



2024 Student Presentations

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College of the Arts & Media

Art & Design

Blight

Presenter: Megan Herbert

Co-Presenters: Joy Miller, Emily Bober

Faculty Supervisors: Jeremy Catarino, Rose Brauner

Abstract: Our team is making a 2D side-scroller PC game titled Blight. Bean (player) and Bento (your pet cat) live in a small village facing a big problem. After stumbling upon a mutated deer in the forest possessed by an evil power, Bean and Bento go on a mission to figure out the source of this evil. Throughout this excursion, the two of you will work together to solve puzzles, avoid obstacles, and figure out the mystery behind the mutation of the woodland creatures.

The Arcade Showdown

Presenter: Corey Whitehorn

Faculty Supervisor: Jeremy Catarino

Abstract: This is a two-minute animated short film about a kid who sees an ad for a new video game console called the Infinity Sphere, sold by the one and only “John Gaming”. However, the only way to get it is to win first place in a fighting game competition against one of the best players in the world.

The Creation Poem

Presenter: Emily Bober

Faculty Supervisor: Steve Leeper

Abstract: The Creation Poem is an 8-minute animated film that calls attention to the beauty of our planet and its connection to mankind, a topic that is still relevant today. My goal over the summer was to implement that original sentiment through my designs, conveying the poem’s significance in modern times. Many of my ideas came from research of artists Aaron Douglas and Mary Blair, however I also used the existing storyboard panels to influence my final design choices.

Fastigium

Presenter: AJ Chambers

Faculty Supervisor: Latesha Merkel

Abstract: Fastigium is a 2D precision platforming video game exploring the dream world of the main character, Bayani. He is sick with the worst fever he's had in his life. Inspired by works such as Celeste and Yume Nikki, Fastigium features pixel art and an original chiptune soundtrack.

Parallels of the Unknown

Presenter: Emily Bredin

Faculty Supervisor: David Stairs

Abstract: Our exhibit is asking questions about the enigmas of our planet as in humanity, diseases, water (freshwater & the ocean), but also beyond in space & beyond our world, the supernatural. We are going to have multiple different displays in each section, giving physical & video demonstrations to keep our audience involved & give them visuals of these subjects. To reflect the unknown environment of these enigmas, we’re going to have the gallery be dark & illuminated in certain areas in different colors (using colored lights) as well as painted to emphasize the different sections.



Dysphoria in My Reflection

Presenter: Kuyen Alcantara

Faculty Supervisor: Lavana Shurtliff

Abstract: This art piece is about the feeling of dysphoria as a trans person. As a trans person myself, there are a lot of misconceptions about what being trans is or even the concept of dysphoria. Dysphoria is defined as the discomfort or disconnection of one's gender with one's assigned gender/sex at birth. Many trans people often describe it as not feeling like their body is their own and, often in their artwork, are portrayed as having an individual trapped in their body. As a trans person myself, I wanted to portray dysphoria differently. When I feel dysphoric, I don't recognize myself in the mirror, which creates a feeling of dread, anxiety, and discomfort. My goal for the art piece was to portray the discomfort and horror of the disconnect between one's reflection and body when looking in the mirror. I used markers and pen to highlight the reflection in the mirror and emphasize the anxiety of looking at your reflection and only being able to see something you don't recognize as you question what you truly look like to others. I want to use horror as a way to express my dysphoria, which isn't just feeling sad but includes the element of discomfort and anxiety I feel as a trans person.

The Skullys in: Comic Book Kooks

Presenter: Jaymes Rodriguez

Co-Presenter: Robin Berk

Faculty Supervisors: Jeremy Catarino, Rose Brauner

Abstract: The Skullys is a comic book series by Robin Berk following two zany skeleton siblings and their misadventures across the cosmos. Our project aims to translate this comic series into a short, digestible film with fun gags, unique art styles, and a simple storyline that shows the breadth of the medium of comics. The film is seven minutes long with several sections including live action, stop motion, and 2D animation in multiple different art styles. It starts when the Skullys steal a magical orb from the laboratory of their roommate, Dr. Deer. After Dr. Deer scolds his assistant George about reading comic books instead of real books, the Skullys, Dr. Deer, George, and Mr. Worm are sucked into the world of comics. They are turned into superheroes and noir protagonists, even shooting out into the real world as clay figures, until finally, they find their way back home having learned absolutely nothing.


Sweet Silkie

Presenter: Alondra Garcia

Co-Presenter: Brad Nelson

Faculty Supervisor: Jeremy Catarino

Abstract: Alondra Garcia and Brad Nelson in the Animation Program at Central Michigan University, with the help of present and former students at CMU, brings a senior thesis film to this space. Being a film made in 2D Animation and character rigging created in Toon Boom Harmony. This project is based on a nostalgic memory from one creator themselves. Retelling a tale based on her childhood memory of collecting eggs from her backyard chickens when she was a child. With the premise of this film following an anxious girl accompanied by her jovial but easily distracted dog, is asked to go collect the eggs from the chicken coop where the silkie chicken lives.



Communication, Journalism, & Media

Sheikh Mujib's March 7, 1971 Address:

Inventing Political Authority to Reshape Political Power

Presenter: Motasim Billah

Faculty Supervisor: Edward Hinck

Abstract: Sheikh Mujibur Rahman's historic 7th March 1971 speech is a remarkable and pivotal moment in the history of Bangladesh's struggle for independence. UNESCO recognized it as part of the world's documentary heritage, and this speech serves as an inspirational and emancipatory source. This study examines how Sheikh Mujib, known as Bangabandhu, used his rhetoric to establish political legitimacy during a tumultuous period after the 1970 presidential election in Pakistan. By invoking the history of discrimination and crafting a narrative of political authority, he laid the foundation for a movement that would reshape the political landscape. This analysis delves into the key elements of his speech and the strategic terms he set for negotiations with existing power structures to establish people's democratic rights. Understanding the political rhetoric of Bangabandhu is essential in appreciating his role as a charismatic leader and his contributions to Bangladesh's quest for nationhood.

January 6th:

An Analysis of Donald Trump's Speech at the Ellipse Rally

Presenter: Liberty Guilmette

Faculty Supervisor: Edward Hinck

Abstract: This research paper analyzes the social context preceding former President Donald Trump's January 6th speech at the White House Ellipse and the content within his speech. This speech is an important artifact to examine because it was the event directly before the insurrection at the United States Capitol on January 6th, 2021. Examination of this speech is required to determine what factors influenced American citizens to riot at one of the most prominent government buildings in the United States. The analysis of this rhetorical artifact will be accomplished utilizing the critical approach of dramatic criticism. The analysis seeks to explain how this speech intensified audience emotion, diminished rational thinking, and supported the unlawful behavior of citizens to uphold Trump's vision of America.

Reverie

Presenter: Alexander Adam

Faculty Supervisor: Heather Polinsky

Abstract: A feature film about a young man who retreats into daydreams to escape from reality. "Joe lives his life usually in isolation. Though he longs for connection, he finds it easier to live life alone. While he spends his time in solitude, he allows himself to retreat into his own imagination, where he spends time discovering new worlds, saving the citizens of his subconscious, or meeting with imaginary friends. When his real life becomes too much to bear, Joe must reconcile his imagination with reality, before he loses his grip on it.



Analyzing the Art of Ambiguous Rhetoric in American Pop Songs Through Bruce Springsteen's Born in the U.S.A.

Presenter: Cody Wilson

Faculty Supervisor: Edward Hinck


Abstract: Using media as a means to portray and suggest particular messaging and symbols has become a primary method in modern American discourse. Most citizens of the country are actively engaged in some form of media consumption on a daily basis, whether it is music, film, television, or social media. In the present day, this consumption becomes a defining role in American individuality, and pop culture genres become ambiguous and ambivalent symbols that represent facets of society depending upon the audience's own terministic screens that influence the interpretations of the rhetorical texts. In a focused analysis of Bruce Springsteen's 1984 pop music hit Born in the U.S.A., a precedence of the methodology of this process is displayed. A pop song is a widely accessible, understood, and circulated genre. Therefore, the particular nationalistic rhetorical devices of the genre were interpreted differently by American audiences depending on their point of view, and the rhetor's original intent was overtaken by the audience's own rhetorical interpretation. In a western country like America where there are so many different audiences with different backgrounds, it is inevitable that a genre like a pop song can become an ambivalent rhetorical device of ambiguity that can be used by different audiences, despite the text's original intent. Pop music from renown artists are an effective vehicle of persuasion and messaging because they can be used both on a personal and impersonal level.

Exploring the Stereotypical Portrayals of Women in Contemporary Ghanaian and Nigerian Comedies

Presenter: Rosemary Charway

Faculty Supervisor: Kirsten Weber

Abstract: The exponential growth of digital media has introduced new ways of improving social issues affecting gender equality through digital activism and representation. However, it also poses potential threats to the gender discourse due to high accessibility, limited control, and insufficient gatekeeping role. Thus, it has become necessary to investigate whose voices are being heard in digital spaces and how these voices portray gender roles. The objective of this study is to interrogate the dynamics of female representation in selected Ghanaian and Nigerian comedy skits. The study will employ a mixed method analysis and data will be analyzed using the critical feminist and rhetorical lens. Findings from the study will reveal how the ideals of power, autonomy, sexism, and objectification are characterized in humor to reproduce dominant stereotypical ideologies about women in Ghana and Nigeria.



Music

Understanding Silence to Enhance Performance

Presenter: Andrew Vinopal

Faculty Supervisors: Christopher Chapman, Allan Gumm

Abstract: Silence is a composition tool that is very rarely explored outside of its use in a performance yet often provides the most impactful or profound moments in a musical work. The purpose of this literature review is to explore the wider scope of silence and why it has a profound effect on human emotions. Areas of expertise that inform this topic include neurology, psychoacoustics, philosophy, psychology, linguistics, theology, anthropology, and musicology to get the best understanding of this nuanced effects of silence. The first section explores varied definitions of silence and its historical impact. Next is an exploration of silence as a component of language and how to apply the rules of language will begin to inform silences in a musical context. This leads to the structure of silence and how different contexts may change the overall perception of silence, which sets the context for exploring actual responses to silence. These responses can be measured both as a neurological, measurable, response and an emotional, reportable one. Finally, it is the perceptions of these silences in a musical setting that bring together disparate theories. All these components function together to strive to answer the question why silence has such a profound musical impact on an observing audience and how can it be used to improve ensemble performance.

Rhythm, Meter, and Political Statements in 20th Century American Art Song

Presenter: Rebecca Henning

Faculty Supervisor: Keith Clifton

Abstract: Art song has long been a part of the musical culture in America, with the first American art songs dating to the 1750s. For decades art song in America was largely influenced by French *mélodie* and German *Lied*; however, it gained its own unique perspective in the mid 20th century through a boom in modern American poetry. American composers explored political themes expressed in these poems, as well as considering influences from popular music and extended tonalities. As more poetry emerged exploring once taboo themes, composers set these poems to express their own beliefs on topics such as race, war, sexuality, and poverty through their musical decisions. This poster argues that 20th century American composers used rhythm and meter to convey their political beliefs in art song. Rhythms and meter changes allowed composers to emphasize the poetry and create rhythmic motifs to represent political issues in America. The poster will include detailed commentary on songs by David Del Tredici, John Musto, David N. Baker, Margaret Bonds, Lori Laitman, and Ricky Ian Gordon.

Scarce Availability of Ethnomusicology in Collegiate Music Programs

Presenter: Kelsey Morris

Faculty Supervisor: Keith Clifton

Abstract: A study looking at the musicology and ethnomusicology requirements at the collegiate level. Ethnomusicology is an area of growing importance for modern musicians who are expected to portray diversity in their music selection, teaching practices, and post academic research. However, ethnomusicology and world music is underrepresented in collegiate music programs and therefore graduated musicians are underprepared for the professional world. Programs selected were from public doctoral/professional universities (Carnegie Classification) in Michigan, Indiana, and Ohio with schools of music covering music education and performance with a minimum of 10,000 undergraduate/graduate student enrollment. Programs were shown to have fewer ethnomusicology requirements compared to western music history requirements and often had more or only musicologists on faculty.



Musicians Mental Health and Solutions:

A Literature Review

Presenter: Cory Russell

Faculty Supervisor: Alan Gumm

Abstract: The purpose of this literature review is to identify statistics and findings in the found literature to showcase the ongoing mental health crisis that plagues musicians. Through numerous sources it is found that the three sub-types of musicians – that is university student, educator, and performer are all plagued by ongoing mental health diseases. There exist five solutions that all work on their own merit or can be combined to create a general solution plan to help these populations. Public awareness and acceptance of mental health diseases help to showcase the issue. Peer advocacy programs provide resources, guidance, and education on mental health diseases. Remission programs provide students and staff both an opportunity to learn to work with their diagnosis, while providing them a chance to enter the workforce post-graduation. Cognitive Behavioral Therapy (CBT) is a therapeutic way to provide relief of symptoms and general guidance on how to live with a mental health disease. Finally, a universal measurement system can be implemented to better guide researchers and individuals the progress of one’s recovery. These solutions should be researched further, as well as more studies on that of the music educator in order to further understand all the above populations and the prevalence of mental health disease that lies within them. Further research into sad moods is also required, in order to better understand the validity of the research to this point.

A Closer Look at a Conductor’s Movements:

A Literature Review

Presenter: Eric Strasshofer

Faculty Supervisor: Alan Gumm


Abstract: Musicians are injuring themselves, pushing the limits on what the modern musician can do. With an increased demand on production, technical skill, expression, and rehearsal schedules, the body of both professional and amateur musicians alike are bearing the brunt of this. Even more so, the data collected on this phenomenon is mostly about the players on the stage, not the conductors leading them. Conductors are integral parts to ensuring the cohesion and direction of an ensemble. There are many resources available to all musicians; while traditional medicine cannot always give musicians the answers they are looking for, solutions may lie in alternative medicine. Concepts like Alexander Technique, Feldenkrais Method, Laban Movement Theory, and Dalcroze Eurhythmics may have solutions for musicians and conductors alike to help prolong careers and keep up with the demands of modern music, all while giving practical solutions to upkeep on their bodies. The purpose of this literature review is to investigate these movement methods in the viewpoint of the modern conductor, looking for strategies and solutions to staying up on the podium.

Echoes in Clay

Performer: Melissa Navarre

Faculty Supervisor: Israel Davis

Abstract: Melissa is a senior in the Bachelor of Fine Arts in Studio Art program and an active member of the percussion studio at CMU. For her senior BFA exhibition, Melissa has been researching the connection between two very different art mediums: clay and sound. Melissa has made a series of ceramic drums and other percussion instruments for a program of percussion literature that she will perform in a recital. Her performance took place on April 14 @1pm in Chamichian Recital Hall at the School of Music. The performance was also live streamed on YouTube.





Sondheim and Minimalist Processes: A Brief Analysis of Sondheim Accompaniments

Presenter: Mario Sangret-Savalle

Faculty Supervisor: Tracy Watson

Abstract: Stephen Sondheim is a notable composer and writer, with significant contributions to the musical theater genre. His work has challenged many of the typical conventions established within the artform, and has continued to be revered by musicologists, directors, performers, and audiences alike. There is a significant body of scholarship available surrounding him and his work, and certainly an even greater amount of personal review and critique from the general public. There is, though, a lack of critical attention to Sondheim's personal, professional, and musical connection to the minimalist movement and the composers of the style. Sondheim did, after all, own multiple Philip Glass and Steve Reich records, and has often expressed a great admiration for Steve Reich's artistry. Even in Sondheim's self-established guiding principles for his compositions, he creates with the notion that, "less is more." There is a great deal of connection to the minimalist aesthetic, but little scholarship is being done to assess the qualities of Sondheim's compositions that connect his works to the style. Sondheim's usage of repetitive, ostinato-like figures, his creation of multiple-metrical processes, and the implementation of additive and subtractive processes within his accompaniments demonstrate this musical connection to minimalism.

Andy Akiho's Seven Pillars: Large-Scale Form in the 21st Century

Performer: Landon Schumacker

Faculty Supervisor: Marco Schirripa

Abstract: Andy Akiho's 2021 Pulitzer Prize-nominated percussion quartet, *Seven Pillars*, is a groundbreaking advancement in contemporary chamber music composition. While its unique timbres and mind-bending rhythmic landscape certainly set it apart aesthetically, its true power lies further beneath the surface. In a breathtaking 11 movements, Akiho has created on a massive scale a work of true musical innovation that holds certain implications for the world of contemporary art music. Outside of adding new standards to the percussion ensemble repertoire, its greater impact will be felt in the way it achieves large-scale formal cohesion in a new way. Multi-movement works with a similar length and scope of *Pillars* most likely draw from the harmonic and structural conventions of the symphonic tradition, propelled by compositional greats such as Beethoven and permeating the practice for hundreds of years. What is so eyebrow-raising about Akiho's magnum opus is that such a massive product is delivered with a lack of these conventions, while holding the same cohesion, nonetheless. In place of a strict harmonic/melodic framework and predictable forms, Akiho instead uses themes and motives that are purely rhythmic, and a palindromic macro structure to build his evening-length work. These innovations will pave the way for future composers and have an impact on how major-scale works will be approached.



Orpheus Brass Trio

Performer: Jake Crotteau

Co-Performers: Jacob Hamlin, Ainsley McCracken

Faculty Supervisor: Cole Bartels

Abstract: We will be playing music by American composers such as Arthur Meulemans' *Trio* and Gina Gillie's *Tango* from *Trio for Brass*.



Theater & Dance

"Music Box"

Choreographer: Isabella Silos

Dancers: Grace Curtis, Kyra Humphrey, Rhiannon Seiser

Faculty Supervisor: Heather Trommer-Beardslee

Music: "Darkwood", "Time Bomb", and "Time"; performed by Freshman Sound; composed by Semen Andreevich Chepukhalin

Description: "Music Box" is a fusion style dance about three haunted ballerinas that emerge from their music box to explore their surroundings and potential magical powers.

"Vessel"

Choreographer: Rhiannon Seiser

Dancers: Emma Gibbons, Kyra Humphrey, Myairra Jefferson, Isabella Silos, Aubrie Wolfe

Faculty Supervisor: Heather Trommer-Beardslee

Music: "The Hand" composed by Bruno Coulais, performed by Bruno Coulais, Laurent Petitgirard, and Hungarian Symphony

Description: The choreography includes inspiration from several genres of dance but is mostly a modern piece. The dancers move as if they have strings attached to their joints, like marionettes. This signifies circumstances in life that make it as though a person cannot act in the way they would like to; an outside force is pulling the strings. Everyone can have their own interpretation of who or what the "puppet master" is.

"Life"

Choreographer: Olivia Verduco

Dancers: Caroline Goodwin, Madi Rozema

Faculty Supervisor: Heather Trommer-Beardslee

Music: "Married Life" composed and produced by Michael Giacchino



College of Business Administration

Business Information Systems

The Path to a Successful Growth Stage as a Disruptive Firm

Presenter: Ava Mater

Faculty Supervisor: Shelly Bartosek

Abstract: This research aims to explore effective project selection methodologies contributing to the success of disruptive firms. Through a detailed case study of a disruptive firm, we conducted extensive interviews with key decision-makers. Our findings reveal that the subject firm employs a dynamic approach to project selection, attributing a portion of its success to this methodology. Despite the leaders' hesitancy to explicitly classify their firm as being in a growth success stage, they express confidence in their decision-making process facilitated by the dynamic approach. The firm appreciates the easily adaptable framework offered by this methodology, underscoring its role in their strategic choices.



College of Education & Human Services

Fashion, Interior Design & Merchandising

Proposing Guidelines for Calculating Energy Expenditure in Infants Aged 1-12 Months

Presenter: Richard Dankwa

Faculty Supervisors: Tanya Domina, Lauren Agnew

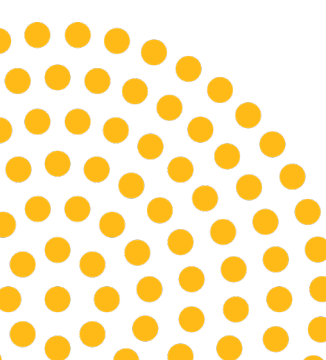
Abstract: This study investigates the metabolic energy generation per unit surface area in infants aged 1-12 months, with the aim of proposing guidelines applicable in determining temperature ratings for this demographic. By analyzing total energy expenditure (TEE) and accounting for energy needs for growth, the study extends the principle of calculating energy requirements to encompass infants in this age range. The findings contribute to a better understanding of energy expenditure dynamics in early infancy and offer insights for optimizing infant care practices, particularly in maintaining thermoregulatory balance.

Exploring Thermal Comfort of Textiles Utilizing Fibers From the Banana Tree

Presenter: Brady Pitcher

Faculty Supervisors: Tanya Domina, Lauren Agnew

Abstract: This study investigates the thermal properties of five different biodegradable banana tree-based fabric samples. Banana tree fabric, originating from centuries-old practices in the Philippines, has gained interest in Western markets for its minuscule environmental footprint. Furthermore, a societal shift has been seen in the current fashion climate, urging consumers to consider the lifecycle of their purchased products. Through this, the exploration of biodegradable fabrics has gained large attention, offering customers more sustainable alternatives to traditional materials. Currently these technical fabrics are integrated into bags, sneakers and furniture. Through this research the authors have found that some samples, particularly the ones with high air permeability and low weight, can also be applicable to next-to-skin garments and keep the wearer thermally comfortable. This research benefits the textile industry by providing insight into an alternative biodegradable fabric, contributing to the broader community goal of prompting sustainability and mitigating the negative impacts of textile production on the environment.



Human Development & Family Studies

How Do Students and Teachers Perceive Their School Climate and How Does This Affect Social Emotional Learning?

Presenter: Hannah Conner

Faculty Supervisor: Gina McGovern

Abstract: A safe and supportive school climate can reduce the negative effects of risk factors such as poverty and trauma and increase children's ability to regulate stress, therefore improving their social emotional health and academic capability (Darling-Hammond & Cook-Harvey, 2018). The primary aim of this project is to explore teachers' and students' perceptions of their school climate and how social emotional learning is supported at one particular midwestern school in the United States of America. Broadly, we want to know whether and how social and emotional learning fosters a positive school climate. By performing a Reflective Thematic Analysis study (Braun & Con School and Community Pathways to Engagement (SCoPE) interview data, we have been able to code key phrases that display the influence teacher and student perceptions on school climate had on this particular school. So far we have identified significant importance to concepts such as student and teachers ability to regulate emotions, student's ability to express themselves at school, how safe the school is identified to be, the way conflict is managed, and the specific values, strategies, and challenges of teachers as they pertain to the overall climate of the school. This data will provide noteworthy information regarding the way that the environment instilled within a school system can impact students and teachers and their social emotional wellbeing and what measures need to be taken to improve the education system.

