PA) is known to directly target and disrupt host immune cells as part of its pathology. In particular, PA exhibits high affinity binding to capillary morphogenesis protein 2 (CMG2), a receptor expressed on dendritic cells, macrophages, and other antigen presenting cells. Dendritic cells are the most potent antigen presenting cells and can induce activation of T cells, crucial for a sustained immune response. Given the high affinity binding between PA and CMG2 and targeting of dendritic cells, we hypothesize that PA can be used as a vector for targeted delivery of conjugated antigens to dendritic cells. To test this hypothesis, we have generated a conjugate between PA and Spy0469, a putative 42 kDa surface protein of Streptococcus pyogenes. Since memory T-cell responses to Spy0469 are common in the human population, we surmise that activation of T-cells by the PA-Spy0469 conjugate would be stronger than Spy0469 or PA alone. To assess binding, we carried out the gel-shift assay and constructed binding curves using Prism software. Our results indicate that attachment of Spy0469 to domain 4 of PA, the receptor binding domain, does not disrupt the ability of PA to bind to the host cellular receptor CMG2. This suggests that vaccine antigens can conceivably be attached to domain 4 of PA and delivered to dendritic cells for development of immunity.

Tommy Huela
Faculty Mentor(s): Greg Houseman
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Natural Sciences and Engineering

RESTORATION OF LEADPLANT IN FORMERLY TILLED FIELDS: EFFECT OF SEEDING PATTERNS AND SOIL TYPES

Understanding the factors that influence plant establishment and growth is crucial in ecology and conservation biology particularly for species that are difficult to reestablish. One such species is Amorpha canescens (leadplant) that is considered of high conservation value, but often absent from prairie restoration projects. To address this problem, we tested how different soil types (homogeneous vs. heterogeneous), seed sowing treatments (spatially aggregated vs. uniform), and patch size (large vs. small) influenced the abundance of A. canescens in plant restoration experiments that began in 2017. In the summer of 2023, we quantified the aerial cover of A. canescens in plots representing different treatment combinations. We found that the A. canescens cover was highest when seeds were sown in an aggregated spatial arrangement for plots composed of heterogeneous soils. This effect was stronger in plots comprised of small rather than large sized patches. In plots with homogeneous soils, A. canescens cover also appeared higher under aggregated compared to uniform seed sowing, though this difference was not significant. Amongst individual patches of large scale and heterogeneous soils, A. canescens produced more cover in certain soil types than others. There were no differences in the cover among soil types in small scale patches. These results suggest that A. canescens cover is highest when isolated from other plant species particularly in heterogeneous rather than homogenized soils. Furthermore, restoration of A. canescens in former tilled fields may benefit from sowing or planting seeds in aggregated rather than uniform spatial patterns.

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CHARACTERIZATION OF NEUTRAL SULFUR REACTIONS AT LOW TEMPERATURES: AN INVESTIGATION OF EUROPA'S SUBSURFACE ICE COMPOSITION

Europa, one of the four Galilean moons of Jupiter, has been under increasing scrutiny in recent years due to the possibility of the existence of life in its subsurface ocean and the detection of key elements on its surface, including sulfur. Sulfur has been detected in various compounds on Europa through the Galileo mission, but the question of its origin remains unsolved. Currently it is unknown if the sulfur is indigenous to Europa or if its source is the nearby moon Io, where there is known to be a large amount of sulfur in many forms. The aim of this investigation is to model a plausible characterization of neutral sulfur reactions in conditions relevant to the subsurface ice of Europa through the use of density functional theory calculations to determine activation energy barriers of critical reactions in the sulfur cycle. Thus far, optimizations of structures and transition state structures have been performed for a reaction similar to those of interest in terms of charge, size, and elemental composition in order to confirm our methodology against a previously calculated standard. Next steps include additional optimizations and intrinsic

reaction coordinate calculations, as well as a transition into the solid phase. Looking further forward, computational chemistry research regarding the sulfur chemistry of the Jovian system could be valuable in the discussion of possible life on Europa and the interpretation of upcoming missions to the Galilean moons, as well as contribute to the validity of density functional theory methods in the context of astrochemical sulfur reactions.