Navigating to Justice:

How Youth Programs Support the Positive Development of Black Youth

Presenter: Michyah Jones

Faculty Supervisor: Gina McGovern

Abstract: Black youth in the United States face systemic racism perpetuating psychological and physical harm. Despite this, many exhibit several strengths and resilience. Research highlights the importance of strong racial-ethnic identity and critical consciousness in mitigating these effects. Out-of-school programs play a crucial role in fostering these qualities, providing safe spaces for reflection, connection, and action. Through culturally relevant content and activities, these programs empower youth to explore their racial identity, historical injustices, and their role in shaping a more just future. Our findings specify research-backed recommendations for enhancing out-of-school programs to support positive Black youth development.



Master of Science in Administration

The Impact of Organizational Structure on Communication and Job Satisfaction in the Automotive Manufacturing Sector

Presenter: Dayanitha Jammula

Faculty Supervisor: Abby McGuire

Abstract: Organizational structures play a critical role in shaping communication dynamics and influencing job satisfaction within the automotive manufacturing sector. This study aims to explore the intricate relationship between organizational structures, communication patterns, and employee satisfaction, with a focus on the automotive industry. By analyzing existing literature and empirical research, the study seeks to elucidate the mechanisms through which organizational structures impact communication effectiveness and employee morale in automotive manufacturing settings. The research delves into various aspects of organizational structures, including hierarchical models, departmental configurations, and decision-making processes, to assess their implications for communication flows and job satisfaction. Additionally, the study examines the role of leadership styles, organizational culture, and technological advancements in shaping communication dynamics within automotive manufacturing companies. Through a comprehensive analysis, the study aims to identify potential barriers to effective communication and avenues for enhancing job satisfaction among employees. The mediating effects of communication on the relationship between organizational structures and job satisfaction in the automotive manufacturing sector. By scrutinizing the interplay between structural elements, communication channels, and employee perceptions, the research seeks to provide insights into strategies for optimizing organizational structures to promote open communication and foster greater job satisfaction. The findings of this study are expected to contribute to the body of knowledge on organizational behavior within the automotive industry and offer practical implications for managers and leaders seeking to improve communication effectiveness and enhance employee satisfaction in manufacturing environments.

Breaking Barriers in IT Project Management:

Unveiling the Impact of Diversity and Inclusion on Team Dynamics and Organizational Success

Presenter: Sravani Tathikonda

Faculty Supervisor: Abby McGuire

Abstract: This project explores the profound impact of diversity and inclusion (D&I) on IT project management, emphasizing how D&I enhance team dynamics and contribute to organizational success. Through empirical evidence, theoretical insights, and examples from leading companies like Google, it illustrates the benefits of a diverse and inclusive workforce. The research underscores leadership's critical role in fostering D&I within organizations, showcasing case studies and personal narratives to highlight D&I as strategic assets essential for competitive advantage in the digital era.



A Novel Way to Improve Work-Life Balance is the 4-Day Workweek

Presenter: Sherly Nandha

Faculty Supervisor: Abby Mcguire

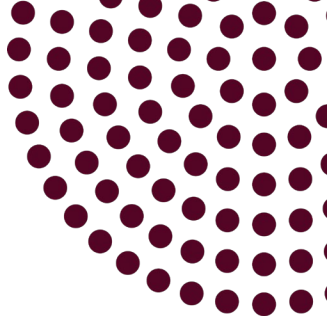
Abstract: Although the traditional 5-day, 40-hour workweek has been the norm for many years, several companies are now experimenting with 4-day compressed workweeks in an effort to improve productivity and work-life balance. This paper uses a SWOT analysis to examine the possible advantages and disadvantages of switching to a 4-day workweek. It identifies advantages like better wellbeing and more schedule flexibility as well as disadvantages like difficulties coordinating and the possibility of overwork. The analysis presented in this paper informs tactics that can facilitate the successful implementation of the 4-day workweek while optimizing outcomes. These strategies center on innovation, organizational agility, and employee-centricity. It is advised that leaders receive change management training, adopt an iterative strategy with strong employee feedback loops, use technology to facilitate new workflows, expressly encourage continuous experimentation and innovation, and create performance metrics that are output-driven. 4-day workweeks can have a lot of benefits when implemented carefully and prioritize flexibility, adaptability, and employee empowerment, according to this research. Companies can increase productivity while workers can strike a better balance between work and personal obligations. The shortened timetable does, however, also bring with it more workload, coordination, and cultural issues that need to be carefully addressed.

Exploring the Impact of Intercultural Communication on Workplace Conflict Resolution in the Aerospace Industry

Presenter: Bhargavi Sanjamolla

Faculty Supervisor: Abby Mcguire

Abstract: In the dynamic landscape of the aerospace industry, the intricate relationship between culture, communication, and conflict resolution plays a pivotal role in shaping organizational dynamics. This relationship is complex, influenced by a myriad of factors ranging from organizational culture to individual communication styles and cultural backgrounds. In this exploration, we delve deep into understanding these factors and their implications for conflict resolution within aerospace organizations. At the core of effective conflict resolution lies an understanding of organizational behavior principles. Organizational culture, often considered the backbone of any institution, sets the tone for employee interactions and decision-making processes. Within the aerospace industry, where precision, safety, and innovation are paramount, organizational cultures tend to prioritize collaboration, adherence to protocols, and continuous improvement. However, the multicultural nature of aerospace teams introduces layers of complexity, as cultural differences can lead to varying interpretations of these norms and values. Misunderstandings or misinterpretations can escalate into conflicts if not addressed effectively.




Optimizing Project Performance in Manufacturing: A Comprehensive Analysis of Agile Project Management

Presenter: Karishma Shaik

Faculty Supervisor: Abby Mcguire

Abstract: This paper explores the critical role of strategic decision-making in optimizing project performance through agile methodologies in the manufacturing sector. By defining strategic decision-making as a systematic process aligning project objectives with broader business strategies, the paper underscores its significance in navigating complexities and uncertainties inherent in manufacturing projects. Drawing from real-world examples and case studies, it demonstrates how strategic decision-making integrates into agile project management, facilitating responsiveness and innovation. The paper identifies key performance indicators (KPIs) and factors influencing project performance, offering strategies for success in agile project management. Additionally, it examines the advantages and challenges of adopting agile methodologies in manufacturing, emphasizing the need for a cultural shift, effective resource management, and regulatory compliance. Furthermore, the paper discusses a global-level strategy for optimizing project performance in manufacturing, highlighting market expansion, supply chain optimization, localization efforts, and global branding. A SWOT analysis identifies strengths, weaknesses, opportunities, and threats associated with implementing agile project management in manufacturing.





Teacher & Special Education

How Short-term Irish Placements Influence American Teacher Education Students' Thoughts about Teaching

Presenter: Amyah Seybert

Faculty Supervisor: Shane Cavanaugh

Abstract: Study abroad has been a popular experience for college students over many years and is not slowing down (Gielten, 2012). Many employers have seen a trend on overall transferable skills from students who participated in a study abroad when entering the workforce; including problem-solving, adaptability and diverse thinking (Franklin, 2010; Mulvaney, 2017; Tobianah, 2010). However, there is little research on how studying abroad with pre-service teaching experiences has influenced teacher education students' attitude/interest towards teaching, teaching strategies or techniques, and overall mindset toward the field of teaching. This research aims to answer this question by a review of the literature surrounding the outcomes of teaching-based study abroad programs and through interviews with five teacher education students who participated in the May 2023, faculty-led Ireland program. These interviews will look for common themes in how teaching experiences while studying abroad have affected teacher education students. The findings from this research can further our understanding of the outcomes of study abroad programs and potentially encourage teacher education students to join study abroad programs that focus on teaching experiences.

Critical Aspects of Letter-Based and Alternative Grading Styles and Student Stress

Presenter: Kristian Reeb

Faculty Supervisor: Natalia Collings

Abstract: This study was organized and designed in order to see if there is any association between high stress levels and aspects of the A-E/F letter grading system used in the majority of classrooms across the country that are often deemed traditional (e.g., rigidly determined, non-negotiable, and punitive criteria for evaluation). This research will be conducted by issuing a short survey to two different groups of students. The first group of students that will be evaluated using this survey are students who have specifically taken a class that relied on criteria-based evaluation designed to enable improvement through revisions and gradual progress, and ask them how their stress levels while taking that class compared to stress levels in classes with more traditional grading policies. The second group of students will be honors students who are not expected to, but may have experiences with alternative grading styles. The anticipated results are that students who were in classes where letter grades were not used or not heavily emphasized, would feel less stress. This would present the idea that traditional letter-based grading could be in need of reform if it causes too much stress for students. Educators, both current and future, may want to be privy to the results of this study, as creating a classroom environment that provides minimal stress for students with maximum effort and output should be desired.



Where is Play Present in a Primary Mathematics Classroom?

Presenter: Shelby Woods

Faculty Supervisor: Tracy Donohue

Abstract: This study sought to understand the extent of playful mathematics learning in elementary schools through an observational study in a second-grade classroom in a Midwest city. Data was obtained through handwritten notes, recordings, photographs, and a teacher interview. Observations were analyzed using the five elements of play-based learning: joy, engagement, social interaction, meaningful learning, and iteration. This qualitative data provided insight into how playful learning was evident and what role it takes in the primary mathematics classroom. Additionally, this data uncovered the challenges educators face in delivering mathematics content to students, which may hinder opportunities for playful learning. After careful study of the data, it appears that playful learning may never appear complete in mathematics lessons, but it can be found in fragments of everyday math instruction.

Picture This:

Enhancing Learning Through Visual Communication With Students From Various Settings

Presenter: Abby Camara

Co-Presenter: Haleigh Marshall

Faculty Supervisor: Holly Hoffman

Abstract: This session will examine the benefits of visual communication and ways that it enhances learning experiences for students of differing ability within various educational settings. We will discuss current research on the technique, describing ways we have utilized different forms of visual communication within multiple settings to foster student learning.

Early Childhood Education Professionals Perceptions of Their Professionalism in the Field

Presenter: Caryn Wenban

Faculty Supervisor: Holly Hoffman

Abstract: This project seeks to examine the needs, challenges, and barriers faced by early childhood education professionals. This mixed methods study included surveys of early childhood teachers and explored teacher seasonality, preparation, values, and well-being in regard to improving teaching conditions in early childhood learning environments. The project extends the literature on the issues of teacher support and provides further insights into how teachers view the needs of early childhood education professionals today. Qualitative data through survey questions with early childhood professionals to examine their professionalism in their field highlights information on the needs and challenges faced by early childhood educators. This study also includes an examination of how early childhood educators' needs can be more adequately met and supported through professional development, additional support, access to resources, and recognition.

Keywords: early childhood, teacher seasonality, teacher preparation, teacher values, teacher well-being.

Driving Performance With PMERG–A Guide to Improve Achievement and Retention

Presenter: Susan Sobehrad

Co-Presenters: Breanna Naglich, Laura Nicole Miller

Faculty Supervisor: Ray Francis

Abstract: The Participation-Motivation-Engagement-Retention Guide (PMERG) suggests a research-based approach to teaching and learning that synthesizes four elements of successful educational experiences into a teaching and learning model that facilitates student success. Leveraging the components of PMERG has the potential to alleviate apathy and disengagement for students in order to promote retention in online and blended learning environments, and promotes effective technology integration, as a means to create positive learning experiences. The PMERG model is explored through the lenses of three personae: a first-generation college student, a student with a social-emotional learning deficit, and an instructor experiencing difficulties in retaining online students. Participants will be invited to engage with this model and think through activities designed to drive participation, motivation, and engagement, in order to improve student outcomes and increase student retention. Presenters will: 1) Define the four core components of the PMERG model and explain how they are related to student and educator retention in online and blended learning environments; 2) Explain how participation, motivation, and engagement interact to drive achievement; and 3) Illustrate use of the PMERG model to develop to meet achievement and retention goals.



College of Health Professions

Communication Sciences & Disorders

Assessing Accessibility for Deaf and Hard of Hearing Individuals Within Mid-Michigan

Presenter: Makayla Nehrt

Faculty Supervisor: Kendra Miller

Abstract: The purpose of this study was to assess levels of accessibility for Deaf and hard of hearing individuals within public establishments in the mid-Michigan community. 50 people participated in a study that asked questions for current or past employees of public establishments in the mid-Michigan community. Questions focused on whether or not employees had proper training on accommodations and employee comfort levels in communicating with the Deaf community. In addition, A survey was conducted with a Deaf member of the community to gain perspective on the experience of a Deaf individual and how they feel when communicating with employees. Survey responses showed a large majority of employees not having training or knowledge on how to communicate with Deaf individuals. The interview results confirmed that while some people do a good job of communication, there is still a lot of room for improvement. Overall, results show that while the community shows a desire to learn more, there is much room for improvement in accommodations. Based on the results, it seems as though one of the most important things to change is providing increased training to employees on how to effectively and appropriately communicate with the Deaf community.

Combined Effects of High-Frequency Hearing Loss, Fitting Formula, and Venting on Real-Ear Sound Level and Patient Perception

Presenter: Amanda Brown

Co-Presenter: Paige Hunter

Faculty Supervisor: Yunfang Zheng

Abstract: This study investigated how acoustic options & fitting formulae affect hearing aid fitting for high-frequency hearing losses (HFHLs). We (researchers) tested various configurations on Kemar and with actual participants with different HFHL configurations. We used 14 earpiece options and three fitting formulas, collecting both objective measurements (sound levels in the ear canal) and subjective feedback (participant preferences) for nine different hearing loss scenarios. The results revealed that the severity of hearing loss, the type of earpiece, and the fitting formula all significantly impacted sound levels and how well people could hear. Participants with HFHL perceived sounds differently than those with normal hearing. These findings suggest the need for improved fitting guidelines for HFHL, as participants generally preferred settings with less loudness and earpieces allowing for more natural sound, with individual preferences varying. Further information is forthcoming for improved fitting with HFHLs.



Comparison of Hearing Devices: OTCs, PSAPs, and Prescription Hearing Aids

Presenter: Elyse Kady

Co-Presenter: Kady Krzeminski

Faculty Supervisor: Yunfang Zheng

Abstract: This research study aims to compare the acoustic fit and personal perceptions of Jabra Enhance over-the-counter (OTC) hearing aids, SONY CRE-E10 OTC hearing aids, and AirPods Pro earbuds programmed to function as both OTC hearing aids and personal sound amplification products (PSAPs) by assessing the output of each device across different frequencies using real-ear measurements and speechmapping, and having each participant fill out a personal perceptions questionnaire. The goal of this study is to gain a better understanding of popular devices that are currently on the market in 2023 that are advertised as a more cost-effective alternative for prescription hearing aids. By measuring the output of the devices compared to a prescription hearing aid recommended by audiologists and assessing the personal perceptions of each device, the overall effectiveness of these devices can be analyzed. The results from this study would help hearing health care professionals better understand modern OTC and PSAP devices and how they compare to prescription hearing aids. Additionally, results from this study would help people with mild to moderate hearing loss that need hearing aids and are trying to decide whether OTC hearing aids, PSAPs or traditional hearing aids are the right choice for them.

Comparison of Acoustical and Perceptual Outcomes between the ActiveVent™ and Standard Receivers

Presenter: Taylor Zeller-Gerten

Faculty Supervisor: Yunfang Zheng

Abstract: This study investigated the clinical differences between the ActiveVent™ and standard receivers. Sections of software simulations, real ear measures on Kemar, and objective and subjective measures on participants were completed using five groups of high-frequency sensorineural hearing losses. Results revealed more gain, maximum gain before feedback, microphone directionality, but relatively less speech enhancer feature for AVclosed than open conditions. Kemar results confirmed the possible leaking energy from the opening, using speech enhancement features for AVclosed, and change in feedback curves. Results from participants showed no advantage of ActiveVent™ compared to standard receiver in noise for the groups of moderate, moderately-severe and severe losses, but there were about 10% higher word recognition scores with the ActiveVent™ compared to the standard receiver for both groups of normal hearing and mild losses.



Caring for Patients With Dementia in Nursing Homes: An Analysis of Employee Focus Groups

Presenter: Rebekah Stanley

Faculty Supervisor: Natalie Douglas

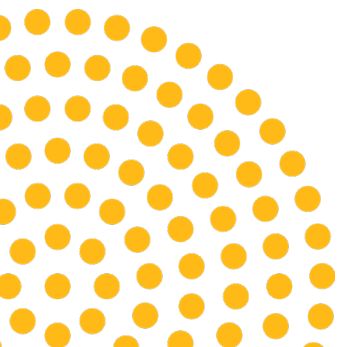
Abstract: Dementia is a widespread and deadly syndrome, affecting between 3.7 and 5.8 million individuals in the United States and 37.8 to 51.0 million people globally (National Academies of Sciences, Engineering, and Medicine, 2021). It is very difficult to care for people living with dementia due to the combination of cognitive, behavioral, and motor deficits that may occur. This project will seek to further understand perspectives of nursing home employees caring for people living with dementia in 3 communities in California through the analysis of employee perspectives. After a detailed literature review, deidentified transcripts from six focus groups were analyzed according to themes. The results will further be presented publicly at SCREE on Central Michigan University's campus.

Fitting Formula Effects on Hearing Aid Fitting for Different Degrees and Configurations of Hearing Losses

Presenter: Yara Ayoub

Faculty Supervisor: Yunfang Zheng

Abstract: This study investigated the acoustical and perceptual effects of fitting formulae on hearing aid fitting. Software simulations and real ear measurements (REMs) on KEMAR were completed on flat, rising, and sloping hearing losses (HLs). Each configuration included four degrees of HLs and 20/25 sub-configurations for each rising/sloping loss. REMs and perceptual responses from NH listener were completed for simulated mild HLs. Results showed significant impact of fitting formula on gain, output, and perception. Further effects of multiple aspects were reported. Recommendations regarding appropriate fitting formula selection for different HLs were discussed providing insights for better hearing aid fitting outcomes.



Exercise Physiology

The Rehabilitation of a One-Year-Old Male Diagnosed With Left Hemiplegic Cerebral Palsy

Presenter: Karli Gasta

Co-Presenters: Alexa Michels, Julie Jacoby

Faculty Supervisor: Roop Jayaraman

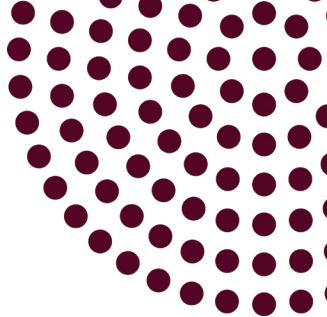
Abstract: Cerebral Palsy (CP) comprises a spectrum of disorders arising from impaired brain development, commonly diagnosed within the first two years of life, resulting in motor disabilities and potential developmental delays. This case study aims to assess the impact of early Physical Therapy (PT) intervention on children with Cerebral Palsy, focusing on resolving existing and preventing future developmental delays. This case study examines the influence of early PT intervention on a male patient diagnosed with Left Hemiplegic Cerebral Palsy at seven months old, exploring the effectiveness of therapeutic interventions in addressing developmental delays. The subject, born prematurely, received seven months of PT intervention. Initial assessments revealed developmental delays in locomotion, range of motion, and posture, with specific goals established for achieving milestones. The subject engaged in therapy interventions facilitating progress toward established goals. Post-discharge, the patient continued home interventions, demonstrating progress by achieving initial goals, walking independently, and receiving continued Speech Therapy for swallowing and verbal communication. The family has been educated on recognizing signs requiring further therapy, and the patient is scheduled to return to PT if future developmental delays arise. This case underscores the positive impact of early diagnosis and intervention on patient outcomes.

The Effect of Physical Activity Prior to Group Therapy for Substance Use Disorders on Mood and Mental Health

Presenter: Katherine Sunday

Faculty Supervisor: Micah Zuhl

Abstract: The study found that brief exercise sessions before mindfulness-based relapse prevention therapy (MBRP) sessions improved mood states in individuals undergoing substance use disorder aftercare. Activities like walking, yoga, and breathing exercises led to significant reductions in anxiety and increases in liveliness and happiness, particularly on the first and second days. However, there were no significant changes in overall mental health over the 10-week period, and differences between the exercise group and the control group were not observed. This suggests that while exercise may enhance mood in the short term, its effects on mental health may diminish over time. Nonetheless, integrating exercise into therapy sessions could potentially improve engagement with therapeutic practices.



An Analysis of Exercise Advice and Habits during Pregnancy: What Do Women Hear and Do?

Presenter: Lexi Houk

Co-Presenter: Hannah Ewing

Faculty Supervisors: Rachael Nelson, William Saltarelli

Abstract: Pregnancy can result in serious health complications for the mother and child, and the risk of such complications increases with excessive maternal weight gain and obesity. However, few pregnant women achieve the recommended amount of exercise. Although OB/GYNs report recommending exercise, it's unclear whether pregnant women are receiving or understanding this information, which may be why so few meet current exercise guidelines. The purpose of this research was to examine what exercise advice pregnant women receive from their OB/GYNs. Participants were recruited via social media platforms, word of mouth, and from flyers sent to 200 pediatric clinics across the U.S. The survey consisted of 27 questions concerning participant demographics, clinician exercise advice, attitude toward exercise during pregnancy, and exercise behavior. 65% of respondents reported that their OB/GYN encouraged them to perform regular exercise during their pregnancy, and 62% reported that they felt supported by their OB/GYN to exercise. However, only 29% of respondents reported that they were given advice on modifications to make exercise easier/safer, 27% reported receiving pregnancy and exercise educational materials, and 2% reported that their OB/GYN prescribed a personalized exercise plan. While most women appear to be receiving encouragement from OB/GYNs to exercise during pregnancy, pregnant women may need further guidance concerning physical activity in order to increase exercise engagement.

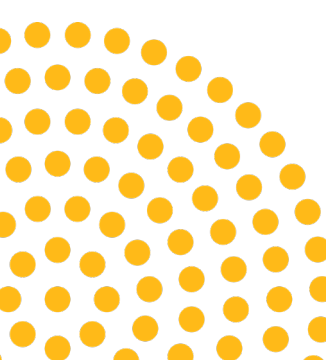
The Effect of Hot Yoga on the Acute Changes in Blood Glucose and Blood Pressure Levels in Hyperglycemic Adults

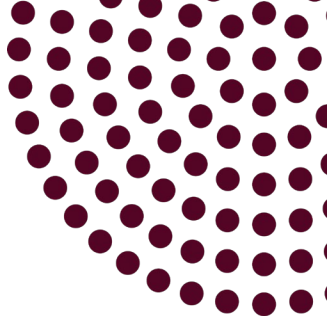
Presenter: Megan Harris

Co-Presenter: Liam O'Brien

Faculty Supervisor: Rachael Nelson

Abstract: Nearly a third of the U.S. population suffers from hyperglycemia, and unfortunately poor glucose control has been linked to the onset and/or progression of other chronic diseases and conditions. While lifestyle interventions like heat exposure and yoga exercise have been shown to independently improve glycemic control and other health markers among hyperglycemic adults, their combined impact on health remains unknown. The purpose of this study was to examine the health benefits of yoga exercise training performed in a thermoneutral vs. hot environment among hyperglycemic adults. Nine hyperglycemic adults, who were previously sedentary participated in this investigation. Participants were randomized to complete 1 hour of yoga, 3 days/week, for 8 weeks in either a thermo-neutral or a hot environment. Blood glucose and blood pressure were measured before and 5 minutes after each individual yoga session to determine average acute responses to yoga exercise. There was a trend for average blood glucose to be lower from before to after exercise, but no significant difference between groups at any timepoint. No significant differences were detected in systolic or diastolic blood pressure between groups or from pre- to post-exercise. Two months of low-to-moderate intensity yoga exercise training does not appear to be sufficient to elicit meaningful improvements in blood glucose or blood pressure levels regardless of the environment yoga is performed in (i.e., hot or thermoneutral).





Influence of Incremental Increases in Accumulated Steps/Day on Prevalence of Metabolic Syndrome in Overweight vs Obese Individuals

Presenter: Zachary Houslander

Co-Presenter: Allyson O'Grady

Faculty Supervisors: Rachael Nelson, William Saltarelli

Abstract: Metabolic syndrome (MetS) is a cluster of risk factors that increase risk of developing cardiometabolic diseases. Over 1/3 of U.S. adults have MetS, including ~25% and 50% of overweight and obese adults, respectively. Components of MetS are treatable through regular exercise, however <30% of U.S. adults meet aerobic exercise guidelines. Alternatively, a sufficient amount of daily living steps may be able to reduce MetS. Purpose: To determine number of steps/day associated with reduced prevalence of MetS in overweight vs. obese individuals. Methods: A cross-section study design was used to evaluate prevalence of MetS in overweight vs. obese individuals. 62 overweight (BMI: ≥ 25 kg/m²; n=22) or obese (BMI: ≥ 30 kg/m²; n=40) adult (age: 40.5 ± 14.0 years), non-exercisers participated. Each participant wore an accelerometer to determine average steps/day over three days. Average steps/day were stratified into categories of <2,000 steps/day, up to >10,000 steps/day. MetS was determined by presence of ≥ 3 components. Results: 4.5% of overweight individuals and 47.5% of obese individuals had MetS. Minimal prevalence of MetS was seen in overweight individuals, while obese individuals showed reduced prevalence of MetS at >10,000 steps/day. Conclusion: Accumulating $\geq 10,000$ steps/day is associated with reduced prevalence of MetS in obese, non-exercising adults. Weight maintenance should be encouraged to reduce prevalence of MetS in overweight, non-exercising adults.


Osmolarity of Commercially Available Hydration Drink Mixes

Presenter: Kaleigh Hendricks

Co-Presenter: Christiana Donkor

Faculty Supervisor: Micah Zuhl

Abstract: Hydration beverages play a pivotal role in maintaining fluid balance, replenishing fluids and electrolytes depleted during physical activity and dehydration. Commercially available powdered hydration beverages specifically have gained increasing popularity over the last few years for their convenience and portability. Each product claims elevated hydration capabilities, however, these exact hydration measures are not required to be stated on a standard nutrition label. The purpose of this study was to investigate the osmolarity of commercially powdered hydrating drinks currently sold on the market. Methods. A total of 9 different brands were selected for analysis. Sample preparation was standardized across all products. Powders were mixed according to manufacturer specifications and stirred constantly for two minutes on magnetic stir plate. Osmolarity was measured in triplicate using an osmometer (Advanced Instruments), and recorded. Results. One commercially available product (DripDrop) has been tested. The mean osmolarity was 232 ± 3 mOsm. The remaining products will be tested and reported. Conclusions. In addition to emphasizing the significance of taking osmolarity into account when selecting powdered hydration beverages for rehydration, this study could help shape future guidelines for beverage formulation.



Health Administration

Comparing Healthcare in the United States and Other Countries: Social Media Commenters' Perspectives on Health Systems in High-income Countries

Presenter: Elise Bratton

Co-Presenters: Sarah Dusa, Rodina Bizri-Baryak

Faculty Supervisor: Lana Ivanitskaya

Abstract: Healthcare consumers often criticize the United States (U.S.) healthcare system and call for its reform. Few U.S. residents have experiences with single-payer, and universal healthcare systems abroad, often cited for healthcare systems comparisons. Digital platforms foster global healthcare discussions, enabling exchanges between those with insight into the U.S. healthcare system and at least one other system abroad. To find these unique informants, we analyzed 7,704 posts to two YouTube videos about global health systems. We identified more than a hundred comments about health system comparisons by YouTube users from Canada (28%), U.K. (18%), Germany (13%), Australia (10%), Japan (3%), and other countries. These unique informants offered comparisons based on their first-hand domestic and international health encounters or second-hand knowledge through relatives or friends. They compared health systems on costs (procedures, medications, devices), access to healthcare, wait times, and quality of care. The U.S. system is viewed as less effective, mainly due to its higher costs. This perspective is reinforced by the U.S.'s lower life expectancy of 78.5 years, against longer life spans in Japan (84.2 years), Australia (82.7 years), Canada (81.9 years), and the UK (81.3 years). Despite criticisms, some aspects of the U.S. healthcare, such as shorter wait times and quality of care, were praised.

Health Studies That Rely on Data From Social Media Platforms: The Research Landscape

Presenter: Hannah Johnston

Faculty Supervisors: Lana Ivanitskaya, Elina Erzikova, Rodina Bizri-Baryak

Abstract: Since 2008, many scientific disciplines have recognized social media as a cost-effective, rich source of health-related data on worldwide populations. Our aim is to understand social groups and topics studied by health researchers who use data from social media platforms. From 13,080 studies on social media and health in the Web of Science database, we selected 5,000 articles from journals with the highest impact factors. If a journal had more than 100 articles, we picked the 100 most cited articles, extracted terms from their titles and abstracts using AI, and built a term co-occurrence map in VOSviewer, a bibliometric program by Leiden University researchers. To reduce redundancy in terms, a thesaurus was used. The map clusters terms based on their tendency to be used together across many studies' titles/abstracts. The map revealed several social groups and topics: adolescents and college students (mental health, social media use), young women (food intake, body image), social media influencers (marketing), health workers (vaccination), in addition to demographic and diagnosis-specific population groups. Mental health was the most salient research direction but social media studies also focused on vaccine misinformation, marketing and consumption of tobacco products. Health researchers used data from the following platforms: Twitter, Facebook, YouTube, Instagram, Snapchat, and TikTok. Our study summarized past research directions and opportunities for further research.



An Interactive Interface for Age-Adjusted Stroke Risk Estimation

Presenter: Shravan Kumar

Faculty Supervisor: Dimitrios Christos Zikos

Abstract: The study investigates stroke incidence using a dataset of 5,111 patient cases from Kaggle.com. A logistic regression model was developed to analyze demographic and clinical factors associated with stroke risk. Results indicate age, hypertension, heart disease, diabetes, and smoking significantly increase stroke likelihood. An interactive web interface allows users to input demographic data and explore stroke probabilities over time, facilitating lifestyle change visualization. The study aims to motivate patients to mitigate stroke risk through improved lifestyle choices. Future research plans include incorporating additional clinical and lifestyle factors into the model.

Analyzing the Efficacy of Automated Gender Detection When Applied to YouTube

Commentaries on Highly Gendered Topics:

A Methodological Approach and Validation Using Gender-API

Presenter: Rodina Bizri-Baryak

Faculty Supervisor: Lana Ivanitskaya, Elina Erzikova

Abstract: YouTube's role in facilitating political discourse, exemplified by discussions on Roe v. Wade's repeal, underscores its value for qualitative research despite challenges in accessing commenters' demographics. This study compares Gender-API's effectiveness against manual coding in gender identification from YouTube comments on Roe v. Wade, employing Netlytic to gather 28,693 comments, narrowing down to 485 with potential gender indicators. The comparison, based on Cohen's κ , showed a moderate agreement ($\kappa = .577$), validating Gender-API's reliability for gender estimation in social media analysis. Gender-API achieved 77.8% accuracy with an F1 score of 79%, illustrating its utility in understanding gender perspectives in online discussions. These results highlight Gender-API's potential in gender-based analysis, emphasizing the need for accuracy in demographic estimations for comprehensive analyses and policy-making.

Combating DEI Structures:

A Tale of Black Women's Journey's in Healthcare Leadership

Presenter: Cartyea Mathies

Faculty Supervisor: Steven Berkshire

Abstract: This research examines challenges faced by Black women in healthcare leadership, addressing historical stereotypes and systemic barriers. Interviews with 25 Black women leaders reveal persistent challenges influenced by biases. Despite obstacles, strategic mentorship and sponsorship play transformative roles in overcoming barriers. Critical Race Theory is applied to deconstruct historical impediments. The study emphasizes the urgency for proactive measures, advocating for mentorship programs and cultural shifts within healthcare organizations. It underscores the need to move beyond symbolic gestures towards genuine equity and inclusion. The findings stress the potential of Black women leaders to positively impact healthcare outcomes and contribute to a more equitable future.



The Impact of the Behavioral Risk Factor Surveillance System on Research: A Bibliometric Review

Presenter: Chanell Hana

Faculty Supervisor: Lana Ivaniskaya

Abstract: A systematic literature review using bibliometric methods was conducted to study research output from the CDC's Behavioral Risk Factor Surveillance System survey. Extending the findings of a 2015 study by Khalil and Crawford; new studies and methods were applied. The Web of Science (WoS) identified BRFSS articles and terminology; 3,794 publication records had BRFSS in article titles, abstracts, or keywords. VOSviewer's visual of bibliometric networks for keywords and terms extracted from titles and abstracts allowed for custom overlays to illustrate BRFSS publication recency, funding, scientific impact, and scientific contributions to the U.N.'s Sustainable Development Goals (SDG). The keyword co-occurrence network revealed the multidisciplinary nature of BRFSS-enabled research outputs. Over 50% of BRFSS studies were categorized in the Public Environmental Occupat. Health research area. Mental health and gender identity concepts were more recent than studies on weight loss, physical activity, alcohol consumption, and cancer. Authors listed funding for 45% of studies; funding and research impact did not always overlap. Well-cited studies on mental health topics were funded at a lower rate than other less cited topics. Sexual orientation research received above-average funds and was well-cited. BRFSS studies addressed 14 of the 17 SDGs. This study quantified the CDC's BRFSS contribution to multiple sciences, showcasing BRFSS impact. It can also be used to allocate funding to highly cited.

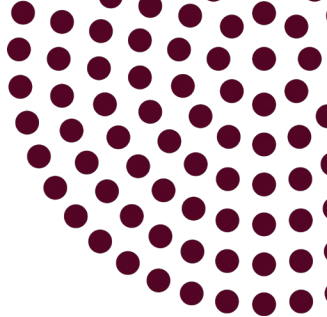
A 2024 Public Discourse on the Affordable Care Act: An Analysis of YouTube Comments

Presenter: Teresa McKelvy

Co-Presenters: Jennifer Mongeau, Jennifer Garman, Kristyn Green

Faculty Supervisor: Lana Ivanitskaya

Abstract: Social media's pervasive role in daily life provides a unique avenue for understanding public sentiments. The Affordable Care Act (ACA), enacted in 2010, is a pivotal healthcare reform that has generated both support and opposition. Existing literature highlights the need for more research on public opinions expressed on social media platforms. To explore current public opinions on the ACA and this health policy's political implications, we analyzed publicly available social media comments posted in response to an ACA-related video uploaded to YouTube by MSNBC in January 2024. The selected video, uploaded by MSNBC, had 224,000 views, 3,000 likes, and 2,593 comments. Netlytic retrieved 1,949 comments, with rigorous inclusion criteria ensuring a comprehensive dataset. A qualitative analysis of YouTube comments elicited by an MSNBC video was conducted. We gathered 1,949 comments using Netlytic. Inclusion criteria ensured relevance, depth, and diversity. This study is based on a thematic analysis of frames. Based on a coding framework derived from Semetko and Valkenburg's frames, we analyzed comments from the perspective of responsibility, human interest, and economic consequences frames.



YouTube Social Media Analysis: Influence of Social Media on Effective Policy Solutions for U.S. Healthcare Reform

Presenter: Hayley Schroeder

Faculty Supervisor: Lana Ivanitskaya


Abstract: This analysis provides insight into prevalent themes and widely held perceptions by social media users who commented on issues surrounding the U.S. healthcare system in response to “What Does US Healthcare Look Like Abroad | NYT Opinion” video by The New York Times. This video was uploaded to YouTube platform on April 28, 2021, and has over 1 million views. For the study we utilized data from 6,594 video comments, of which, solutions for healthcare reform were derived from discourse. The data which included original comments and replies were coded by two independent coders who achieved a moderate agreement (Cohen’s kappa of .503). Utilizing qualitative coding of 6,594 posts, the analysis led to the identification of the following: solutions by type focused on policy change and regulation, political change, changing public opinion or awareness, or allocation of taxes were identified in 214 original comments from participants. Posts presenting a solution scored higher on analytic language than posts without a solution, $t(233.70) = 2.82$, $p = .005$, $d = .166$, 95% CI [1.70, 9.62]. These findings may be useful for researchers, policymakers, and politicians who seek to understand public expectations regarding reform of the U.S. healthcare system. Our findings underscore the need for ongoing evaluation of the U.S. healthcare system by monitoring public perceptions and support for change.

Health Care Access in African Country

Presenter: Lasya Priya Dande

Faculty Supervisor: Abby Mcguire

Abstract: This project is based on how the African country gets access to health care with the help of proper leadership.





Public Health

Overdose Awareness for College Students

Presenter: Lauren Revord

Co-Presenters: Marian Avila, Caroline Hefner, Abigail Hewitt, Madison Lake

Faculty Supervisor: Beth Boman

Abstract: Overdose is a word that is often used in today's society; however, it is not very well understood. This topic is important and relevant as there is an overdose epidemic in Michigan. Our study aims to alleviate many of the misconceptions regarding overdoses and focus on the educational component that is lacking in today's conversation. We created a video that combines facts, procedures, and resources based off preexisting research. Previous studies have been conducted to show that the more sensory components you can combine when learning the higher the chance of retention is (Loma Linda School of Medicine, n.d.). This is why we chose to make a video which combines both visual and auditory modalities with the hope of increasing retention of information. Previous research stated there is a significant increase in long-term knowledge on this topic after overdose education and Narcan distribution trainings were conducted. All research provided positive results based off of testing completed before and after the training (Razaghizad, A. et. Al, 2008). Our study used similar principles with a pre survey and post survey to evaluate the amount of information learned. Our findings showed positive results that the video helped increase knowledge about overdoses. Our study's goal is to help college students become more aware of overdoses and equip them with the knowledge to save a life if ever presented with an emergency.

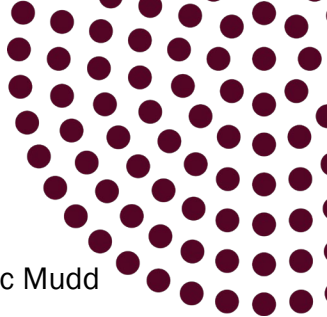
The Risk Factors Related to E-cigarette Use Among USA Adults: An Analysis of the 2022 National Health Interview Survey

Presenter: Sufyani Tahia

Co-Presenter: Soimitra Palit

Faculty Supervisors: Janae Bady, Salma Haidar, John Daniel

Abstract: The purpose of this study is to assess the association between factors related to e-cigarette use in U.S. adults. This cross-sectional study analyzed data from the National Health Interview Survey (NHIS) 2022. The main dependent variable was e-cigarette use and independent variables included sociodemographic factors (age, sex, urban-rural, race, partner status, BMI, education, income, health coverage), lifestyle (depression, anxiety, sleep disorder, coffee, smoking, alcohol), and the potential confounders identified in the literature. Chi-square test was done to compute the odds ratio and a propensity test was conducted to enhance precision and control for potential confounding variables. Data analysis was done using R (4.3.2). Among 7111 respondents, 698 (9.8%) used e-cigarettes. 51.2% were aged 66 to 85+, 56.42% were female, 81.09% lived in urban areas, 52.28% were white, 53% had partners, and 68.98% were obese. After the Propensity Test control, lifestyle factors, depression (OR=2.0), anxiety (OR=2.1), smoking (OR=6.5), alcohol use (OR=19.0), and coffee consumption (OR=1.31) significantly increased the odds of e-cigarette use for all ages. Conversely, sleep disorders (OR=0.3), were associated with decreased odds. Notably, all factors have significant P-values (<0.01). The findings from this study can be used to guide policy and program development for older adults, addressing e-cigarette use and risk factors identified in this study.



How Does Sleep Affect College Students' Academic Performance at Central Michigan University?

Presenter: Sarah Dusa

Co-Presenters: Dalton Crum, Allison Zettel, Joshua Rea, Maddie Burch, Myah Northrop, Eric Mudd

Faculty Supervisor: Elizabeth-Jean Boman

Abstract: Several sleep-related studies have been conducted on college students which found a correlation between the quality and quantity of sleep on cognitive performance (Pilchers and Walters, 2010). Previously, a study was performed on a group of 44 college students to determine the effects of sleep deprivation on cognitive performance and other related psychological variables. In this earlier study, the groups were divided into either 24 hours of sleep deprivation or 8 hours of sleep. The results concluded that sleep deprivation had a significant impact on cognitive performance. This case highlighted college students' lack of awareness about sleep's impact on their performance. Our study aimed to investigate the presence and effects of sleep deprivation on Central Michigan University students and their academic performance in the classroom. To answer this question, we conducted a survey using Google Forms and gained results from various types of students, from different years, and different majors at Central Michigan University. We found this question important because sleep is a crucial aspect of health that has many different effects on people's lives. Many people do not take their sleep schedule seriously, and therefore suffer the undesired effects of sleep deprivation. College students are a group that is presumed to be highly affected by this issue. By bringing awareness to this issue, we hope to decrease the presence and effects of sleep deprivation in college students.

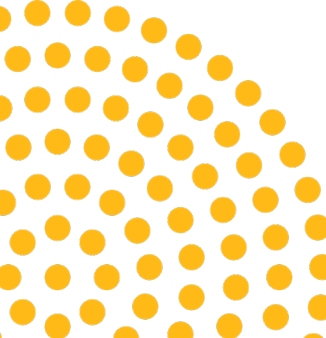
The Effects of College Living Environments on Students Mental Health

Presenter: Anthony Rentzel

Co-Presenters: Mya Ross, Faith Boynton, Molly Sherman, Grace Boynton

Faculty Supervisor: Elizabeth-Jean Boman

Abstract: Going away to college can cause students to suffer severe mental health challenges. According to a study from the Healthy Minds Network, in 2023, over 40% of students suffer from depression, and almost 60% receive some form of mental health therapy/counseling (Eisenberg, 2023). Leaving for college is a stressful process, from deciding where to continue their education to choosing both a career path and their first sense of freedom away from their guardians, young adults face stressful challenges every day that can hurt their mental health. The goal of this research is to determine if there is a correlation between mental health (negative or positive) and Central Michigan University students residing in a Living-Learning Community or traditional, on-campus housing. Our data will be gathered by conducting online student surveys and analyzing published research articles. We hypothesize that students who reside in a Living-Learning Community experience fewer negative health impacts during their time on campus due to the additional support they receive around campus. Another study taken at East Carolina University gathered information showing the mental health drain on students, but also that Living-Learning Communities could help mitigate these affects (Wiles, 2013). Hopefully, this project will clarify mental health correlation among Central Michigan University's students who reside in a Living-Learning Community or traditional on-campus housing.






Literature Review:

Alcohol Abuse Prevention That Stems From Race Based Traumatic Stress in African-American/Black College Students

Presenter: Rebecca Terpening
Faculty Supervisor: Janae Bady

Abstract: Race-based traumatic stress (RBTS) is a trauma response to a stressful racial encounter. It combines theories of stress, trauma, and race-based discrimination. This theory states that people of color who experience race-based discrimination, experience that as traumatic, which can often generate feelings that are similar to post traumatic stress disorder. These feelings can lead to isolation, internalized feelings, anxiety, depression, and alcohol and/or drug abuse used as a means to cope; and these feelings are unique to every individual who goes through these experiences. With an increase in White-Supremacy groups all across the United States and racism now considered a public health crisis by the American Public Health Association, there needs to be ways to address the problem by helping those who are impacted by these experiences the most. In this review, I looked at the impact RBTS has on African-American/Black college students, if there are interventions that can develop their coping skills, in an effort to prevent alcohol and/or drug abuse. Practitioners should consider RBTS as a health determinant, especially in alcohol interventions, and be open to listening to unique experiences felt by students. Coping skills can be taught and learned, and sometimes the teacher becomes the student. The unique experiences shared can only improve the interventions that are currently in place and can help practitioners improve existing theories. Students have an increased risk for entertaining risky behavior if they have witnessed and experienced these RBTS and historical traumatic events as a means of coping with trauma. For participants who have endured historical trauma, interventions should consider cultural values and beliefs. For alcohol interventions specifically, ones that improve self-compassion through increasing self-esteem and self-efficacy should also be considered. A focus in the future should be on continuing research on RBTS within intersectional groups on college campuses.