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C.O.S.M.O.S. COSMOSHOX ON-SITE MARTIAN OVERLAY SYSTEM

The WSU NASA SUITS team, CosmoShox, has proposed and started to develop the "CosmoShox On-Site Martian Overlay System" (C.O.S.M.O.S.). Tailored to the unique environmental challenges of the Martian landscape, C.O.S.M.O.S. integrates the Local Mission Control Center (LMCC) and Head Mounted Display (HMD) (e.g. Microsoft HoloLens 2) for efficient mission and task management, encompassing task tracking, and command delivery through an augment reality (AR) and user interface (UI) which the team has developed using Unreal Engine 4.27. The project's design, development, and testing are led by students. Furthermore, the faculty in the Open XR Lab not only oversees XR development but also evaluates psychological safety and performance outcomes linked to Agile product management processes. This holistic approach aims to cultivate both digital and human skill sets among the student cohort, aligning with the demands of the professional world. Moving forward, the research project will undergo IRB-approved human-in-the-loop (HITL) testing from March to May 2024, followed by an in-person Test Week at Johnson Space Center in Houston, Texas, where NASA Design Evaluators will assess its efficacy of their designs in May 2024. The project offers numerous benefits, including interdisciplinary collaboration, hands-on experience with Unreal Engine, and valuable exposure to NASA. Students gain insights into the importance of interdisciplinary work, while also having the opportunity to travel and explore NASA facilities. Continuous mentorship from two CID Faculty members guides them throughout the research journey, complemented by personalized one-on-one guidance from our NASA experts, who are also WSU Alumni. As the project progresses, the conclusion remains open-ended, awaiting further developments.

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CARDIOVASCULAR HEALTH MONITORING USING MULTIPLE CONFORMAL

PHOTOPLETHYSMOGRAPHY DEVICES FOR USE IN SPACEFLIGHT

It is important to continuously monitor astronauts' cardiovascular health since the human body is evolved to function optimally in the presence of Earth's gravity. Photoplethysmography devices use light and an optical sensor to measure blood flow which can determine heart rate (HR), HR variability (HRV), oxygen levels, arterial stiffness, and cardiovascular abnormalities in a patient. We tested multiple designs of the PPG and concluded green light, flexible casing, and adjustable strap provides optimal signal that is inexpensive, lightweight, and noninvasive. Creating a low-pressure environment that replicates microgravity allows manipulation of blood flow compared to normal gravitational environments. Multiple conformal photoplethysmography devices are placed on the forehead, ankle, and wrist to first identify precise locations where signal-to-noise ratio (SNR) is superior. Using multiple devices gives a variety of data since one device is not sufficient. Simultaneous synchronized data collection is performed at all three locations in a low body negative pressure chamber (LBNP). MATLAB software is used to pinpoint each systolic peak in a wave sample and calculations from this analysis can be applied to clinical parameters and measurements, such as HR, HRV, and other cardiovascular health markers. Results can show arterial irregularities, such as palpitations. Our results infer precise locations with low SNR are established, LBNP does alter PPG wave results, and motion artifact creates low SNR. Future testing includes tackling ambulatory motion artifact, creating an algorithm to automatically process data, larger sample sizing, and microgravity testing onboard reduced gravity aircraft.

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MICROBIAL TOLERANCE TO HIGH CONCENTRATIONS OF MN RELEVANT TO EARLY MARS

Heavy and transition metals are known to interfere with processes in the human body and can have deleterious effects on plants and microbes in the environment. The current study is relevant to the geochemistry of Mars, and particularly earlier epochs when Manganese [Mn(II)] appears to have been at high concentrations in near-surface waters. Mn(II), the primary element of interest, is an alloying element that poses a toxicity concern for microbial growth at high concentrations. Our current research used 10 soil samples from different biomes to inoculate a rich growth medium of low salinity and pH with concentrations of 10 mM, 100 mM, 1M, and 2 M Mn(II) in the form of manganous chloride ($MnCl_2$). Water activity was decreased at high molar concentrations of $MnCl_2$ but were shown to be still compatible with microbial growth. Growth measurements were performed aerobically in 2 mL cultures in tubes maintained on a rotary shaker to determine tolerance to Mn(II). Decreased microbial growth was observed when higher concentrations of Mn were present in the medium, with an apparent threshold at near 1 M $MnCl_2$. The growth appeared to be primarily fungal; however, additional testing is in progress to detect

the presence of bacterial growth. Conclusively, an observance or lack thereof in microbial tolerance to high concentrations of Mn(II) and other transition metals provides substantial information about the capacity for life on early Mars. The dynamic conditions of the region's water supply makes our research critical in determining whether life can not only be formed, but also sustained on the planet.