Physical Therapy

Acute Effect of Sauna Use on Hamstring Tissue Extensibility

Presenter: Jason Bohl

Co-Presenters: Austin Emig, Brandon Hauff, Cameron Pearson

Faculty Supervisors: Raju Chowdary, Rachael Nelson

Abstract: Limited hamstring tissue extensibility (HTE) can impair musculoskeletal function. While local thermal modalities enhance HTE, the effect of whole-body dry sauna exposure remains unexplored. This study investigates dry sauna's acute impact on HTE in healthy adults with hamstring tightness. 30 adults (22.5 ± 1.4 yrs.) underwent a 20-minute dry sauna session ($157 \pm 4.0^\circ\text{F}$) in a standardized seated position. HTE was objectively measured using the 90-90 hamstring method, alongside subjective discomfort via Visual-Analog-Scale, before ("pre"), immediately after ("post"), and 20-minutes post-sauna. Post-sauna, HTE significantly increased (20.2 ± 7.4 vs. $18.3 \pm 9.6^\circ$, $p < 0.05$) with decreased discomfort ($p < 0.01$). However, no HTE difference was noted at 20-minutes post-sauna ($p = 0.97$). Dry sauna exposure for 20 minutes acutely improves HTE and reduces stretch discomfort. This suggests its potential for enhancing flexibility in general or clinical settings, but combined approaches warrant further investigation. 20-minute sauna sessions acutely enhance HTE and reduce stretch discomfort.





College of Liberal Arts & Social Sciences

English Language & Literature

What Are Her Words Worth:

Taylor Swift as a Poet and the Complexities of Gender in the Poetic Canon

Presenter: Amanda Kovacs

Faculty Supervisor: JoEllen DeLucia

Abstract: In the modern day of music, it is often forgotten that songwriters are poets. We often understand song lyrics and poetry as different fields with separate histories. This however, is not the case, for their histories are deeply intertwined; up until recently, the history of song lyric and poetry were one and the same. Today, a split yet parallel path has been forged, sending song lyrics down a path that has left it largely disregarded for its contributions to the poetic canon. What is more, gender seems to magnify the newfound perceived distance between poetry and songwriting. This is especially apparent when examining the career and lyrical work of Taylor Swift, who defines herself as a poet as well as a songwriter. While prolific with her pen and guitar, she is met with an onslaught of misogynistic commentary meant to discredit her as a poet. The treatment of Swift and her work in comparison to her male counterparts within the music industry demonstrates the misogynistic relationship between gender and songwriters, thus further illustrating the relationship between songwriters and poets. This project will explore the history of women in poetry, the treatment of other women as songwriters, and the bardic culture and the idea of genius poets which dates back to the late eighteenth and early nineteenth century. This will then be applied to Swift's songwriting to examine the mastery of her poetic craft in relation to the greater poetic canon.

Inclusion and the Importance to Childhood Development

Presenter: Ashleigh Black

Faculty Supervisor: Maureen Eke

Abstract: My project is about diversity and inclusion in childhood development. This topic is very important because it explains the different ways media representation shapes the outlook children have on the people around them. It is important to show differences in abilities, gender, race, sexual identity, body size, and culture. Showing these differences in media allows children to feel more comfortable and accepted in the world around them. It also allows them to be more open to differences in other people. Raising the next generation with higher exposure to differences will create a generation filled with love and acceptance for all types of people, including themselves.



The Cultural Genocide of Indigenous Peoples Through Lack of Education and How This Pertains to Central Michigan University

Presenter: Rachel Lappano

Faculty Supervisor: Maureen Eke

Abstract: The issues surrounding the proper education of students in the United States on Indigenous people, their culture, and history—while prevalent—have been suppressed greatly. In the United States specifically, elementary and secondary education lacks uniform guidelines in teaching students about the land we reside on and the people that were here before us. During their formative years, students are frequently taught only certain parts of history, or even not instructed at all on others, to portray a specific message about America as a nation. This lack of education can be linked with various forms of cultural and historical violence: marginalization, oppression, racism, and microaggressions evident in our society, as well as lack of acknowledgement of topics such as colonization and cultural appropriation. Because of this lack of proper education about Indigenous peoples, Americans are both unknowingly and intentionally participating in the cultural genocide of Indigenous peoples. The study will also examine how Central Michigan University (CMU) maintains its relationship with the local Native American tribes, its course offerings, and transfer of knowledge about Native Americans to students who attend the university. Thus, the study will analyze CMU's role in communicating, educating, and celebrating Native American culture and history both in the classroom and in the general community.


African American Influence on Popular Culture

Presenter: Anna Robinette

Co-Presenter: Maddie Price

Faculty Supervisor: Maureen Eke

Abstract: Examining various popular African American musicians including Beyonce and Kendrick Lamar to understand the influence that they have on popular culture. Gospel, Rap, R&B, and Jazz will be examined to see the influence throughout history and the influence that they have in present day. This will be evolved into a implementable lesson plan suitable for high school aged students.



History, World Languages, and Cultures

Troika:

Life and Leaving Putin's Russia

Presenter: Calvin Older

Faculty Supervisor: Christi Brookes

Abstract: Following Russia's Invasion of Ukraine, we saw countless protests explode across the world. The goal of Troika: Life and Leaving in Putin's Russia is to tell the story of Russians who watched as their country was slowly taken over by an autocratic leader. We begin from the Soviet Union's collapse in the early 90s to past the Invasion of Ukraine in 2022. The end of the Cold War brought in what seemed like a new world for many Russians, and with this new world came new possibilities. The three interviewees in this podcast—Anton, Dmitri, and Ivan—detail their experiences growing up in the post-Soviet space and how Russian liberalism began to blossom and how it was killed. They experienced Putin's rise to power throughout the 2000s and the struggle for freedom that ensued. Protests, arrests, demonstrations, and riots became common sights in this period and each of them played an active part in their respective cities. However, following the Invasion of Ukraine, they were forced to leave Russia due to the regime's oppressive rules regarding speech as well as the mobilization in September 2022. But finding refuge abroad was not the end of their problems, in fact, it was the beginning of a whole lot more. In this podcast, Anton, Dmitri, and Ivan recount their lives in Russia, what led them to leave, and their experience in the new Russian diaspora.

Los Colombianismos y El Parlache:

Visually Translating Narcolombia's Underground Sociolect

Presenter: Sam Lea

Faculty Supervisor: Alejandra Rengifo

Abstract: "El Parlache" refers to the urban language developed by drug traffickers in Medellín, Colombia. Initially, this slang permitted criminals to speak about their work while raising little suspicion. But today it has transformed the foundation of Colombian culture. Translating these terms presents a challenge: How can coded language be translated while maintaining the hidden meaning and connotation in the target language? My capstone aims to translate these concepts visually through various creative works. To do this, I have selected some terms from this slang to be represented visually. Specifically, el sapo, ¿Plata o plomo?, la zona rosa, el patrón, el muñeco, el adobe, armar, el arriero, and el perico. This media will explain to English speakers the meaning behind the terms by assimilating them into our own cultural understanding. These works will provide a new glance at intersemiotic translation and redefine what translation can literally look like.



Land and Legacy:

African American Farmers in Rural Michigan

Presenter: Zachary Russell

Faculty Supervisor: Lane Demas


Abstract: "Land and Legacy" is a historical research paper that was written for a graduate seminar. It focuses on the first African American settlers and farmers in Mecosta and Isabella Counties. The analysis traces the origins of these original settlers, their contributions to farming in the area, and their continued work in creating a lasting legacy. Many rural African American communities, especially in frontier areas, did not have a lasting impact on the region and are easily forgotten. "Land and Legacy" focuses on both the history and the continuing legacy of African American farmers in Mid Michigan.

The CFA Franc and Its Impact on Economic Development and Wellbeing in West Africa

Presenter: Kaleb Wever

Faculty Supervisor: Leila Ennaili

Abstract: This research explores the impact of the CFA franc, the common currency of Central and West Africa, on economic development within the West African Economic and Monetary Union, focusing on key indicators such as inflation, GDP per capita, and the Human Development Index. Empirical results from this study compare countries within the Economic Community of West African States that use the CFA franc and those that do not. A nuanced relationship is revealed between use of the CFA franc and these economic variables. Generally, the results point towards the currency as a stabilizing force in the economy, though the drawbacks of this stability must be acknowledged. My model suggests that GDP per capita and HDI is lower within the CFA Franc Zone compared with similar nations.



Philosophy, Anthropology, & Religion

Barriers to Optimal Health and Healthcare for Latinos in the United States

Presenter: Emily Chen

Faculty Supervisor: Laura Cochrane

Abstract: This project details how Latinos are obstructed from maintaining their optimal health and accessing quality healthcare in the United States. It highlights how structural violence and structural racism contribute to the economic and social barriers to good health and healthcare, the poor mental and physical health outcomes for the Latino population, and how racism and perceptions of Latinos directly impact the healthcare they receive. This project brings awareness to the hardships that Latinos encounter regarding barriers to optimal health and healthcare and assists in reframing the negative perspectives that are pushed onto the Latino population. The CMU community benefits from the information in this paper because it will help create a more welcoming and unbiased student and faculty community for Latinos attending the university. This way, we can learn from others with diverse backgrounds and have more awareness and understanding of those different from us. It was recently brought to my attention that other college campuses are struggling with hateful rhetoric against Latinos, and I hope this paper will inspire some introspection and reflection on how one approaches, perceives, and communicates with people of different racial and ethnic backgrounds. This paper will assist in ensuring that the students and faculty at CMU always succeed in embracing diversity, equality, justice, acceptance, and tolerance in creating community bonds.

PLUR:

Kandi as a Cultural Symbol in Contemporary Rave Culture

Presenter: Derrick VanWay

Faculty Supervisor: Laura Cochrane

Abstract: This research follows the semiotic analysis of kandi, a piece of handmade jewelry that is represented as a symbol among ravers and is traded amongst each other. They are referenced to a variety of factors ranging from close personal relationships, to phrases and sound-bites relevant to specific artists and musicians. The history of raves (Radical, Audio, Visual, Experiences) in the U.S. and their evolution to what they are known as today provides the historical and cultural context needed for this research. As it relates to the history of raves, I further discuss how kandi evolved from a simple fashion accessory to the symbol that is relevant in the contemporary climates of these spaces. Here, I discuss the pillars in which raves were founded— PLUR (peace, love, unity, and respect) — and how kandi is associated with and upholds these pillars. The methodology of this research is mixed, using vignettes from my experiences in participant observation at raves and music festivals to emphasize the culture surrounding kandi, and using digital spaces such as public Facebook community groups to further participant observation to see what kinds of kandi people are sharing and their motivations behind sharing it. These spaces were also used to find interviewees and text informants to share their experiences with kandi. Auto-ethnography is used largely in this research to compare and contrast my personal experiences with public and personal symbolic meanings of kandi within rave culture.





Psychology

Must Leaders Choose Between Career and Family? Examining Familial Tradeoffs and Preferences

Presenter: Mable Clark

Faculty Supervisor: Stephen Colarelli

Abstract: Through two studies, familial preferences and tradeoffs are explored. The first study surveys young people about their work-family preferences and tradeoffs using a budget-allocation methodology. The second study examines the marriage and offspring outcomes of top political and business leaders. Results for Study 1 showed that when able to choose among a list of career and family attributes, there were no gender differences in career preferences, although women had a greater preference than men for a good marriage and for spending time with friends and family. Both men and women who wanted children were willing to make career sacrifices such as less job autonomy, longer hours, and lower job security, compared to those who didn't want children. In Study 2, there were differences in the familial outcomes of male and female leaders. Male leaders were much more likely than the average American man to be married and to be a parent. They also had more children than average. By contrast, female leaders were about equally likely as the average American woman to be married, but less likely to be a parent and had fewer children than average, although these differences did not reach statistical significance.

Sex Differences in Job Attribute Preferences: A Significant Case for No Significant Differences

Presenter: Carter Vespi

Faculty Supervisor: Stephen Colarelli

Abstract: Although there have been great social and economic benefits associated with the movement of women into the labor force, this rapid societal change has likely produced mismatches between the evolved psychology of women and particular kinds of occupations. Specifically, drawing on Anne Campbell's (1999) "staying alive" theory, it is hypothesized that women are less likely to prefer jobs that may involve a high amount of physical risk. To test this, in two studies I presented a budget allocation paradigm to participants to examine whether women, relative to men, would prioritize certain kinds of job attributes that facilitate their physical safety (e.g., safety from physical injury) over more traditional job attributes (e.g., short working hours) when designing their "ideal job" with a given amount of "job dollars". It was expected that women would allocate more of these job dollars towards attributes that are conducive to physical safety as compared to men. It was also hypothesized that this would be moderated by the amount of dollars allocated towards the Helping Other People attribute. However, it was found that, with the exception of a marginally significant interaction effect between Sex and Helping Other People to predict expenditure on the Clean Environment attribute, there were no significant sex differences in expenditure on any of the attributes related to physical safety, nor any significant interaction effects. Potential explanations and implications are discussed.



Gender and Scientific Writing: Female Scientists Report More—But Not Different—Study Limitations

Presenter: Lily McLean

Faculty Supervisor: Debra Poole

Abstract: Evidence that women scientists produce fewer research articles than men has prompted speculation about the factors that contribute to the gender gap in scientific productivity. Expanding on previous findings that women often evaluate their work less highly than men and are less self-promoting, we looked for evidence that female research psychologists describe their work less positively than males. To accomplish this, we retrieved 36 article pairs from psychology journals, written by female and male senior authors, that were matched for number of authors, number of studies, and whether the studies were correlational, experimental, or qualitative. For each article, we extracted the number of limitations mentioned, the types of limitations, and the frequency of words containing “limit” or “weak” in narrative about the authors’ studies. There were no significant findings for the full article set. However, for a subset of 23 pairs with female- versus male-dominated author lineups, female-dominated lineups reported more limitations ($M = 1.30$, $SD = 1.15$) than male-dominated lineups ($M = 1.61$, $SD = 1.50$), Wald $\chi^2(1, M = 23) = 4.03$, $p = .045$, $IRR = 1.33$, 95% CI [1.01, 1.77]. With individual limitations as the unit of analysis, women did not distribute limitations differently across the major categories compared to men, $p = 0.16$. More research is needed to determine if women’s tendency to judge their work more harshly contributes to the productivity difference in science.

Perceptions of Social Media and Internalizing Symptoms

Presenter: Kitty Brushaber-Drockton

Faculty Supervisor: James Gerhart

Abstract: Mental health concerns have been steadily rising in adolescents. Many studies have found a link between increased use of social media and elevated levels of anxiety and depression. The use of social media has become widespread, increasing to the point adolescents report using it “constantly.” A potential protective factor is perception of social media realism, or the extent to which individuals believe content created by others reflects actuality. This study sought to explore perception of social media realism as a potential moderator of the relationship between hours of social media use and anxiety and depression symptoms. Using archival data from 180 students from two rural midwestern schools, results showed a positive association between hours of social media use and depression, but no significant relationship between hours of social media use and anxiety. Gender comparisons revealed boys reported lower levels of anxiety and depression compared to girls and gender non-conforming youth, and girls reported lower levels of anxiety and depression compared to gender-non-conforming youth. Perception of social media realism did not moderate the relation between social media use and depression or anxiety. More research is needed to understand the complexities of social media use, and how it may impact mental health. Continued research should focus on individual mechanisms that can counteract negative impacts of social media, while highlighting positive outcomes.



Contingent and Noncontingent Music for Children with Attention Deficit/Hyperactivity Disorder

Presenter: Samantha Klunejko

Faculty Supervisor: Michael Hixson

Abstract: The purpose of this study was to compare the effectiveness of contingent music (CM), noncontingent music (NCM), and baseline conditions (BL) for improving the on-task behavior and academic productivity of elementary school students with attention-deficit/hyperactivity disorder (ADHD). Furthermore, this study measured students' and teachers' perceptions of such conditions. Average time on-task and average academic productivity were highest in the music conditions. However, using the visual structured criterion method (Lanovaz et al., 2019) to identify treatment effects, the two music conditions were only effective for the on-task behavior of two out of four participants, and CM was only effective for the academic productivity of one participant. Teachers' and students' perceptions of music conditions were positive, but most students chose not to participate in a music condition when given the opportunity to do so. As attention problems such as those seen in children with ADHD continue to increase in U.S. schools, simple interventions such as music may prove to be advantageous for some students.

Frankenstein:

The Dangers of Abandonment and How to Curb the Monster

Presenter: Nadia Simons

Faculty Supervisor: Sandra Kanouse Morgan

Abstract: The novel Frankenstein offers an examination of the significant psychological efforts surrounding human creation and its aftermath. Analysis of both Victor Frankenstein and his creation allows for the study of the psychological effects on a creature comparable to a newborn as well as the lasting effects of neglect. This research bridges the gap between the psychological and literary, combining humanistic and psychodynamic concepts with literary events. Using the novel and two psychological lenses of examination, the connection between Victor's actions and modern-day scenarios can deepen our understanding of the damaging effects of selfishness, trauma, and a lack of love.

Well-being Interventions for Entrepreneurs

Presenter: Rhiannon Grodnik

Faculty Supervisors: Kim O'Brien, Stephen Colarelli, Kyunghee Han

Abstract: Entrepreneurs face a uniquely challenging and stressful work environment. Given what is known about the ill effects of stress, there is a continual need to find solutions poor well-being for entrepreneurs. However, little research has been done to address this need. The present study aims to fill this gap in the literature by investigating the impact on adherence to a well-being intervention based on the health belief model. Approximately 200 participants will be recruited via the Prolific platform to partake in mindfulness, nature walks, and microbreak interventions over the course of two weeks. Participants will complete questionnaires before and after the intervention period. It is hypothesized that by reading about health risks of burnout and identifying benefits and barriers to participating in the interventions, entrepreneurs will be more likely to participate in the interventions and will experience higher well-being.



The Five Factor Model, Mentor-Protégé Matching, and Negative Mentoring Experiences

Presenter: Nadia Schellenberg

Faculty Supervisor: Kimberly O'Brien

Abstract: We study personality matching among 145 mentor-protégé pairs regarding both mentor and protege outcomes (i.e., negative mentoring experiences, burnout, and relationship turnover intentions). In pairs who matched at high levels of either conscientiousness or agreeableness, or low levels of neuroticism, both mentor and protege reported less negative outcomes. Pairs who matched at extreme levels of openness reported worse outcomes, but pairs who matched at extreme levels of extraversion reported better outcomes, for both dyad members.

Memory and Personality

Presenter: Jacob Provost

Co-Presenter: Lauren Steyer

Faculty Supervisor: Hajime Otani

Abstract: With the invention of the internet, there is a growing belief among many people that remembering is a waste of time because one can always look up sought-after information on the internet. The present study was designed to determine whether such beliefs would be associated with lower memory performance as well as inaccurate judgments of learning. Participants were asked to learn two lists consisting of word and picture pairs while making judgments of learning about likelihood of remembering each pair. After each list, their memory was tested using a cued-recall test. Other measures were also administered: personality, need for cognition, beliefs about the importance of memory, smartphone addiction, and information technology use. The results will show associations among one's attitudes toward remembering and memory performance as well as other individual differences measures.

The Moderating Effect of Third-party Involvement on the Relationships Between Team Conflict, Team Satisfaction, and Perceived Stress

Presenter: Cassandra Stockner

Faculty Supervisor: Matthew Prewett

Abstract: Ample research has shown the harmful effects of team conflict on team satisfaction and stress and has sought to explain the effects of various variables on these relationships. The present study investigated the effect of third-party involvement on the relationships between team conflict, team satisfaction, and perceived stress. Third-party involvement refers to individuals outside of the organization who work with the team and/or will be receiving the final 'product' from the team (i.e., clients). It was hypothesized that each type of team conflict would be negatively related to team satisfaction and positively related to perceived stress. It was also hypothesized that third-party involvement would moderate the relationships between each type of team conflict with team satisfaction and perceived stress, respectively. The results found each type of team conflict to be negatively related to team satisfaction and positively related to perceived stress. The effect that third-party involvement had on such relationships, however, was not as clear as expected. Implications and limitations of such are discussed.



Factors Influencing Initial-link Responding in a Self-Control Choice Task

Presenter: Katie Monske

Co-Presenter: Ryan Brown

Faculty Supervisor: Mark Reilly

Abstract: Delivering food immediately before choice trials can increase preference for a smaller, immediate reinforcer over a larger, delayed one. Rats nose poked on a variable-ratio schedule; completion of which resulted in the insertion of the levers and initiated the terminal-link choice trial. Impulsive choice and nose-poking rates were unaffected by pre-choice reinforcer delivery following completion of the initial-link. Subsequent terminal-link manipulations involving the magnitude and proportion of delayed reinforcers failed to affect rates of nose poking. Nose poking rates did decrease when the terminal-link and associated stimuli were delayed. Evidence suggests that the inherent consequences of nose poking in the procedure interfered with the ability of pre-choice food reinforcers to impact impulsive choice.

Effects of Direct Stem Cell Stimulation in the Context of Exercise on Motor Restoration in a 6-OHDA Rat Model of Parkinson's Disease

Presenter: Stefani Galik

Faculty Supervisor: Michael Sandstrom

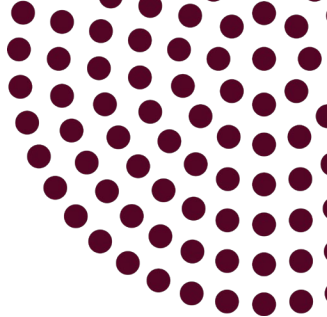
Abstract: Parkinson's disease (PD) is a progressive neurodegenerative disorder resulting from the loss of dopaminergic cells. Popular PD treatments are largely palliative, eliciting unwanted disruptions without restoring host dopamine (DA) neurons or controlled DA release. Stem cell therapy promises both dopamine restoration and host-controlled release. We combined specific transplant stimulation with encouraged exercise to promote improved amelioration of motor deficits. Mesenchymal stem cells derived from bone marrow (BM-MSCs) were rendered dopaminergic and altered to allow direct activation by the catalyst coelenterazine (CTZ). After transplantation into a PD rat model, directly stimulating these transplants at the time of swimming appears to increase supportive integration of transplants, eliciting improved movement control. These results indicate the more efforts to correlate transplant stimulation with swimming, the more motor control is restored per treated animal. Animals receiving direct transplant stimulation at the time of exercise (Group 3, Group 4) showed greater motor control compared to groups not receiving stem cell stimulation (Group 1, Group 2). After two stimulation events (Group 4) subjects exhibited improved motor control compared with only one stimulation event (Group 3). Non-transplanted PD rats were also stimulated, yielding no motoric benefits, and confirming behavioral improvements likely derived from transplants being "trained."

Text-to-speech and Reading Comprehension

Presenter: Zachery Mondlak

Faculty Supervisor: Hajime Otani

Abstract: Text-to-speech software is a feature implemented in most modern technology. Despite claims that text-to-speech software is effective with assisting readers who have conditions where reading impairment is a crucial characteristic (e.g., dyslexia), little empirical evidence supports whether it is effective at improving reading comprehension outcomes. The present study will attempt to fill this literature gap.



"Are You Sure?":

The Use of Debiasing Techniques in Juror Judgments of Guilt

Presenter: Angeline Petras-Gourlay

Faculty Supervisor: Kyle Scherr

Abstract: As the number of exonerations continues to climb, the need for methods of reducing the likelihood of a wrongful conviction has become increasingly clear. Confirmation bias plays a substantial role in wrongful conviction cases, though methods of mitigating its effects in the context of the legal system are still largely unexplored. Therefore, this study examined the effect of a debiasing exercise on mock-jurors' ability to accurately assess a defendant's guilt based on evidence presented at trial. Participants were randomly assigned to undergo a debiasing exercise or not, then read a fictional murder case summary that included a non-coerced confession, a coerced confession, or no confession. All participants then offered a hypothesis about the defendant's guilt, rated their confidence in their hypothesis, and answered questions related to their perception of guilt (both a continuous scalar measure and a binary judgment) and significance of evidence. Although I hypothesized that participants in the debiasing group presented with a coerced confession would exhibit lower guilt ratings, generate more ambiguous hypotheses, and place less significance on trivial pieces of evidence, results indicated that the debiasing exercise did not have a significant impact on participants' levels of bias.

The Confluence of Multiple Perpetrators and the Weapon Focus Effect on Eyewitness Memory

Presenter: Hallie Pruitte

Faculty Supervisor: Kyle Scherr

Abstract: It is well known within psychology and law that eyewitness testimony and memory are not infallible (Carlson et al., 2016; Marr et al., 2021). However, people tend to trust the information and testimony from witnesses. The weapon focus effect is the phenomenon that a weapon in a crime decreases the accuracy of a witness. However there is little research on the idea of how multiple weapons and multiple perpetrators influence eyewitness memory. Through brief introductions on each topic (weapon focus effect, multiple perpetrators, and eyewitness memory), this research synthesis attempts to integrate these literatures. Two different empirical routes are proposed for future researchers to conduct to provide more information on this topic. More research needs to be done, but it is theorized that multiple weapons from multiple perpetrators will negatively impact the weapon focus effect.

Validation of an Informant Rating Form for the MMPI-3

Presenter: Sydney Yochum

Faculty Supervisor: Nathan Weed

Abstract: This poster reports results of a study in progress evaluating the recently revised Informant Rating Form (IRF), an observer report instrument whose scales correspond to the Restructured Clinical (RC) scales of the MMPI-3. The purpose of the present analysis was to determine the convergent/discriminant correlations between scores on the MMPI-3 RC scales and the IRF scales.



Role of Individual Differences in Personality and Attitudes in Athlete Return to Play Decisions Following a Concussion

Presenter: Brittany Fust

Co-Presenter: Arianna Jepsen

Faculty Supervisor: Reid Skeel

Funding: Angela Freymuth Caveney Dissertation Endowment

Abstract: Athlete post-concussion return to play (RTP) decisions are largely dependent on athlete self-report, highlighting the need to identify athletes at greater risk of minimizing concussion symptoms to RTP prematurely. The Federal Aviation Administration labeled “hazardous attitudes” (HA) of antiauthority, impulsivity, and invulnerability as negatively impacting pilot decision making. Like pilots, athletes must make time sensitive RTP decisions while experiencing stress and peer pressure. Thus, the current study aimed to identify whether HA are related to premature RTP decisions following a concussion. Athletes with and without a concussion history were recruited online via Amazon Mechanical Turk and grouped according to post-concussion RTP decisions (i.e., premature RTP while actively experiencing symptoms or sitting out and abiding by rest protocol). One-way MANOVA and logistic multinomial regression revealed non-significant differences in HA between athlete groups. These findings suggest all athletes in the sample, regardless of post-concussion RTP decisions, reported similar levels of antiauthority, impulsivity, and invulnerability attitudes, thus limiting the ability to distinguish group membership based on these characteristics alone. Future research should aim to continue identifying risk factors for premature RTP and developing targeted psychoeducational interventions for athletes at greater risk, encouraging athletes to follow rest protocol to promote concussion recovery.

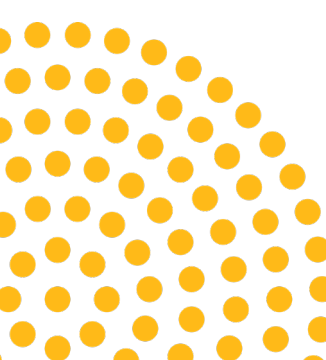
Frequency of Everyday Memory Errors as Captured by a Novel Ecological Momentary Assessment Technique

Presenter: Arianna Jepsen

Co-Presenters: Brittany Fust, Sofia Lesica, Gabriela Andrzejewska, Brianna Cashman

Faculty Supervisor: Reid Skeel

Abstract: The current study assessed a novel, smartphone-based ecological momentary assessment (EMA) technique to measure, on average, how many times per day semantic, episodic, or prospective memory errors occur in healthy participants. Forty-six undergraduate students completed a questionnaire to collect demographic information and participants' current level of perceived forgetfulness. Participants also received a brief educational session to ensure participants' understanding of the three different types of memory assessed in the study. Participants completed a survey sent through their phone three times a day for seven days. This survey consisted of six prompts addressing the frequency of semantic, episodic, and prospective memory errors and the closest descriptions to what occurred. A total of 21 daily surveys were sent to each participant, and the average response rate was 19.70 completed surveys (N = 46). The high response rates indicate that this EMA technique is a low burden and tolerable to subjects. On average, subjects reported a total of 5.91 memory errors daily. There was an average of 2.34 prospective memory errors, 1.94 semantic memory errors, and 1.64 episodic memory errors reported each day. Findings from this study provide support for the use of the novel, smartphone-based EMA technique in assessing the frequency of everyday forgetting and can be used in future studies.





Telework and Abusive Supervision: The Mediating and Moderating Roles of Virtuality and LMX

Presenter: Angeles Astorga

Faculty Supervisors: Matthew Prewett, Stephen Colarelli, Misty Bennett

Abstract: Abusive supervision refers to sustained nonphysical aggression perceived by subordinates from supervisors, such as public ridicule and taking credit for their work. Abusive supervision has been found to negatively affect productivity, well-being, and organizational costs. While there is ample research in this field, there is a notable absence of studies conducted in a virtual environment. With the rise of remote work and the unique experiences faced by teleworkers, such as heightened autonomy and susceptibility to feelings of isolation, it is crucial to understand how abusive supervision manifests in virtual contexts and its effects on employees. Research has shown that a subordinate's relationship with their supervisor can mitigate perceptions of abusive behaviors, with higher quality trust, communication, and interactions leading to reduced perceptions of abuse. However, properties of telework, such as media richness and synchronicity, raise questions about whether this relationship holds true in virtual environments. This study examines how media richness (the ability of a communication medium to convey complex information) and synchronicity (the timing of communication interactions) influence the relationship between telework, Leader-Member Exchange (LMX), and perceptions of abusive supervision.

Prevalence Reduction in Flash-Rate Discrimination Training Decreases Stimulus Reporting in Rats

Presenter: Ryan Brown

Co-Presenter: Katie Monkse

Faculty Supervisor: Mark Reilly

Abstract: In humans, reducing the prevalence of a stimulus can drastically alter measures of its detectability. Two contrasting effects have been reported in the literature. One effect demonstrates a decrease in stimulus reporting due to a reduced prevalence, and another demonstrates an increase in stimulus reporting. Using the conditional discrimination procedure of Fox, Smethells, and Reilly (Experiment 1, 2013), rats were trained to discriminate between high (5 Hz) and low (1 Hz) flash rates of a stimulus light at either 10% or 50% prevalence of a 5 Hz flash. Generalization gradients obtained using unreinforced probe trials replicated previous research. Next, the prevalence of the 5 Hz flash rate trials will be reduced to 10% or increased to 50% for 50 training sessions and another series of probe trials will be presented. We predict that the prevalence reduction of the 5 Hz stimulus will result in a downward shift in the generalization gradient, indicating an increased probability of pressing the lever associated with the higher-prevalence 1-Hz stimulus. Replication of the prior literature found in humans would open the door to studying these prevalence effects in a more controlled laboratory setting with non-human animals.




Effectiveness of Parenting Programs Implemented in Rural Areas: A Meta-analysis

Presenter: Ashlae Portell

Faculty Supervisor: Larissa Niec

Abstract: Children and families from rural areas experience geographic, financial, and social barriers to accessing evidenced-based mental health care. Despite these challenges, little research has been conducted to understand how families and clinicians in rural areas can overcome these barriers. We conducted a meta-analysis to determine the components of parenting programs that predict greater treatment success when disseminated in rural areas globally. Searches of databases took place in September and October 2021. Eligible studies assessed the efficacy of a parenting program disseminated in a rural area. Subsequent to screening, two reviewers independently abstracted data (inter-rater agreement > .90). A total of 32 studies (N = 11,145 families) were eligible for inclusion and represented all six continents besides Antarctica. We calculated effect sizes for several parenting and child outcomes (e.g., parenting skills, child externalizing and internalizing behavior) in a meta-analysis using the corrected Hedges' g formula. Pooled estimates of effect sizes revealed parenting programs had a small but significant effect on overall parenting (g = 0.33, 95% CI [0.21, 0.44], p < .001) and overall child (g = 0.43, 95% CI [0.27, 0.459], p < .001) outcomes. These effect sizes were slightly smaller compared to findings from previous meta-analyses conducted with majority non-rural samples.



College of Medicine

A Medical Oath

Presenter: Ryan Flaherty

Faculty Supervisor: Beth Bailey

Abstract: Taking a medical oath has become a prevalent rite-of-passage for those pursuing the profession. Many oaths derive their gravitas merely from antiquity or repetition, but I sought to individualize and modernize the traditional oaths. I am not proud enough to believe that I could compete with the Hippocratic oath, the World Health Organization revised Hippocratic oath, or the Geneva declaration on my own. However, I leveraged my love of classical literature to create a new medical oath, supported by the distilled wisdom of human history and life experience that is contained within literary canon. In the past two years, I have read over sixty works of classical world literature. I believe that works become classics by resonating with some shared aspect of the human experience. By abstracting the perennial wisdom of these works, I hoped to forge an oath addressing modern issues with the unyielding principles elucidated by centuries of literary works. Categorizing quotations from these works by the four pillars of ethics—beneficence, justice, autonomy, and non-maleficence—I was able to create an oath upon the words of those far more articulate than I. To create a medical oath which would direct my entire career, I turned to the words and ideas which have already stood the test of time. If selected to present, my poster presentation will consist of the oath, the relevant quotations, works of literature, and development process.

Professional Socialization Through the Eyes of an Artist in Medical School

Presenter: Merlin Kochunilathil

Faculty Supervisor: Beth Bailey

Abstract: Professional socialization refers to the longitudinal process of enculturating oneself in a profession, as one learns the specific skills, mindsets and occupational culture, which they utilize to mold their own identity. It's not meant to be an easy process, especially as physicians in training leave some or all of their former identity, to step in the physician role. In classic medical sociology literature and current medical education literature, developing competence, learning to interact with symbols such as the language, tools and clothing, and training for uncertainty is considered part of socialization in the medical profession. Unfortunately, the decay of empathy, loss of idealism and technical management of emotions such as clinical empathy has also been associated with the socialization of the physician from undergraduate to graduate medical education. It is fair to say that socialization to the role of a physician is not only intensive in many facets but also a long-term and multi-factorial endeavor. Considering that most of the work in the medical and sociological space is in a written format and from a research standpoint, the goal of my comics is to explore my own sense of enculturation through my years as a medical student and to depict it in comic form. Through my comics, I will be exploring my own experiences with the topics mentioned above.



Holistic Remedies and How They May Work

Presenter: Chloe Looman

Faculty Supervisor: Beth Bailey

Abstract: Complementary Alternative Medicine is becoming a bigger part of the medical conversation. Oftentimes there is a big divide between western medicine and naturopathic/ alternative medicine, but there doesn't need to be. Since treatment adherence is one of the largest issues in treating patients, a patient's interest in their healthcare and wellness should be celebrated in whatever form it takes. This guide is meant for the layperson skeptical of western medicine to begin to approach the science of how familiar remedies interact with components of the body, and begin to see how they aren't so far removed from pharmaceuticals. It is also meant for the health professional to understand how different home remedies interact with the physiology of their patients. This investigation draws from a variety of cultures' healing practices and investigates the biochemistry behind medicinal plants and mushrooms.

Genetics and Immunology of Psychodermatology

Presenter: Samantha Hess

Faculty Supervisor: Mohammad Jafferany

Abstract: The bidirectional relationship between disorders of the skin and disorders of the mind has been long established. However, the directionality and the degree of impact is an area that requires further research and understanding before clear causality can be established. An additional area of research that has grown within recent years is the genetics and biomarkers of dermatological diseases and their psychiatric comorbidities. Due to the diverse nature of dermatological diseases, in both clinical presentation and pathophysiology, the genetic factors underlying these diseases are an up-and-coming area of research. Some common immune-mediated and inflammatory psychodermatological diseases include Alopecia Areata (AA), Psoriasis, Atopic Dermatitis (AD), and Vitiligo. These disorders, as well as other psychodermatological diseases, have been shown to have multifactorial etiologies that can include factors from genetics to hormones to psychology. This manuscript intends to compile existing knowledge regarding the listed common dermatological disorders, their psychological impacts, and the genetic factors that impact the diseases.

Development of an Affordable Fascia Closure Model to Train Surgical Residents

Presenter: Joseph Vito Vyskocil

Faculty Supervisor: Cristina Nituica

Abstract: Midline laparotomy closure, a critical surgical skill, often lacks adequate training with traditional methods. Addressing this gap, we introduced a cost-effective (\$54) simulation model using commercial materials to mimic the abdominal wall's layers. Evaluated by surgical faculty and residents through a 5-point Likert scale, the model received high scores for its realistic representation of midline laparotomy (mean score: 4.28), texture of fascia during needle insertion (mean score: 4.17), and effectiveness in resident training (mean score: 4.44). This innovation offers a practical, low-cost, and safe training environment, marking a significant advancement in simulation-based surgical education, with strong endorsement from both faculty and residents for its potential to enhance midline laparotomy closure skills.



A Model to Reduce Isolation and Loneliness in Older Adults

Presenter: Kasandra Bienkowski

Co-Presenter: Madison Miller

Faculty Supervisor: Jyotsna Pandey

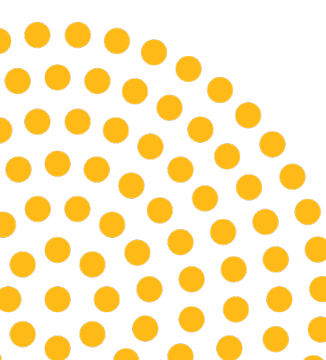
Abstract: Social connectedness as a social determinant of health has garnered recognition for its impact on patient health outcomes. This paper examines the interplay of social isolation, characterized by an objective lack of social contact, and loneliness, defined as the subjective feeling of being isolated, on health outcomes, with a specific focus on rural communities. Studies depict an increasing loneliness among Americans over the past two decades, notably exacerbated during the COVID-19 pandemic. This increase has been shown to heighten the risk of developing both mental and physical comorbidities that present a bi-directional relationship between aspects of social connectedness and health outcomes. This study collected data from older adults residing in rural communities to investigate the levels of social isolation and loneliness, employing the Cornwell Waite Social Disconnectedness scale and UCLA Loneliness scale, respectively. Of the individuals surveyed, a statistical significance was seen across categories of not lonely, sometimes lonely, and lonely when participants were asked about their satisfaction with daily or weekly contact with others. These findings underscore the need for interventions aimed at addressing loneliness and social isolation among older individuals in rural settings. Further research is warranted to bolster existing data and continue investigating the intricate relationship between social connectedness and health outcomes.

Comparative Risks of Electronic Versus Tobacco Cigarette Use During Pregnancy: Findings From a Low-Risk Sample

Presenter: Michelle Azar

Faculty Supervisor: Beth Bailey

Abstract: Harms of tobacco use in pregnancy are well studied and include low birth weight, decreased newborn well-being, and need for medical interventions after birth. Less understood is the effect of electronic cigarettes (ECs). We examined whether EC use during pregnancy also increases risk of adverse birth outcomes. Data were from the Michigan Obstetrics Initiative (OBI), a quality improvement effort involving 75 maternity hospitals, focused on safely reducing cesarean delivery rates. Our participants were nulliparous, singleton pregnancy, term delivery, and vertex fetal positioning. Participants delivered since January 1, 2021, with no known pregnancy alcohol and opioid use. After control for confounding and comparison to controls, the EC group had significantly lower birth weight; the tobacco group had reduced birth weight, and greater rates of arterial cord pH less than 7.1, 5-minute Apgar scores less than 8, and neonatal intensive care unit admission. While EC use in pregnancy reduced birth weight, most newborn risks linked to tobacco exposure were not predicted by EC use. Additional study is needed, as nonsignificant trends toward poorer outcomes for EC users were evident and potentially significant with larger samples or when amount/timing of EC exposure is considered. Given this sample was low risk, cases for whom EC use led to adverse outcomes were potentially eliminated. Growing evidence suggests pregnant patients should be counseled to avoid EC use.





Assessing Inpatient Dispositions of Opioid and Polysubstance Use Under Michigan's Opioid Laws

Presenter: Elizabeth Darga

Faculty Supervisor: Juliette Perzhinsky

Abstract: The State of Michigan passed laws to enforce opioid prescribing to reduce subsequent opioid misuse, however deaths have not decreased. Patients with opioid use disorder (OUD) and polysubstance use require long term follow-up care to overcome their addiction, and it is unclear what factors may predict who receives this care. Understanding the disposition of patients who are admitted to hospitals may enhance understanding of how to ensure these patients get the most appropriate care. Analysis of the SID showed that routine discharge was most common regardless of gender or whether patients had OUD or polysubstance use pre and post Michigan Prescribing Laws. There were fewer hospital admissions with OUD alone in the State of Michigan (pre-era vs post-era) females 1.95% vs 1.82% ($p < 0.0001$) males 2.35% vs. 2.15% ($p < 0.0001$). Across the entire study period in Michigan, insurance status significantly predicted disposition for those with OUD or with polysubstance use, with the odds of being transferred to SNF/HHC instead of routine discharge lower for patients with Medicaid versus Medicare [OUD OR=0.43, 95%CI: 0.41,0.44, polysubstance use OR=0.56(0.53,0.58) respectively]. Compared to nationally, Michigan had a decrease in admissions for OUD and polysubstance use following the prescribing laws. For patients with OUD alone and patients with polysubstance use, type of insurance predicted whether a patient was transferred for additional care, discharged AMA, or died.

Utility of Urinary Epidermal Growth Factor in Predicting Post-donation Kidney Function

Presenter: Katlyn Droke

Faculty Supervisor: Mona Doshi

Abstract: Low post-donation renal function is associated with an increased risk of end-stage kidney disease in living donors. Renal compensation after donation is variable and is dependent on nephron endowment and health of the remaining kidney. Urinary epidermal growth factor (uEGF) is a marker of renal cell integrity and tubular health. We investigated the relationship between uEGF and post-donation renal function. Methods: We enrolled 74 consecutive living kidney donors at the University of Michigan Transplant Center and measured urine EGF and creatinine levels prior to nephrectomy. Post-donation renal function was assessed via serum creatinine at 6-, 12- and 24 months after surgery. Glomerular filtration rate (GFR) was calculated using race-free CKD-EPI 2021 equation. Seventy (95%) of donors had at least one assessment of renal function after donation and 59 (85%) had more than once. Univariable and multivariable longitudinal logistic models were used to examine the association between uEGF/creatinine ratio and post-donation $GFR \geq 60$ mL/min/1.72m² adjusting for repeated measures and other pre-donation characteristics. Results: Of the 74 living donors, 59 (80%) were whites, 43 (58%) females, mean age 43 ± 12 years, mean BMI 27 ± 5 kg/m², and median pre-donation GFR was 101 [92-110] mL/min/1.73m². The median uEGF was 11.75 [5.80 - 24.40] and median uEGF/creatinine ratio was 14.7 [10.5-18.9].



A Longitudinal Study Assessing Medical Students' Attitudes Towards Interprofessional Education Using the Interprofessional Attitudes Scale

Presenter: Katlyn Droke

Co-Presenters: Gabrielle Kennelley, Andrew Nowak, Michael Kirby, Brittany Hamama, Cuyler Huffman

Faculty Supervisor: Jyotsna Pandey

Abstract: Effective healthcare delivery requires the synergistic functioning of diverse care teams. Previous studies indicate that interprofessional education (IPE) is an effective modality for better preparing medical students to work on interdisciplinary teams. However, there is limited research investigating the relative efficacy of different IPE models. Our goals were to assess the effects of IPE experiences on medical students' attitudes regarding collaboration on interdisciplinary healthcare teams and identify key timepoints for clinical immersion. We conducted a longitudinal study using the Interprofessional Attitudes Scale (IPAS) to assess medical students' IPE core competency development at five intervals. Results were analyzed using individually paired T-testing to investigate whether individual IPE sessions or the broader curriculum fostered changes in students' attitudes regarding interdisciplinary care. Significant results at the category level were further investigated at the subcategory level using Wilcoxon Signed Rank tests. Significant findings occurred within the 'Teamwork, Roles and Responsibilities' category between pre-MS1 and post-MS2 surveys and post-MS2 and MS4 surveys, with multiple additional subcategory findings. This suggests embedded clinical practice produces meaningful changes in students' attitudes regarding team-based healthcare, and sustained immersive training better prepares students to positively contribute to interprofessional teams.

Cadaveric Dissection of the Temporomandibular Joint to Identify Anatomical Landmarks for CN VII Branches to Mitigate Risks of Single Endaural Incision TMJ Replacement Surgery

Presenter: Bradley Hunt

Faculty Supervisor: Zachary Klukkert

Abstract: In traditional temporomandibular joint replacement (TJR) operations two incisions must be made and the masseter transected. A novel TJR approach accomplishes positive surgical outcomes without transecting the masseter or using more than one incision, however, all patients who underwent the pilot operation experienced temporary partial paralysis of facial muscles. The objective of this study is to identify a system for predicting the location of the temporal branches of the facial nerve near the TMJ to assist in mitigating the risks associated with this new approach. This study was designed as a statistical analysis using the distance between temporal branches of the facial nerve as they cross the zygomatic arch from the external auditory meatus as the main variable. Dissection of the extracranial origin and circum-parotid distribution of peripheral branches of the facial nerve was performed on 20 cadaveric donors at the Central Michigan University College of Medicine with a total of 28 dissections due to bilateral investigations of 8 donors.