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UTILIZING A WEARABLE FETAL HEART RATE MONITOR TO INCREASE OBSTETRICS HEALTHCARE ACCESS: DETERMINING THE DEVICE ACCEPTABILITY

Maternal and infant healthcare in rural and underserved areas suffers from more adverse health outcomes than urban areas. This study targets a population that faces barriers to timely prenatal care due to gaps in medical access in rural locations. The lack of obstetrics care in rural areas is a burgeoning issue of interest, as health outcomes for rural mothers and infants are lower than their urban counterparts. As a result, there is a growing need for telemedicine services that can be rendered to rural mothers through their prenatal care. The development of a small, wearable fetal heart rate monitor will facilitate access to prenatal medical care for mothers in rural areas. This project focuses on collecting, analyzing, and implementing data of women of reproductive age (18-49) concerning their acceptability towards and feasibility of wearing a fetal echocardiogram (fECG) monitor, which would permit the transmission of fetal heart rate and relevant clinical information to their prenatal care provider. The project goal is to utilize the data provided by survey participants to determine the best configuration of the device to serve the target population, pregnant moms living in rural areas or those with lack of access to healthcare. The survey was implemented using snowball recruitment as well as postering in local communities. Data was analyzed using SPSS (v29) and descriptive statistics with respect to participant responses and demographics. 163 participants completed the survey, with 103 responses to acceptability questions; older women aged 30-49 showed higher rates of acceptability (70.07%, n=54) than young women aged 18-29 (53.06%, n=49). 70.7 % of participants preferred a device of size 1 inch by 3 inches or less (n=149). These findings will guide the design and clinical utilization of the monitoring device to ensure effective use for providers and patients alike. Collecting and analyzing this data is crucial in tailoring a product to the intended population’s needs and convenience.

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ON THE FRONTLINES: PERCEPTION FROM SAFE STREETS WICHITA STAFF ON ITS NALOXONE DISTRIBUTION STRATEGY

The opioid epidemic is a serious problem in the United States and has led to numerous overdoses. To reduce overdoses, distributing naloxone in hotspots is a proven harm reduction strategy. The Behavioral Community Research Action Team (BCRAT) at WSU partnered with a local harm reduction coalition, Safe Streets Wichita, to evaluate the processes and initial outcomes of the coalition's harm reduction strategy. As part of the evaluation, the purpose of this poster was to gather the perceptions of Safe Streets staff on how well the naloxone distribution was conducted in the community in hotspots throughout Sedgwick County. Qualitative interviews were conducted with Safe Streets Wichita staff. A thematic analysis following Braun and Clake (2006, 2022) was used to analyze the interviews. After the interviews were transcribed and coded, two major themes were identified: (1) lack of funding as a major barrier and (2) the impact of stigma. The staff described the need for more funding to continue to give out information, naloxone kits, and fentanyl test strips. They also discussed how no funding allocated toward positions was a barrier. The thematic analysis also showed that stigma contributes to people who experience substance-related harms and affects the outreach of harm reduction efforts.

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THE PERSPECTIVES OF PEOPLE WITH LIVED EXPERIENCE ON THE PROJECT WORKED NALOXONE DISTRIBUTION

The opioid epidemic in Wichita has claimed the lives of many and affected many more. Due to the lack of availability of life-saving harm-reduction tools like the overdose reversal drug naloxone or fentanyl test strips (FTS) used for identifying substances contaminated with fentanyl, the epidemic has been largely under-addressed. Because of this, Safe Streets Wichita has taken action to get these resources into the community for free. This program aimed to provide free Naloxone and FTS to the community to target areas heavily hit by the overdose crisis in Wichita. The goal of this research project was to collect feedback from individuals running and affected by Project WORKED to create an outline and create a stronger program in the future. The information was collected using one-on-one interviews with individuals close to the program as well as individuals served by the program. This poster will analyze the responses from people with lived experience with the opioid epidemic and people affected by the naloxone distribution program. The primary method of data collection used in the interviews was thematic analysis which yielded the following strengths and weaknesses repeatedly brought up by this group of interviewees. Firstly, the strengths: 1) Provided accessible naloxone and FTS to the community, 2) brought awareness of the opioid epidemic in Wichita to the community, 3) helped to make connections to support, resources, and community, 4) saved lives through the distribution of naloxone. Also, some areas of improvement: 1) Being undersupported and spread too

thin across Wichita, 2) the program only provided intramuscular (needle administration) versus nasal naloxone, which was preferred, 3) requests to provide more links to care and resources with the supplies, 4) general underfunding of the program. The goal of this project is to provide a researched intervention to be implemented in other communities across Kansas.