Utilizing Cadaveric Dissection to Understand Pathophysiology

Presenter: Ian Kuo

Co-Presenter: Bradley Hunt

Faculty Supervisor: Jyotsna Pandey

Abstract: In medical education, anatomy is a building block to understanding the function of the human body and the application of its pathology. Thus, pathology & anatomy can be utilized together to understand concepts to a higher degree. The format for clinical anatomy education has diversified and some institutions have moved from cadaver-based instruction to models & digital simulation of stereotypical anatomical configurations. This report discusses the benefits of cadaveric dissection by medical students to understand pathophysiology, connecting anatomy to pathology. The donor described is an 83-year-old female with hypertension who died of cerebrovascular disease. The donor findings included a paravertebral mass suspected as a paraganglioma with confirmatory histology. Other gross pathological findings included a hypertrophied left ventricle, hypertrophied stomach rugae & diffuse intestinal fibrosis. Utilizing these incidental findings, the patient's history and pathophysiology of these structures are used to understand the disease mechanisms and its downstream systemic impacts. As an adjunct to the core medical curriculum, investigation of cadaveric findings is an opportunity for self-directed learning. This unique type of anatomical education builds on a holistic understanding, connecting structure & function in the human body, providing students with an opportunity to deepen application of medical knowledge while developing future clinical problem-solving skills.

“Hi, I'm Skin Cancer”

Presenter: Harrison Loftus

Faculty Supervisor: Beth Bailey

Abstract: For this project, I set out to learn more about sunscreen and skin cancer prevention, and to figure out how to make this information both digestible and desirable. As an aspiring pediatric dermatologist, I also wanted to find the least scary way to initiate a conversation about skin cancer. After reviewing the available literature, I took all my information and designed specific visuals to reinforce the material and make it more interactive. Every 2-page set of this booklet (currently 12 pages in total) complements the other by combining an activity/image along with information on the given topic. I hope that by making the material more visual and interactive, children will be more engaged and interested in the material. My greatest hope would be that after encountering this booklet, the audience would be more likely to engage in protective behaviors against skin cancer (i.e. limiting sun exposure, screening for skin cancer, wearing sun-protective clothing, and wearing sunscreen regularly). I also believe that materials like this can help create a dialogue about “taboo” or uncomfortable topics like cancer. If children become curious and more informed about skin cancer and learn from their family/friend's experiences, then they are more apt to engage in protective behaviors.



Evaluating the Potential vs the Current Performance

Presenter: Katherine McCollum

Faculty Supervisor: Julien Rossignol

Abstract: Social psychologists have repeatedly referred to the notion that humans are what they could be, not what they are now. Professional evaluations are only based on what students have learned in the past, not their ability to learn in the future. Using an evaluation technique that measures not only how well they have mastered previously taught material, but also their ability to learn will allow better evaluation of candidates. There are many factors that affect a person when they are evaluated at a single point in time. A single evaluation may reflect more than just their performance that day. Individuals with high potential with or without current good performance will be able to keep up with the evolving field and research required. Potential performance is important indicator of long-term performance and can be used synergistically with current academic performance evaluations. In professions where the landscape of knowledge is constantly evolving and adapting with new techniques, research and best practices, the ability of incoming professionals to evolve with these changes is crucial.

Barriers and Enablers to Physical Activity Participation in Lower Extremity Amputees

Presenter: Kikelomo Naomi Sekoni

Faculty Supervisor: Prakash Jayabalan

Abstract: Following lower extremity (LE) amputation, individual engagement in physical activity (PA) is known to decrease, though the reasons for this change are unknown. The aim of this study was to assess the barriers and enablers to PA participation in K3 level lower extremity amputees. This was a survey study of individuals with LE amputation, aged, above 18 years and capable of ambulating at a K3 level. Participants were outpatients at a free-standing rehabilitation hospital. The questionnaire surveyed, motivations, barriers and enablers in PA engagement following their amputation. A total of n=48 individuals participated in the study. Respondents performing at least 30 minutes of moderate intensity physical activity for four or more days per week had decreased by 26% post-amputation, despite 98% deeming physical activity as important post-amputation. Only 24% had a physician discuss PA with them post amputation. For 90% of respondents, their desire for improved overall health was the most important motivator for PA post-amputation as compared to their desire for a certain body image (61%) or social interaction (63%). Participants indicated their greatest barriers preventing them from being physically active were a poor fitting prosthetic limb (53%) and fear of falling (34%). LE amputees understand the importance of and desire to engage in PA, but there are both physical and psychological barriers leading to decreased levels post amputation.



Rural-Urban Differences Between Health Status of PACE Program Participants and Adverse Childhood Experiences

Presenter: Khristian Burke

Faculty Supervisor: Jyotsna Pandey


Abstract: This session describes a student-led effort to enhance geriatric medical education via development and implementation of a research project collaborating with local Program of All-Inclusive Care for the Elderly Centers. This effort aims to enhance understanding of the rural-urban differences in overall health outcomes in lower socioeconomic status older adults and how the region of residence influences outcomes in elderly populations based on childhood experiences. The session will elaborate on the process of implementing such a project that works jointly with community resources with the goal of encouraging attendees to take an active approach in interacting within the geriatric community to enhance the geriatric medicine curriculum.

Association of Anatomical and Demographic Biomarkers With Survival in Ocular Melanoma

Presenter: Swara Sarvepalli

Faculty Supervisor: Beth Bailey

Abstract: Ocular melanomas make up a relatively small percentage of all melanomas (3-5%) but are the most common type of eye tumor in adults, with a high rate of metastasis and mortality. This retrospective de-identified database study of 2,917 patients was completed using the SEER Database. Data were filtered for patients with a primary diagnosis of ocular melanoma between 1990-2018. The primary outcome was the cause of death. Age was significantly higher in patients that died from ocular melanoma; after logistic regression, increased age was independently associated with decreased odds of melanoma mortality (OR 0.984; 0.977, 0.992; $p < 0.001$). Primary site of melanoma was also statistically significantly different between groups; conjunctiva (81.7%) and cornea (81.3%) had the highest survival rates, while lacrimal gland (100%) and overlapping lesion of eye and adnexa (73%) had the highest mortality rates ($p < 0.001$). After logistic regression, the primary site of the retina (OR 4.056; 1.60, 10.28; $p = 0.003$), choroid (OR 2.316; 1.476, 3.633; $p < 0.001$), ciliary body (OR 2.621; 1.561, 4.403; $p < 0.001$), overlapping lesion of eye and adnexa (OR 10.307; 4.403, 24.129; $p < 0.001$), and unspecified ocular site (OR 4.343; 2.436, 7.744; $p < 0.001$) were all associated with significantly increased odds of mortality from ocular melanoma when compared to conjunctiva. Overlapping lesions of the eye and adnexa, unspecified ocular site, and retina were associated with the highest mortality risk.



College of Science & Engineering

Biochemistry, Cell & Molecular Biology

Copines in *Dictyostelium discoideum* Have Distinct Functions in Cell Signaling and Development

Presenter: Cody Morrison

Faculty Supervisor: Cynthia Damer

Abstract: Copines are a family of calcium-dependent phospholipid-binding proteins found in most eukaryotic organisms. We use *Dictyostelium discoideum*, which has six copine genes, to study copine function. To elucidate the function of each copine, we utilize genetic knockouts and characterize their phenotypes. Our lab created two copine mutant cell lines, cpnA- and cpnC-, using homologous recombination, and obtained cpnD mutants from the Dictyostelium REMI mutant project. All three copine mutants exhibit developmental defects. cpnA- cells exhibit delayed streaming during aggregation and do not culminate into fruiting bodies. cpnC- mutants aggregate early, do not form streams, make large rings during the mound stage, and culminate into small fruiting bodies. cpnD mutants proceed normally through development but make smaller fruiting bodies. cAMP signaling mediates many aspects of development, so we investigated signaling pathways in mutants. cpnA- cells have higher intracellular Ca²⁺, while cpnC and cpnD mutants do not. CpnA was found to interact with the calcium-ATPase, PatA, found on contractile vacuoles, and promote the dimerization of PatA, suggesting CpnA may act as an activator of PatA and play a role in calcium homeostasis. cpnC- cells have reduced RegA (cAMP phosphodiesterase) protein, while cpnC and cpnD mutants do not, suggesting CpnC may regulate the stability of RegA. These data indicate that copines have distinct roles in regulating cell signaling pathways in Dictyostelium.

Ras Activation in Dictyostelium Cells

Presenter: Ashlyn Nagel

Faculty Supervisor: Cynthia Damer

Abstract: Copines are a class of calcium-dependent lipid-binding proteins found in a variety of eukaryotic organisms such as Paramecium, Dictyostelium, Arabidopsis, C. elegans, mice, and humans. Dictyostelium discoideum is a key model organism that can be used to study cellular processes such as cytokinesis, cell motility, phagocytosis, chemotaxis, signal transduction, and cell differentiation. Six copine genes have been identified in the Dictyostelium genome, cpnA – cpnF, which exhibit 28-60% amino acid identity. Although their exact function is unknown, studies have indicated that copine A may have a role in cAMP signaling during chemotaxis. Upon cAMP stimulation, activated Ras transiently localizes to the plasma membrane. This, along with recent evidence linking copines to human cancer, has led researchers to believe copines may play a role in regulating Ras independently or dependently of cAMP signaling. To answer this question, we investigated the differences in Ras activation for parental versus copine knockout cells by performing pull-down assays with Dictyostelium cells. Our results showed that Ras activation in parental cell lines, NC4A2 and AX4, is not statistically different from Ras activation in Dictyostelium copine knockout (cpnA- and cpnC-) and mutant (cpnDm 50 and cpnDm 168) cells.



The Interaction of Actin With the Actin Cross-linking Domain of the MARTX Toxin in *Vibrio cholerae*

Presenter: Jacob Brown

Faculty Supervisor: Steven Juris

Abstract: *Vibrio cholerae* is a bacterium that contains the Multifunctional-Autoprocessing Repeats-in-Toxin (MARTX) toxin that is responsible for the water-based disease cholera. It is known that the MARTX toxin interacts with actin proteins in cells utilizing an actin cross-linking domain (ACD), however, it is relatively unknown exactly how this interaction occurs. To understand this interaction, truncations from the C-terminus of an ACD were made to investigate which region is responsible for binding to actin using mutant plasmid that was isolated from a mutant yeast strand. These mutant truncations block wild-type ACD toxicity, which suggests that the truncations sequester actin from being cross linked. An ACD construct was studied by first constructing a plasmid DNA pet28a ACD with a BirA biotin ligase inserted in. This plasmid was then expressed to create an ACD-BirA biotin ligase protein. This protein will then be incubated in an actin and biotin solution, in order to indirectly determine the interaction between the ACD and actin protein. The protein with the ACD construct that is synthesized, and the truncations, will hopefully determine which region of the ACD is responsible for the actin interaction, and how this interaction takes place.

Improving Bioluminescent Gamma-aminobutyric Acid Sensor Response to Ligand

Presenter: Kaylee Taylor

Faculty Supervisor: Eric Petersen

Abstract: Many neurological diseases such as Alzheimer's Disease, Parkinson's Disease, and autism spectrum disorder have been shown to be caused, in part, by an imbalance of neurotransmitter levels. Expanding on the types of neurotransmitters that can be detected is important to study the causes and treatments of these diseases. In this study, we focus on the amino acid gamma-aminobutyric acid (GABA), which is an inhibitory neurotransmitter found throughout the brain and is involved in many neurological disorders. We developed a variety of genetically encoded bioluminescent GABA sensors that are an attractive alternative to using fluorescent sensors because they do not require an excitation light source, allowing deeper areas of the brain to be recorded without damaging tissue and improving signal-to-noise ratio due to the lack of autofluorescence. We created a library of bioluminescent GABA sensor variants and tested them for improved responses to GABA. Taking bioluminescence readings on a plate reader, we found that the sensors with a mutated GABA binding domain and optimized linkers have higher responses to saturating amounts of GABA than the ones with the native GABA binding protein. To further improve the response of the sensors to GABA with the goal of using them to image brain activity in rodents, we will use rational design to mutate amino acids in different areas of these GABA sensors with the goal of improving response amplitude and signal-to-noise ratio.



Immune Targeting of Mycobacteria through Cell Surface Glycan Engineering With Antibody Recruiting Molecules

Presenter: Priscilla Dzigba

Faculty Supervisors: Benjamin Swarts, Mallary Wacker

Abstract: Mycobacteria, which cause serious human diseases like tuberculosis and leprosy, are known for their intrinsic drug tolerance, posing challenges for traditional antibiotic treatments. In response to this issue, we devised a unique therapeutic strategy involving the modification of mycobacterial surface glycans using antibody-recruiting molecules (ARMs). Our specifically designed mycobacteria-targeted ARMs, termed Tre-DNPs, aim to enhance macrophage effector functions by engaging human antibodies. In our proof-of-concept experiment, we showed that anti-DNP opsonized, DNP-flagged *Mycobacterium smegmatis* enhanced phagocytosis by macrophage. This result highlights the potential of our strategy to strengthen the host immune response. Importantly, the metabolic pathways responsible for the cell surface integration of Tre-DNPs are conserved across all mycobacteria but absent in other bacteria and humans. Demonstrating that our ARM approach can be applied to develop immune-targeting strategies for different mycobacterial pathogens. Our recently conducted study showcased the successful modification of the surfaces of *Mycobacterium avium*, *M. abscessus*, and *M. tuberculosis* using Tre-DNP. As a result, the modification caused a surge in the uptake by macrophages and enhanced killing of intracellular *M. avium* and *M. abscessus*. Highlighting the broader applicability, this emphasizes the versatility and potential impact of our approach across different mycobacterial species.

Wastewater Quantification of Antibiotic Resistance Genes During the COVID-19 Pandemic

Presenter: Chris Haupt

Faculty Supervisor: Maggie Williams

Abstract: SARS-CoV-2 has had a profound impact on our world, both during and after the 2020 global pandemic. During the COVID-19 pandemic, hospitals were required to completely shift all focus to preventing the loss of life, a decision that would not be without consequence. An increase in hospitalizations, the misuse of antibiotics, and necessary use of antibiotics for secondary infection during the global pandemic will contribute to the growing issue that is antimicrobial resistance. A Previous study collected wastewater samples weekly and analyzed them for COVID-19 prevalence. Each sample from November 2021 to April 2022 were used to extract DNA from 30 mL of the collected wastewater. qPCR was used to test for the presence of over 35 ARGs and mobile genetic elements. Almost all ARGs that were included in the primer panel were detected in our DNA samples. Multiple ARG/MGE were found to both increase and decrease in relative abundance along with COVID-19, indicating a positive correlation. Specifically, an increase in the *msr(E)* gene, which conveys resistance to erythromycin, coincides with an increase in COVID-19 detection. This data can be used to help quantify the impact COVID-19 has had on our environment and may be useful for early detection of future human health hazards.

Micro- and Nano-plastics Quantification and Removal From Bottled Water Via Extraction

Presenter: Elizabeth Buttle

Faculty Supervisor: Dale LeCaptain

Abstract: Recent realization of the high numbers of micro- and nanoplastic particles are cause of an increasing concern in food and beverages. Recent studies emphasize the presence of particles in bottled water. Plastic particles have an affinity for water immiscible liquids, making them useful for the reduction of plastic particles from aqueous suspensions including commercially bottled water. Laser imaging techniques and mass quantification were used to measure the micro- and nanoparticle size and concentrations. These methods were also used to demonstrate the removal of the plastic particles. Various methods for the removal of the particles were tested. Techniques were developed for production of producing suspensions from commercially used polymers, allowing the evaluation of effectiveness for polymers encountered in commercial applications.



Biology

Variation in Diatom Taxonomic Diversity Along a Disturbance Gradient in the Chippewa River, Michigan

Presenter: Madison Cree

Faculty Supervisors: Hunter Carrick, Daelyn Woolnough

Abstract: Diatoms are microscopic, unicellular algae that are reliable indicators of aquatic ecosystem health. Diatoms are important primary producers in aquatic environments and play a vital role in the carbon cycle as photosynthetic organisms. Current estimates show that diatoms contribute to nearly half of all carbon fixation globally, and therefore represent a major sink. The purpose of this study was to determine if there were changes in diatom diversity along an upstream to downstream disturbance gradient along a 4th order river (Chippewa River, Michigan). The Chippewa River is fed by a relatively large watershed (include watershed size in km²) with mixed land use that reflects large inputs (indicated percent coverage of forest, ag, urban). Benthic diatoms were systematically collected from river rocks and prepared for microscopic analysis from three sites in the river that encompass a reach exposed to varying levels of contaminant of emerging concern (CEC). Diatoms were imaged and identified using a scanning electron microscope. Our hypothesis is that the species of diatoms present at each site will be different due to environmental factors like water flow and sediment load, but also due to chemical contamination in the river. Because diatoms occupy a range of niches, species shift from generalists to more pollution tolerant species can be used to evaluate chronic levels of river contamination.

Effects of Environmental Changes on Photosynthetic Rates of Phytoplankton in the Laurentian Great Lakes

Presenter: Rachel Lee

Faculty Supervisor: Hunter Carrick

Abstract: The Laurentian Great Lakes include 5 lakes (Lakes Erie, Huron, Michigan, Ontario, and Superior), that stand as the largest expanse of freshwater. The Great Lakes play a pivotal role in providing essential resources and services to both the United States and Canada. The Great Lakes experience winter for about 3-6 months and a critical gap exists in the scientific exploration of winter limnology. Climate change manifests in the form of increasing air temperatures during winter and a reduction in ice cover across the Great Lakes (Ozersky et al., 2021). The changes impact the element cycling among species and have repercussions on the community of organisms at higher trophic levels, given their dependence on phytoplankton as the base of the food web (Lehtinen, et al., 2016). The objective of this study is to observe the role of ice cover as a "master variable," influencing the extent of photosynthesis undergone by phytoplankton in specific regions of the Great Lakes (Ozersky et al., 2021). We conducted photosynthesis versus irradiance experiments on natural phytoplankton collected from 12 basin-wide sites in both 2022 and 2024 during winter (February to early March). Samples captured a range of winter conditions that include open water to complete ice cover. Our results reflected a large variation in the maximum rate of photosynthesis (0.1 to 5 ugC/ugChlorophyll/L/hour) that appeared to be regulated by lake trophic status and was lower compared to the summer period.



Application of Flow Cytometry for Bacterioplankton Measurements in Freshwater Lakes

Presenter: Wyatt Ross

Faculty Supervisor: Hunter Carrick

Abstract: Planktonic bacteria (bacterioplankton) play a central role in providing direct trophic links to metazoan species and the recycling of nutrients within aquatic ecosystems. A basic question is how does the density of bacterioplankton vary among ecosystems at different stages of succession (or trophic status)? An increasingly widespread practice to measure plankton density in natural waters is the use of flow cytometry. In order to expand on the overall planktonic density, we specifically quantified bacterioplankton. Using flow cytometric measuring for bacterioplankton, I conducted a study where the goal was to quantify bacterioplankton density among six freshwater lakes on Beaver Island, MI. The lakes sampled reflect various stages of succession (trophic states) due to the natural history of the island, where increasing elevation is positively correlated with the age of lakes on the island. This landscape feature provided an environmental gradient from which I could investigate the role bacterioplankton might play in lake succession. I predict that bacterioplankton density will increase inversely with elevation. To measure these lakes, a standard set of data was created using Fluoresbrite® YG Carboxylate Microspheres. Experimental water samples taken from the various lakes were then measured and compared to the standard data to determine bacterioplankton density.

Does Territoriality Modulate Patterns of Brain Oxidative Damage in Males of the Cichlid Fish *Astatotilapia burtoni*

Presenter: Olivia Buzinski

Faculty Supervisor: Peter Dijkstra

Abstract: Dominance in a social hierarchy is established using aggression in many species. Relative to subordinates, dominant males have greater access to resources and establish territories as a site for reproduction. It has been suggested that the intensity of territorial defense is limited due to the metabolic cost of aggression, such as oxidative stress resulting from an imbalance between the production of reactive oxygen species and antioxidants. However, the full scope of these physiological costs is not yet fully understood. The hypothalamic-pituitary-gonadal (HPG) axis is responsible for the secretion of androgens which are linked to aggression and dominance. More recently, androgens have been associated with varying patterns of oxidative stress; however, this interaction is relatively understudied. Here, we attempt to manipulate the degree of territoriality expressed in males of the aggressive cichlid species *Astatotilapia burtoni*. We induced territoriality by housing males on either side of a clear, perforated screen and provided each male with a defendable structure (territory). We attempted to manipulate the degree of territoriality by altering the proximity of territories across the screen. This will allow us to assess how territoriality and the HPG axis may modulate patterns of oxidative damage in various tissues. This work will provide insight into the cost of social dominance and the evolution of life history trade-offs.



Effects of Brooding Status on Lipid Peroxidation and Mitochondrial Function in a Mouthbrooding African Cichlid Fish

Presenter: Howard Mitchell

Faculty Supervisors: Peter Dijkstra, Edward McKee

Abstract: Reproduction is one of the most physiologically demanding life-history events, leading to potential trade-offs between current and future reproductive success. The existing ‘oxidative cost of reproduction hypothesis’ asserts that the physiological cost of reproduction leads to oxidative damage to the individual and a resulting decline in longevity or future reproductive capacity. However, most studies failed to detect an oxidative cost of reproduction. Since mitochondria are a major site of ATP and ROS formation, measuring mitochondrial performance along with oxidative damage could advance our understanding of potential physiological constraints occurring during reproduction. In the African cichlid fish *Astatotilapia burtoni*, females carry developing embryos in their mouths for up to 4 weeks after spawning, and are subsequently unable to forage for food. We compared mitochondrial respiratory capacity and efficiency using high-resolution respirometry between brooding and non-brooding females. We found that brooding females had lower mitochondrial respiratory capacity than non-brooding females. We also found that mitochondrial efficiency was linked to oxidative damage (specifically lipid peroxidation), and that this effect depended upon brooding status. Our results show that mitochondrial capacity and efficiency is adjusted during reproduction, with potential effects on oxidative damage levels.

Examining the Interactions Between Actin and the MARTX Toxin in *Vibrio cholerae*

Presenter: Taylor Dick

Faculty Supervisor: Steven Juris

Abstract: In places like Africa, Southeast Asia, and Haiti, cholera is still a prevalent and life-threatening illness. This bacterium has a multifunctional auto processing repeats-in-toxin (MARTX) which has three effector domains: an actin cross-linking domain (ACD), a Rho inactivation domain (RID), and an alpha/beta hydrolase domain (ABH) (Woida, Satchell, 2020). The ACD is a catalytic domain that utilizes actin, depleting the cell’s actin levels enough to depolymerize and destroy the cytoskeleton of the cell, ultimately killing the cell (Geissler, 2009). A mutant ACD was discovered in yeast (*Saccharomyces cerevisiae*) that blocks the normally functioning ACD, preventing it from killing the yeast cells. Three of these ACD truncation mutants were made, all having a shorter number of amino acids (78, 83, and 199) than the normal ACD (456). The research problem for this project was to find out if the ACD truncation mutants have an actin-binding site and apply that to cholera. If all three mutants interact with actin, the suspected actin binding site must be between amino acids 1 and 78 because that’s the length of the shortest mutant. Recent research found that wild-type ACD turned actin into toxic oligomers that poisoned the cells’ ability to form actin (Heisler, et al., 2015). Discovering why and how often *Vibrio cholerae* binds to actin is important because it helps further understand the MARTX toxin, as well as this deadly bacterium.



Therapeutic Drug Intervention in *Drosophila Melanogaster* to Treat Neurodegenerative Disease

Presenter: Cooper Allers

Faculty Supervisor: Michelle Steinhilb

Abstract: Alzheimer's disease is one of the most prevalent and devastating neurodegenerative diseases of our time. It is characterized by a gradual loss of cognitive ability that begins with mild impairment and ends with severe dementia affecting nearly all areas of the brain. Neurofibrillary tangles caused by abnormal tau protein aggregation have been implicated in Alzheimer's disease progression. Calpain, a protease that cleaves full-length tau (65kD) to liberate a 17kD fragment, has been implicated in promoting tau toxicity. For this reason, efforts to reduce tau toxicity have targeted the calpain protease. Additionally, kinases have been found to play a role in tau toxicity; the hyperphosphorylation of tau by kinases has been shown to be intrinsically toxic. Our lab utilizes a *Drosophila* model of neurodegenerative disease in which expression of human tau in photoreceptor neurons results a 'rough eye' phenotype that can be modified: genetic or pharmacological interventions can make the tau-induced rough eye worse (enhancement) or better (suppression). This project examines both kinase and calpain inhibitors to ameliorate tau-induced neuronal toxicity. We anticipate that feeding inhibitory drugs to tau-expressing flies will result in a marked suppression of tau toxicity, helping to identify intervention strategies for potential application in clinical research.

Investigating the Effect of Pharmacological Calpain Inhibition in a *Drosophila* Model of Polyglutamine Disorders

Presenter: Logan Douglas

Faculty Supervisor: Michelle Steinhilb

Abstract: Machado-Josephs disease (MJD) is a neurodegenerative disorder that affects about 1 in 20,000 people worldwide. MJD is in a family of polyglutamine disorders caused by repetitive DNA sequences that lead to progressive loss of coordination and ultimately nervous system dysfunction. MJD can be effectively modeled in the common fruit fly, *Drosophila melanogaster*, as the fly genome has been well annotated and importantly, flies have conserved versions of the proteins needed to perform many of the important posttranslational modifications that are implicated in MJD disease progression. This project focuses on the proteolytic enzyme calpain since the Steinhilb lab and others have demonstrated the importance of calpain cleavage in several neurodegenerative diseases. Our lab has shown previously that MJD-induced neuronal toxicity can be suppressed by genetically reducing calpain expression in flies. In this project I employed transgenic flies that express the human MJD protein in photoreceptor neurons to investigate whether pharmacological calpain inhibition can suppress MJD-induced toxicity. Discovering pharmacological methods for reducing the pathological burden of MJD in a model organism is the first step to producing effective therapies for clinical trials.



The Impact of Pharmacological Inhibition in Suppressing Tau Toxicity

Presenter: Justus Holben

Faculty Supervisor: Michelle Steinhilb

Abstract: Alzheimer's disease (AD) is a neurodegenerative disease that affects more than 6 million Americans. It is characterized by a multitude of symptoms, including memory loss, seizures, and mood swings. There are treatments on the market that are aimed at targeting these symptoms; however, there is no known cure. AD is characterized anatomically by the presence of neurofibrillary, tau tangles and beta-amyloid plaques. Because of this, AD belongs to a family of diseases called tauopathies, which are characterized by abnormal phosphorylation of tau proteins by kinases in the brain, leading to the characteristic neurofibrillary tangles and ultimately, miscommunication and death of hippocampal neurons. It has been shown that functional tau (65kD) becomes toxic when it is cut into a 17kD fragment by the enzyme calpain. For this project, we utilized the model system *Drosophila melanogaster* (the common fruit fly) to test the efficacy of pharmacological calpain and kinase inhibitors to suppress tau-associated neurodegeneration in photoreceptor neurons of the compound eye. The aim of this study is to determine whether pharmacologically inhibiting two main drivers of tau-induced neuronal toxicity, phosphorylation and proteolytic cleavage, are viable treatment strategies to alleviate the neurodegeneration associated with AD.

Examining the Impact of Tau Toxicity on Climbing Ability in *Drosophila*

Presenter: Noah Klan

Faculty Supervisor: Michelle Steinhilb

Abstract: Alzheimer's disease (AD) is a significant medical and societal challenge marked by memory loss, cognitive decline, and behavioral changes. It belongs to a disease class known as tauopathies, known for tau protein tangles in the human brain. Tau, a microtubule-associated protein, typically stabilizes microtubules but can aggregate due to post-translational modifications, leading to cognitive impairment. *Drosophila melanogaster*, the fruit fly, is an ideal model for studying the role of tau in disease due to molecular pathway similarities. The climbing assay, using the fly's innate negative geotaxis behavior, is used to assess neurodegenerative improvement or decline. Specifically, my project uses this assay to assess how human tauopathy-associated genes and potential therapeutic drugs affect fly locomotion. Since others have shown that tau toxicity correlates with impaired climbing ability, I will employ the climbing assay to screen potential modifiers of tau toxicity to look for an improvement in locomotor behavior in drug-fed flies. This research represents a crucial step toward understanding the role of tau in neurodegeneration and its implications for Alzheimer's disease treatments.

Genetic Parentage Analysis of Wild Black-Footed Ferrets

(*Mustela nigripes*)

Presenter: Mary Gibson

Faculty Supervisor: Bradley Swanson

Abstract: The black-footed ferret (*Mustela nigripes*) has been listed as endangered since 1967, in large part due to the removal of the ferrets' main food source, prairie dogs (*Cynomys* spp.), and the introduction of sylvatic plague, caused by the bacterium *Yersinia pestis*. The last wild ferrets were captured from Meeteetse, Wyoming between 1985 and 1987, but the current captive and wild populations are descended from the genetic equivalent of only seven ferrets. The genetic diversity of all black-footed ferrets has been a main concern of wildlife managers, especially to minimize mating between related individuals while increasing the population size. The mating system of black-footed ferrets is currently unknown, since wild ferrets are nocturnal and live underground in prairie dog burrows. Hair and buccal swabs from 243 wild black-footed ferrets from Conata Basin, spanning 15 years (2002-2016) were tested at 13 microsatellite loci in fragment analysis to evaluate genotypes. Forty litters were examined and 14 litters could be multiple paternity or a male is missing from the sampled genetic pool. Thirty-one kits out of 118 could not be the offspring from the assumed, putative mother. Mixed paternity likely exists in wild black-footed ferrets but the high genetic similarity among individuals could be obscuring other multiple paternity litters in this study.

Unionid Assemblage and Habitat Assessment After Major Dam Failures in Mid-Michigan

Presenter: Nicole Vellequette

Faculty Supervisors: Daelyn Woolnough, David Zanatta, Ava Laszlo

Abstract: In 2020, two central Michigan dams failed in a chain of four reservoir lakes along the Tittabawassee and Tobacco rivers. In 2021 and 2022, standardized surveys were conducted to assess habitat parameters, current densities, species richness, and spatial distribution of unionid assemblages and threats posed by invasive species in these four lakes (Secord, Smallwood, Wixom, and Sanford). Overall, 23 live species were found in the surveys, but it was discovered that the lentic reservoir habitats generally do not support speciose unionid assemblages with highest densities of unionids found mostly upstream of the reservoirs or below the dams. Substrate in Secord, Smallwood, the Tittabawassee River reach of Wixom, and Sanford lakes, were found to be mostly similar and not supportive of sensitive species. Conversely, substrate in upstream Tobacco River reaches of Wixom Lake was much more variable and supported dense, species rich unionid assemblages (12 live species). The upstream reach of Wixom Lake was also the only location where the live federally endangered *Epioblasma triquetra* (Snuffbox) was found. Invasive *Dreissena polymorpha* and *Cipangopaludina chinensis* (Secord and Smallwood Lakes) fouled substrates throughout the four lakes and threatened most unionids in the system. These data could be used to further understand unionid assemblages and general habitat parameters in dam-affected ecosystems and for guiding dam management practices while protecting unionids.



Reassessment and Assemblage Evaluation of Unionids in the Upper Tittabawassee River Watershed 40 Years After Historical Study

Presenter: Aaron Vlasak

Faculty Supervisor: Daelyn Woolnough

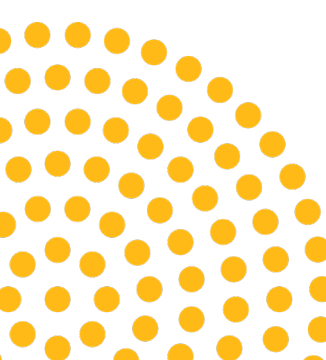
Abstract: Native freshwater mussels (unionids) provide many ecosystem services. However, unionids are understudied especially in tributaries, inland lakes, and reservoirs. Our objectives were to determine the current diversity and density of unionids in tributaries and reservoirs of the Tittabawassee River and to compare our data to the limited historical data of the watershed. We also wanted to identify changes to the habitat that could help explain any observed changes in the unionid assemblages over time. We surveyed a total of 39 sites using standard snorkel and SCUBA time search methods; sites included 28 historical sites, 5 new tributary sites, and 6 reservoir sites. We present unionid community composition, abundances, changes from historical data as well as risks to these unionids. In total we found >1000 live unionids represented by 16 species. This study found multiple species that were not found 40 years ago as well as loss of species at numerous sites. The density of the mussels changed at all but 3 sites where only shells were previously found. Every species also changed in density at least one site, with the most variation from the past study per species being 16 sites with density changes of Giant Floater. We address how these data can be used as a new baseline to monitor and conserve the unionids of the Upper Tittabawassee River Watershed. We will discuss how the infrequent timeline of mussel surveys can make it difficult to explain why changes have occurred.

Patterns of Shell Shape Variation in the Critically Imperiled Freshwater Mussel Genus *Epioblasma*

Presenter: James Haugh

Faculty Supervisor: Dave Zanatta

Abstract: The freshwater mussel genus *Epioblasma* comprises 27 species from eastern North America. Ten species are federally protected with the remaining 17 species presumed to have gone extinct due to human activity. Due to their critically imperiled status and extreme rarity, most species have little to no molecular data available for genomic analysis and thus their evolutionary history is poorly understood. In the absence of molecular data, we set out to better understand aspects of *Epioblasma* ecology and evolution by quantifying and analyzing shell shape. To quantify and assess shell shape variation within and among species, photographs of *Epioblasma* specimens ($n = 1400$) representing all 27 species and 59 different river bodies were sampled from museum collections for geometric morphometric analyses. Each interior shell shape was extracted via Procrustes-transformed landmarks to get a set of coordinates. An LDA was able to correctly identify *Epioblasma* specimens to subgenus at a rate of 82.7%, and groupings formed by a UPGMA cluster analysis were largely consistent with previous subgeneric classifications. A PCA and examination of thin-plate splines were able to quantify differences in male and female *Epioblasma* forms and could be used to explain trends in sexual dimorphism among species and subgenera. Correlation analyses showed relationships between waterbody and specific differences in shell shape among subgenera. Further explorations of the data are ongoing.



Gape Size Differences Between Cisco (*Coregonus artedii*) and Lake Whitefish (*Coregonus clupeaformis*) During Early Life Stages

Presenter: Jaxon Chappell

Faculty Supervisor: Scott McNaught

Abstract: The mouth gapes of Lake Whitefish and Lake Cisco were investigated to see if there was a significant difference between the two species that could be causing changes in recruitment. Mouth gape measurements were taken from preserved specimens of lab and wild caught fish. There were positive correlations for each species in their linear regression relationships and equal variance between the analyzed samples. There was no significant difference between the slopes of the regressions for the two species when relating gape to length.



Chemistry & Biochemistry

Analysis and Quantification of the Antioxidant Properties of Beer

Presenter: Jonah Guerrero

Faculty Supervisor: Dale LeCaptain

Abstract: In the microbrewing industry, there has been a growing problem of craft beers degrading before consumption. Specifically, the level of IBU's (International Bitterness Units) in various craft beers has been found to be lower than what the reported level is supposed to be. This is due to oxidation of the beer over time, resulting in degradation. Hops, an integral part of the brewing beer, has been used throughout history as a natural antioxidant for hundreds of years, an example of this being IPA's (India Pale Ales), which had higher hops content to prevent the beer from spoiling. Knowing this, the goal of this project is to use Reverse-phase High Performance Liquid Chromatography (HPLC) to analyze the antioxidant properties of hops. The part of the hops in particular that is being analyzed is the alpha and beta humulones, both of which are responsible for oxidation resistance. These humulones are reacted with a free radical known as 2,2-diphenyl-1-picrylhydrazyl (DPPH) to simulate oxidation, then run through an HPLC to look for shifts in DPPH peaks. The shifts in the peaks will indicate differing levels of degradation, allowing the level of degradation/oxidation over time based on hops content to be quantified.

Novel Adsorptive Membranes and Resins for the Removal of Arsenate and Ammonia From Water

Presenter: Catriana Nichols

Co-Presenters: Emmanuella Anang, Abolade Busari

Faculty Supervisors: Anja Mueller, Itzel Marquez, Bradley Fahlman

Abstract: Existing methods for the removal of arsenic and ammonia, such as adsorptive resin and membrane processes, face challenges in selectivity and mechanical stability. Molecularly imprinted acrylate polymers, templated for arsenate and ammonia, were utilized to create adsorbents and adsorptive membranes reinforced with graphitic carbon nitride. The developed adsorbent demonstrated arsenate removal comparable to commercial ion-exchange resins, while ammonia removal surpassed commercial resins in capacity but showed lower selectivity. Although the prepared membranes matched or outperformed commercial resins, further optimization is needed to enhance stability and selectivity. This work explores the potential of molecularly imprinted polymers with graphitic carbon nitride for effective removal of arsenate and ammonia, offering insights into improving membrane performance in water treatment applications.



Hydrogen Fuel Cells Utilizing Hyperbranched Polymer Membranes

Presenter: Zachery Palao

Faculty Supervisor: Anja Mueller

Abstract: We live in a post industrialized world where technological progress has greatly been reliant on carbon based fuels. However, the major cost of this progress has been damage to our ozone and environment through carbon dioxide emissions. Additionally, our crude oil supply does not come from an unlimited source and some theorize that reserves will run out as we enter the 2050s. As such, there has been an increase in research involving new sources of energy, including hydrogen fuel cells. Power for the fuel cell is produced in the form of electrical energy as a hydrogen atom moves from an anode, across a proton exchange membrane (PEM), and combines with oxygen on the cathode side, producing H₂O. The proton travels across the PEM via imidazole molecules, and the electrical energy produced is directed through a separate current. Currently, the main obstacles concerning hydrogen fuel cells revolve on their heat resistance and ability to remain dry during operation. This project focuses on the former issue and proposes the use of a variable branched polymer as a means to increase thermal stability of the membrane. The synthesis of the variable branched polymer must be optimized, as well as the percentage of branching within the polymer that provides the most thermal and physical stability. The structure of the polymer was confirmed using ¹H, ¹⁹F, and ¹³C NMR scans. Physical and thermal properties were tested using TGA and DSC readings.

Synthesis of Azido-Inositol Analogues as Tools to Study Mycobacterial Glycolipids

Presenter: Carson Bush

Faculty Supervisor: Ben Swarts

Abstract: Tuberculosis, caused by *Mycobacterium tuberculosis* (Mtb), is responsible for over 1 million deaths annually, making it one of the world's deadliest infectious diseases. Mtb is particularly tolerant to drugs that could lead to its eradication due to its complex cell envelope. This envelope is partially composed of virulence-associated glycolipids called phosphatidyl inositol mannosides (PIMs) which contain the sugar inositol. PIMs and similar glycolipids have immunomodulatory effects during mycobacterial infection, yet their associated biosynthetic and transporter proteins, and the means by which they exert their immunoactivity in the host, remain largely unknown. To help address these questions, we propose to develop new chemical probe compounds that allow labeling and analysis of PIMs in live mycobacteria. Inositol can serve as a target for developing probes that metabolically incorporate into, and facilitate the study of, PIMs within live mycobacterial cells. Here, we report synthetic studies of inositol analogues modified at the 4- and 5-positions with different functional groups including azido and fluorine groups, which allow for the metabolic labeling and analysis of PIMs in intact mycobacteria. In the future, these probes can be employed in experiments aimed at better understanding PIM biosynthesis, transport, and host interactions, which may provide insights for drug development.



Progress Toward Developing a Catalytically Inactive Hydrolase to Selectively Detect Mycobacterium Tuberculosis

Presenter: Emma Doederlein

Faculty Supervisor: Benjamin Swarts

Abstract: Mycobacterium tuberculosis (Mtb), the causative agent of tuberculosis, is responsible for the death of 1.6 million people annually. The cell envelope contains a unique outer mycomembrane composed of long, hydrophobic mycolic acids. The mycolic acids are bound to trehalose 6-positions either as trehalose monomycolate (TMM) or trehalose dimycolate (TDM). TDM has previously been shown to be a virulence factor of Mtb. Since TDM is not a glycolipid that is naturally synthesized in humans or other microbes, it can serve as a biomarker for detecting Mtb. A novel strategy to detect carbohydrate-containing molecules with native structures using engineered, catalytically inactive carbohydrate-processing enzymes has recently emerged. Here, we utilize this strategy with a TDM hydrolase (Tdmh) to detect TDM. Tdmh is a serine esterase present in mycobacteria that hydrolyses TDM to TMM and a free mycolic acid. In its catalytically inactive mutant, Tdmh S124A, the catalytic triad serine (S) is substituted to alanine (A). We hypothesized that Tdmh S124A will maintain its binding specificity for TDM but lose catalytic activity. Detection of the mutant enzyme can be achieved using fluorescence or blotting. In this work, we expressed and purified the enzymes, confirmed catalytic activity, and evaluated the mutant enzyme's binding of TDM. This engineered enzyme has the potential to be a valuable new tool for detecting Mtb quickly and accurately.

Synthesis of a Mycolic Acid Probe for Investigating Mycolic Acid Recycling in Mycobacteria

Presenter: Andrew Kruskamp

Faculty Supervisor: Benjamin Swarts

Abstract: Mycobacterium tuberculosis (Mtb) has plagued humanity for thousands of years and it still claims over a million lives a year, with over a quarter of the world's population being latently infected. Emergence of drug-resistant strains has motivated research investigating pathways offering candidates for novel drug targets, including cell envelope recycling pathways. Mtb owes much of its success to its thick outer envelope characterized by unique fatty acids called mycolic acids. These present a unique chemical structure: they can be very large (up to 100 carbons), the alpha carbon anchors an alkyl branch, the beta carbon bears a hydroxy group, and further modifications occur along the main chain. This architecture plays a critical role in membrane structure and pathogenesis, and also serves as a template for probe development to investigate relevant pathways. Due to its unique structure, it can be inferred that mycolic acids must be chaperoned by proteins that are unique to mycobacteria and have the ability to discriminate between these and more generic straight-chain fatty acids that are more ubiquitous to life. A native mycolic acid analogue was synthesized and decorated with a fluorophore. It is hypothesized that this mycolic acid probe can be fed to mycobacteria and its movement tracked with the fluorescent handle. Tracking the probe may elucidate mycolic acid recycling pathways and uncover novel drug targets.



Dental Adhesives

Presenter: Paige Bricault

Co-Presenter: Nate Babar

Faculty Supervisor: Anja Mueller


Abstract: This research involves analyzation of two different dental adhesives. Both adhesives are one-step self-etch adhesive systems. One sample, pairs a desensitizer with the self-etch. Desensitizers are known historically for reducing sensitivity in the preparation but does not interfere with bond strength. Self-etch adhesives have an acidic nature, which allows for priming and rinsing to occur in one-step. Using IR spectroscopy, NMR spectroscopy, and mass spectroscopy specific components have been identified. Further analysis is ongoing to identify all components.

Degradation of Polysaccharide Hydrogels for Skin Scaffold

Presenter: Jenna Schultz

Faculty Supervisor: Anja Mueller

Abstract: The skin is not only the largest organ, but also one of the most important. The primary function of skin is that it serves as a protective barrier to keep out environmental factors. But skin also prevents the loss of fluids, maintains homeostasis, and is the largest sensory organ. In the event that all layers of skin are damaged and functions are impaired, “temporary skin” or skin scaffolds have to be used. The scaffolds are seeded with the patients’ skin cells to accelerate healing. However, current skin scaffolds are not biodegradable; therefore, they have to be peeled off, to the detriment of the healing process. In this research, we are developing a biodegradable skin scaffold that will degrade while the skin heals. Analysis of the physical properties of the gel are measured during degradation. Also, degradation rates are determined, and degradation products are being identified.