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EXPLORING THE ACCEPTABILITY OF A WEARABLE FETAL HEART RATE DEVICE BY RACE AND ETHNICITY

The creation of wearable fetal heart rate devices offers a novel opportunity for urban mothers, providing them with a tool to actively monitor and engage with their pregnancy which was previously unattainable outside of clinical settings. The devices allow continuous and convenient fetal monitoring, potentially reducing maternal anxiety. Additionally, the ability to track fetal heart rate trends over time could aid in the early detection and intervention of potential issues.

These devices have various benefits enhancing prenatal care, but their acceptability across race and ethnicities is uncertain. This study considers the relationship between the race and ethnicity of women and the acceptability of the wearable fetal heart rate among urban women.

An online quantitative survey was conducted via Qualtrics among urban women, compiling data regarding their attitudes towards wearable fetal heart devices. The survey was based on previous device acceptability survey tools and consisted of 47 questions, including questions regarding participant demographics such as age, education, health literacy, and more. The association between race and ethnicity and device acceptability was analyzed through descriptive statistics including cross-tabulations to compare the variables and Chi-square tests to assess the statistical significance of the differences, using SPSS (v29).

With a total of 163 responses, the cross-tabulation analysis of the valid cases (N=103) showed differences in the acceptability between Caucasian and minority women. Minority women had a higher acceptability of 70% in comparison to the 57% of Caucasian women ($p=.162$). Chi-square analysis results suggest a trend of high acceptability in minority women however, the differences did not reach the conventional statistical significance.

The data collected by these devices can be invaluable for medical professionals, offering insights into acceptability of wearable medical devices to improve fetal health outcomes within urban populations, leading to improved healthcare interventions and outcomes for maternal and child health in urban settings.

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The Interplay Between Neurodivergence, Substance Use, and Loneliness Among Wichita State Students

The current study aimed to assess the strength of the relationship between neurodivergence (i.e., Autism, ADHD, learning disorders, or speech disorders) and substance use (i.e., marijuana and alcohol use) and the influence of these two variables on loneliness. This study also explored whether substance use moderates the relationship between neurodivergence and loneliness.

Data for this study were derived from the 2022 National College Health Assessment (NCHA). Analyses included a chi-square test for independence to examine the association between neurodivergence and substance use, as well as a two-way between-groups analysis of variance to explore the combined effects of neurodivergence and substance use on loneliness.

Results revealed a significant association between neurodivergence and substance use. Compared to neurotypicals, neurodivergent participants more often reported using alcohol or marijuana at least once in the 30 days prior to survey completion. Substance use was not shown to moderate the relationship between neurodivergence and loneliness. However, both neurodivergence and substance use were found to influence loneliness independently. Being neurodivergent was associated with higher levels of loneliness, as was having used a substance.

Conclusions drawn from this study are important for the university to consider as the sample was comprised of WSU students. The results suggest that neurodivergent students are at heightened risk of substance use and potential misuse or abuse. Findings also revealed that both neurodivergence and substance use influence students' levels of loneliness. This may be explained as neurodivergent and substance-using students similarly perceiving themselves as different from their campus community peers, which may result in social withdrawal and subsequent loneliness. It is the authors' hope that this research will be used to incentivize the creation of targeted intervention efforts that will support neurodivergent students in accessing resources like support groups and substance abuse prevention programs.

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Analysis of Severe Weather Impact on Traffic Patterns Using Long-Short-Term-Memory Neural Networks

This study aims to answer the question "How do severe weather events such as snowstorms and tornadoes affect traffic patterns in Kansas?" by analyzing existing traffic data to identify disaster-induced mobility and evacuation patterns using neural network predictive modeling.

Studying the impact of severe weather events on traffic volume and patterns aids in designing more resilient infrastructure and developing effective emergency response strategies.

We examine the impact of historical severe-weather events obtained from the National Oceanic and Atmospheric Administration on hourly traffic across the state. We employ long-short-term-memory (LSTM) recurrent neural networks to construct a counterfactual prediction, which is compared against the actual traffic data to analyze the causal impact of severe weather events on daily traffic patterns in different regions of the state.

The study considers the impact of a 24 hour snowstorm in February of 2014 located along the interstate I-135 located north of Wichita that accumulated over a foot of snow. When comparing the actual traffic counts versus the LSTM generated counterfactual, a cumulative loss of about 60,000 vehicles continued over the next 3 days. We also assess the causal impact of an EF-4 tornado traveling through Douglas County in May 2019. The resulting counterfactual suggested a shifted travel pattern consisting of an initial sharp drop in traffic volume, but quickly followed by an atypical surplus.

The results of these case studies indicate unique evacuation responses depending on factors such as the type of weather event or the demographic of the impacted area (urban or rural). The varying impacts on travel patterns and volumes can be useful when designing more resilient infrastructure and developing effective emergency response strategies. The future scope of this research includes using this model to develop a spatial-temporal simulation of the population response to severe weather events.

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Design of Fully Integrated LED Quantum Magnetometer Arduino Shield based on NV Diamond Centers

Quantum magnetometry is a promising technology for sensitive magnetic field sensing that has a wide range of applications. Unfortunately, this technology is very cost-intensive and size-limiting in many real-world applications. Consequently, this pioneering technology has found little use outside the lab. The aim of this research is to create a compact and fully integrated LED quantum magnetometer based on nitrogen-vacancy centers in

diamond microcrystals that will allow for the commercialization of quantum magnetometers. Due to recent strides in the field of quantum magnetometry, integrated quantum sensors can be miniaturized to a degree that would allow them to be viable in applications they were not previously. Using research from the University of Münster (Pogorzelski et al, 2024) we aim to build off their approach and integrate our quantum magnetometer onto a PCB in the form of a modular Arduino R4 Uno shield that allows it to be easily implemented into many systems. We aim to do this by replacing external signal processing hardware required with current systems with sequential Bayesian estimation code run on the Arduino R4 Uno. The sensor and required signal amplifiers and drivers for the sensor are integrated into a single PCB board that can be attached to the Arduino as a module. Once constructed this PCB system will be tested with existing lab results on quantum magnetometers to deem its sensitivity viable with our intended goals.

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DEVELOPMENT OF A WEARABLE FETAL HEART RATE MONITOR: AN ANALYSIS OF FETAL ELECTROCARDIOGRAM EXTRACTION ALGORITHMS

In a time of increased ease of access to medical care, there remain groups that lack sufficient access to healthcare. Maternal and fetal healthcare in rural and underserved areas remains insufficient. Inferior maternal and fetal healthcare outcomes can be correlated with decreased access to healthcare. Based on existing studies, congenital heart defects are the most common birth defect and cause of infant death and can be treated when found in a timely manner; this treatment can increase survival rates. Utilizing wearable technology allows greater access to maternal and fetal healthcare in rural and underserved communities, leading to an increase in positive medical outcomes. As the first step in development, extraction algorithms to separate fetal and maternal heart rate were explored. Four different extraction algorithms (BSS, TS, KF, and AFM) and various subtypes were analyzed to determine the most accurate separation technique to produce the clearest fetal heart rate. This study analyzed the FECGSYN Toolbox v1.0.0, an open-source realistic non-invasive foetal ECG (NI-FECG) generator. Different signal-to-noise ratios were utilized for the Muscular Artifact (6dB, 12dB, 18dB, 24dB) and Baseline Wander (-4dB, 0dB, 4dB, 8dB) data sets. Algorithms were analyzed according to the accuracy of the extracted fetal heart rate in comparison with the actual fetal heart rate. Fetal heart rate was successfully extracted from the synthesized data. For the BSS algorithm, extraction accuracy remained fairly consistent as signal-to-noise ratio increased, based on eight channel input. For the TS and KF algorithms, extraction accuracy generally increased as signal-to-noise ratio increased. For the AFM algorithm, extraction accuracy slightly increased as signal-to-noise ratio increased. Next steps of the project include determining the most accurate algorithm subtype that will remain accurate when exposed to different

noise levels.

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Oral Health for Older Adults