Earth & Atmospheric Sciences

Assessing Central Michigan University Students' Tornado Preparedness on Campus

Presenter: Lauren Harvey

Faculty Supervisor: Martin Baxter

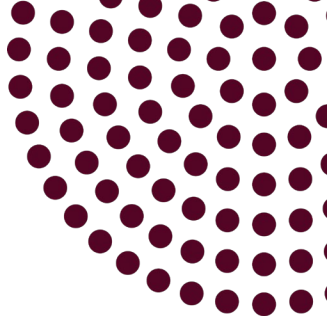
Abstract: College students are uniquely vulnerable to severe weather events, including tornadoes. While universities are only required to inform students of the potential for severe weather events, previous studies have found that students often believe that their schools will provide them with additional information on how to shelter, and that they tend to look towards professors and others in positions in authority for guidance. However, it is possible that these faculty members and employees do not have sufficient training to make informed decisions about protective actions. This study was created to determine how Central Michigan University (CMU) students perceive CMU's responsibilities during severe weather as well as to assess students' level of preparedness for hazardous weather events on campus. Data was gathered via a campus-wide online survey which included both Likert-style and scenario-style questions. It was found that participants generally held CMU responsible for both warning dissemination and student safety. It was also found that students held themselves less responsible for their own safety and that students did not strongly believe that they were knowledgeable about or prepared for severe weather on campus. Students did generally report that they could receive severe weather messaging from at least one reputable source.

PFAS Fate and Transport Across a Groundwater-Surface Water Interface

Presenter: Eleanor McFarlan

Faculty Supervisor: Larry Lemke

Abstract: Per- and polyfluoroalkyl substances (PFAS) are emerging contaminants of concern that are not largely understood. In the 1960's, PFAS compounds were dumped in the House Street Disposal Site, an unlined landfill on the crest of a glacial end moraine in Rockford, Michigan. In 2017, PFAS was discovered in the groundwater and a network of monitoring wells has delineated a plume that migrated 3 km (2 mi) downgradient toward the Rogue River. Today, the Michigan Department of Natural Resources (MDNR) operates fish-ponds where the PFAS plume intersects the groundwater-surface water interface (GSI). Each year, the MDNR fills these ephemeral anthropogenic ponds from a nearby creek. At the end of the summer, the ponds do not drain completely as they contain natural springs. This study investigated the effect that seasonal changes have on PFAS transport across the GSI. Surface water samples were collected from five locations within and adjacent to the fishponds. Groundwater-surface water mixing models suggest different classes of PFAS compounds move differentially across the GSI. We developed two 100 km² (40 mi²) MODFLOW models for the site –with and without the fishponds. Changes to the fishpond constant head boundaries did not substantially change the predicted flow paths, suggesting that PFAS transport is dominated by the regional flow system with limited influence from seasonal changes to boundary conditions at the GSI.



Exploring Textural Variations of Spodumene in Lithium-Cesium-Tantalum (LCT) Pegmatites From Florence County, Wisconsin, USA

Presenter: Jacob Meldrum

Faculty Supervisor: Monaliza Sirbescu

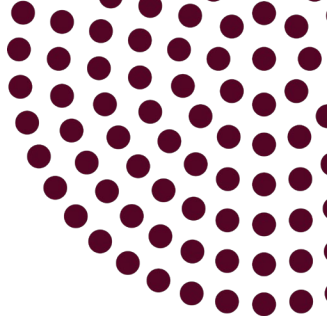
Abstract: As lithium demand drastically increases because of its use in electric car batteries, discovering new sources of it is crucial. This study focuses on spodumene, the primary Li ore mineral, examining its occurrences within the King's X2 and Price Lake pegmatites. These dikes, situated in the Florence Co. pegmatite field, intrude discordantly into early Proterozoic amphibolites. Through various analytical techniques, including laser induced breakdown spectroscopy (LIBS), we investigate the association between coarse magmatic spodumene (CMS) and deformation-related spodumene-quartz intergrowths (DR-SQI). DR-SQI is observed in absence of the mineral petalite, which breaks down to form the traditionally known SQI texture. This suggests a distinct formation mechanism involving progressive dissolution, replacement, and recrystallization of CMS, likely during late hydrofracturing and albitization events. Our findings show primary CMS as having a Li concentration that approaches its known stoichiometric value and distinctive cathodoluminescence (CL) characteristics, while secondary spodumene in DR-SQI exhibits Li depletion and complex CL zoning patterns. This study sheds light on the evolution of lithium minerals and offers insights into potential lithium resource exploration strategies.

Effects of Vegetation on Microplastic Concentrations in Great Lakes Coastal Wetlands

Presenter: Julia Shablin

Faculty Supervisors: Amanda Suchy, Donald Uzarski

Abstract: Microplastics are plastic particles (<5mm) found in nearly all environments. Microplastics have the potential to negatively impact human and wildlife health via ingestion and carry and transport toxins on their surface. Wetlands may be particularly vulnerable to microplastic accumulation as vegetation can trap small particles and reduce water velocity, promoting settling of microplastic particles. Our objective was to examine how vegetation may affect microplastic concentrations in coastal wetlands in the Great Lakes. Sediment samples were collected from 15 sites as part of the long-term Coastal Wetland Monitoring Program during the summer of 2022. At each site, sediment was collected from up to three dominant vegetation zones including *Typha* sp., *Schoenoplectus* sp., and *Phragmites* sp.. Microplastics were extracted from sediment via CaCl₂ density separation after wet sieving (0.3-5 mm) and removal of organic matter (30% H₂O₂). Microplastics were collected on a filter and manually counted using a dissecting microscope. We found average microplastic concentrations were not significantly different between patches of *Typha* sp. (323 particles/L soil) and *Schoenoplectus* sp. (257 particles/L soil). However, microplastic concentrations were more variable in *Typha* sp. patches (range = 73 - 600 particles/L soil) than in patches of *Schoenoplectus* sp. (range = 89 - 180 particles/L soil). This suggests that *Typha* sp., may be more vulnerable to hotspots of microplastic deposition.




Basin-Wide Changes Reflected by Linked Geochronology and Geochemistry Within the Lower Cretaceous Rocas Verdes Basin, Patagonia

Presenter: Julia Daniel

Faculty Supervisor: Natalia Zakharova

Abstract: Understanding the causal mechanisms for physical and environmental change in sedimentary basins is necessary to link the sedimentary record to local versus global events in earth's past. Moreover, constraining the timing of these changes in sedimentary records further aids our understanding of how a basin evolves and why. This investigation focuses on the late Jurassic to early Cretaceous Rocas Verdes Basin (RVB) in the southernmost Andes, where previous studies and field observations have documented substantial changes in depositional environments. In this study, we aim to better reconstruct depositional conditions of the RVB by evaluating new geochemical and geochronological data from mudstones of the Zapata Formation in southern Chile. New results are correlated with previously characterized age-equivalent stratigraphy of the Rio Mayer Formation further North in Argentina. Sampled sections of the Zapata Formation were selected based on its inferred paleogeographic position, which represents a deeper and less restricted portion of the basin relative to the Rio Mayer Formation. We conducted whole-rock geochemical analyses of 30 samples from the Zapata Formation. We then correlated lithological and geochemical records of the Zapata and Rio Mayer Formations using measured stratigraphic sections, chemostratigraphy, and geochronology. While the chemical concentrations differ between the Zapata and Rio Mayer formations, they follow similar trends suggesting basin-driven changes.



Earth & Ecosystem Science

Effect of Temperature and Solids Retention Time on the Removal of Antibiotic Resistance Genes During Anaerobic Digestion of Sludge

Presenter: Yasna Mortezaei

Faculty Supervisors: Goksel Demirer, Maggie Williams

Abstract: This research aimed to examine the impact of operating temperatures (35 °C and 55 °C) and solids retention time (SRT) variations (20, 30, and 40 days) on the anaerobic digestion (AD) of sludge, focusing on the removal of antibiotic resistance genes (ARGs) and biogas generation. Results revealed that at shorter SRTs (20 days), thermophilic AD (TAD) exhibited lower levels of ARGs compared to mesophilic AD (MAD), with removal rates of 75.80% and 45.78%, respectively. Conversely, at longer SRTs (30 and 40 days), MAD demonstrated increased ARG removal rates of 51.79% and 79.63%, while TAD rates decreased to 53.95% and 24.65%. These findings suggest that MAD requires extended SRTs for optimal ARG removal, whereas thermophilic reactors are more effective at shorter SRTs. Additionally, biogas production was notably higher (34–42%) under thermophilic conditions across various SRTs, indicating that reducing SRT and elevating temperature are viable strategies for enhancing biogas output.



Engineering & Technology

Evaluation of Floodplain Reconnection Effectiveness Considering the Downstream Changing Lake Water Level Effects Under Climate Change: A Case Study of Shiawassee National Wildlife Refuge

Presenter: Mohammadjavad Karami
Faculty Supervisor: Roderick Lammers

Abstract: Floodplain reconnection is a flooding mitigation strategy that involves breaching or relocating levees to allow rivers more space during high water events. This increases storage capacity and reduces flood stages, providing benefits like enhanced water quality, reduced erosion, habitat restoration, and improved recreation. Our project focused on quantifying the impact of downstream Great Lakes water levels and climate change on floodplain restoration effectiveness at Shiawassee National Wildlife Refuge, MI. Using a 2D HEC-RAS hydraulic model, we assessed historic (leveed) and current (reconnected) conditions, considering downstream lake levels and climate change effects. Various management scenarios, including real-time inflow/outflow control and altering flow paths, were tested to maximize floodplain reconnection benefits. The study revealed that downstream water levels significantly influence effectiveness, suggesting broader applicability beyond the Great Lakes. Our findings contribute to optimizing floodplain reconnection strategies for coastal areas facing similar challenges.

Effect of Heating Rate on Microstructure and Corrosion Resistance Ability of Quenched and Tempered 8620 Low Carbon Alloy Steels

Presenter: Sina Tajmiri
Faculty Supervisor: Ishraq Shabib

Abstract: This study examines the microstructural evolution and electrochemical properties of cold-rolled wrought 8620 low carbon alloy steel under different heat treatment regimes. Coin-shaped samples were prepared from 8620 steel rods and exposed to an annealing temperature of 850 °C under two heating rates referred to as slow rate (SR) and fast rate (FR). A microstructural analysis of SR samples revealed predominantly martensitic phases, while FR samples displayed a dual-phase microstructure consisting of martensite and ferrite. During subsequent tempering, martensite was transformed into tempered martensite and ferrite. SR samples exhibited a greater hardness as measured by mechanical testing. The corrosion resistance of the samples was demonstrated by electrochemical tests. The corrosion resistance of SR quenched specimens was superior to that of FR, whereas SR samples showed higher polarization resistance. As a result of tempering, tempered SR samples showed a significant decrease in corrosion resistance, while tempered FR samples retained their properties. Electrochemical impedance spectroscopy (EIS) yielded information related to corrosion behavior, with SR samples showing higher impedance and tempered FR samples exhibiting closer-to-ideal capacitive behavior and a low Cdl which indicates overall enhanced corrosion resistance ability.



Examining the Impact of the InSciTE Program on Undergraduate Students at Central Michigan University

Presenter: Violet Lane

Faculty Supervisor: Wiline Pangle

Abstract: The Integration of Science, Technology and Engineering program (InSciTE) at Central Michigan University (CMU) aims to teach science, technology, engineering, and math (STEM) focused students transferable skills such as communication, collaboration, and creative problem solving (cmich.edu). InSciTE is also rooted in equity, aiming to attract applicants from underrepresented STEM groups (such as LGBTQI+ and marginalized ethnic groups) to foster strong bonds both within the InSciTE community and within CMU as a whole for its cohort. Due to its start date in the Spring 2023 semester, limited assessment of the current InSciTE students has occurred. This paper focuses on the study of InSciTE and non-InSciTE students within the College of Science and Engineering, analyzing trends found in survey data to determine whether InSciTE has started to fulfill its goals. This paper will act as a foundation for future research on the program and as an early analysis of the differences between InSciTE and other cohorts or communities at CMU.

Electro-Deposition of Calcium Phosphate Coatings on AZ31 Magnesium Alloy for Biomedical Applications

Presenter: Salma Abdelgawad

Faculty Supervisor: Waseem Haider

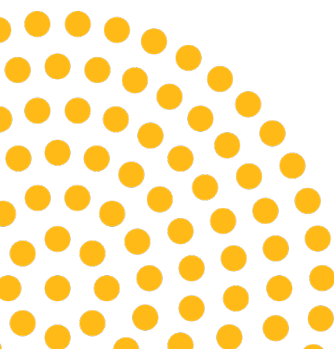
Abstract: Metallic magnesium alloys have shown great potential as a material for bone implant applications due to their unique mechanical strength that is very similar to that of human bone. Additionally, magnesium alloys have high biocompatibility and biodegradability. As a biodegradable metal, magnesium can be used in humans and can be safely absorbed by the body. Calcium phosphate (CaP) coatings are electrochemically deposited (ECD) onto the magnesium alloy to slow down material corrosion time. However, with certain bone fractures and ailments, implants are only intended for a specific time of use. Research has not been widely conducted on the corrosion and degradation times of magnesium alloys in simulated body fluid (SBF). In this study, magnesium alloy AZ 31 was coated with calcium phosphate using pulse current and different ECD times. To determine the effect of voltage supply and time, morphological and electrochemical analysis were carried out.

Comparative Analysis of Magnetron Sputtered Aluminum Coating on AZ 31 vs. ZK60 Alloy

Presenter: Tipp Baker

Faculty Supervisors: Waseem Haider, Ishraq Shabib

Abstract: This project aims to conduct a Comparative Analysis of Magnetron Sputtered Aluminum Coating on AZ 31 versus ZK60 Alloy. We explored the use of magnesium alloys for biodegradable implants due to their biocompatibility, mechanical strength, and ability to degrade harmlessly within the body. The study focuses on sputtering an aluminum coating to regulate the corrosion rate of magnesium alloys. Methods include sputtering aluminum on AZ 31 and ZK 60 alloys, conducting electrochemical testing, analyzing surface characteristics using SEM, EDS, and XRD imaging.



Geography & Environmental Studies

History of Fossil Fuel Divestment Movements at Three Universities Through Student Newspapers and Supporting Documents

Presenter: Claire DeBlanc

Faculty Supervisor: Matthew Liesch

Abstract: Many universities have investments that help fund fossil fuel projects. In a world that is increasingly impacted by the climate crisis, caused largely by the burning of fossil fuels, countless people are protesting investments in companies that pose a threat to the climate. The leaders of these fossil fuel divestment movements are primarily university students, following in the footsteps of the successful South Africa apartheid and the tobacco divestment movements. These past movements have been displays of the power of student activism. As the fossil fuel divestment movement grows, it is on course to be the third success story for divestment movements. This paper explores the recent history of fossil fuel divestment at Central Michigan University (CMU), Michigan State University (MSU), and the University of Michigan (UM), primarily through student-run newspapers. The mission statements and/or core values of each of these universities are at odds with fossil fuel investments and students have worked to hold the administration responsible. All three of these universities have had fossil fuel divestment movements of widely varying scopes as well as varying success. CMU's movement led to no tangible results, MSU is still working towards divestment but has seen no commitments, and UM has officially divested from fossil fuels and is in the process of cutting ties with all investments that they have identified as fossil fuel.



Mathematics

Improving Neuroimaging by Using k-NN Regression in Q-ball Imaging

Presenter: Hiruni Kamali Pallage

Faculty Supervisor: Yeon Hyang Kim

Funding: National Science Foundation of USA

Abstract: Studying the neural architecture of the brain without invasive procedures is the aim of our project. We aim to contribute to research on brain disorders by employing an MRI technique called Q-ball imaging. Our approach involves measuring signals in a spherical domain (q-ball) and utilizing mathematical tools like interpolation to construct orientation distribution functions (ODF). These 3D diffusion objects characterize the water movement in the brain. However, the challenge lies in obtaining sufficient signal data without prolonged scan times. To address this, we use k-NN regression to estimate signal values in specific directions. With measured and estimated signals, we construct ODFs for each q-ball and brain slice, ultimately revealing the 3D fiber arrangement. Our method exhibits minimal relative error across numerous q-balls, indicating improved signal and ODF estimations compared to two existing techniques. This discovery holds promise for advancing neuroimaging research.



Neuroscience

Evaluating the Long-Term Capacity and Survival of Optogenetic Dopaminergic Neuronal-Like Stem Cell Transplantation With Varying Levels of Encouraged Complex Limb-Use in a 6-OHDA Rat Model of Parkinson's Disease (Pilot)

Presenter: Tommie Cammarano

Faculty Supervisor: Michael Sandstrom

Abstract: Parkinson's disease (PD) is an idiopathic neurodegenerative disorder, characterized by the loss of dopaminergic neurons in the nigrostriatal pathway. L-DOPA, the standard treatment, increasingly elicits complications. Stem cell therapy is an alternative, aiming to replace lost neurons. We routinely stimulate transplanted cells directly, as they are genetically rendered responsive to light via luminopsin insertions activated by coelenterazine (CTZ). We investigate the cells' integration and effect on behavioral recovery during swimming. Initial short-term studies prompted further investigation into the long-term presence and functionality of these cells. Cell integration appears influenced by swimming exposure. This indicates such exercise could enhance cell transplantation efficacy, a significant insight for Parkinson's disease treatments. Previously, we confirmed these cells can remain in the host circuit for extended periods, a current follow-up study focuses on understanding dopamine release control from these cells over extended periods, employing microdialysis for assessment. The goal is to observe early-stimulated transplanted cells integrating persistently into the host brain and providing appropriately-timed dopamine release for prolonged periods, and representing a long-term therapy for PD.

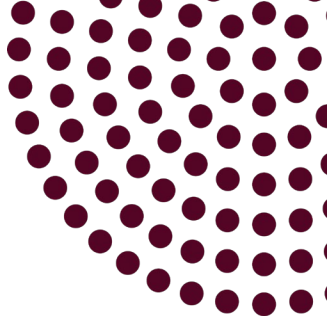
Comparative Therapeutic Efficacy of GM1 Ganglioside and OligoGM1 in an In Vitro Model of HD

Presenter: Kaden Adams

Co-Presenter: David Doyle

Faculty Supervisors: Gary Dunbar, Julien Rossignol

Abstract: Huntington's disease (HD) is a genetic neurodegenerative disease that currently has no effective treatments or cures. Monosialoganglioside, GM1, is a naturally occurring amphiphilic glycosphingolipid that has been implicated in various neuroprotective mechanisms. It has been investigated extensively as a potential therapeutic intervention in many neurodegenerative diseases, including HD. However, its clinical utility is hampered because of limitations on its ability to cross the blood brain barrier (BBB) in therapeutically significant quantities. OligoGM1 is the oligosaccharide portion of GM1 that is a potential new alternative to the complete GM1 molecule for treating neurodegenerative diseases. It has been shown to have the ability to cross the BBB and reduce deficits in a rodent model of PD. The aim of this study was to compare the effects of oligoGM1 and bovine-sourced GM1 on human HD striatal neurons using the MTT assay. Our results indicated that neither oligoGM1 nor bovine GM1 had toxic effects on either cultured wild-type or HD neurons. However, since our HD cells lacked significant mitochondrial dysfunction during the early differentiation period in our study, comparative effects on their ability to maintain mitochondrial functioning were inconclusive. Results from this preliminary study and further analyses in future studies will be utilized to help elucidate the therapeutic effects of GM1 and oligoGM1 in treating HD.



Evaluating the Therapeutic Effects of Delivering CRISPR/Cas9 and Small Interfering RNA Molecules via G4-70/30 PAMAM Dendrimer Nanomolecules on Human Glioblastoma Cells In Vitro

Presenter: Claire Noe

Faculty Supervisors: Gary Dunbar, Julien Rossignol

Abstract: Glioblastoma (GB) is the most common and aggressive central nervous system tumor, with a 15-month median survival time after diagnosis. There has never been a cured case reported, stressing the need for new GB treatments. One promising novel GB treatment involves targeting the AVIL gene, the overexpression of which has been found to be essential for the survival, migration, and invasion of GB cells. In this study, we evaluated the efficacy of AVIL CRISPR/Cas9 and AVIL siRNA therapy in vitro, which target the AVIL gene and AVIL mRNA, respectively. The efficacy of these gene therapies is limited by poor cellular uptake and low stability. Hence, we used G4-70/30 PAMAM dendrimers, which improve the stability and bioavailability of encapsulated treatments. Encapsulating siRNA molecules in these dendrimers yielded a stable complex. RT-PCR data showed that siRNA-treated HEK cells exhibited 55.7% knockdown of AVIL mRNA. CRISPR/Cas9 transfected U87 cells were analyzed for gene knockout via Sanger sequencing and for protein expression via Western blotting. Sanger sequencing of transfected U87 showed 55% AVIL gene knockout after 3 days of transfection. Western blot analysis of CRISPR/Cas9-treated U87 cells revealed reductions in the proteins p92 and FOXM1, which are downstream targets of the AVIL gene. We are working to optimize the siRNA-dendrimer complex treatment in U87 cells using RT-PCR. Our preliminary data suggests that AVIL gene inhibition is a potential treatment option for GB.

Gender Differences in Age-Related Cognitive Functionality Among Mice Administered With Progesterone

Presenter: Olivia Smith

Co-Presenters: David Doyle, Lucas Garmo, Kayla Reed, Ryan Graff, Payton Wolbert, Mouraj Choudhury, Noah Day, Anusha Uprety

Faculty Supervisors: Gary Dunbar, Julien Rossignol, Kenneth Jenrow

Abstract: Progesterone, recognized as a neurosteroid and pivotal sex hormone, has been extensively linked to cognitive function in females, while its impact on males remains relatively unexplored. This study aims to evaluate the influence of progesterone on cognitive ability, considering both sex and age factors. Young (4-9-month-old) and old (20-23-month-old) male and female mice were subjected to daily subcutaneous injections of progesterone (5 mg/kg) or vehicle (30% 2-hydroxy beta-cyclodextrin). Cognitive assessments were conducted using the water-T-maze and passive avoidance behavioral tasks. Initial analysis involved 17 mice, with ongoing studies involving additional animals. Preliminary findings suggest potential cognitive benefits of progesterone in younger male mice, yet these benefits were not observed in older males. Conversely, progesterone showed detrimental effects on cognitive performance in both young and old female mice, aligning with previous research from our lab. Further investigation is underway to validate these initial observations. This study represents the first examination of cognitive disparities related to age and gender following daily progesterone treatment, prompting further exploration of progesterone's therapeutic potential in cognitive function across sexes and age groups.



Modifying Behavior With Cortical Layer Specific Neuromodulation

Presenter: Christiano Bermudez

Co-Presenters: Alexander Silvagnoli, Emmanuel Crespo

Faculty Supervisor: Ute Hochgeschwender

Abstract: The recent evolution of genetic tools to target neural circuits allows an unprecedented precision in neuromodulation. Genetically targeted circuit manipulation allows to probe nervous system function in the healthy brain, explore pathophysiology of neurodevelopmental and neurodegenerative diseases, and might be used to manipulate neural circuits for therapy. For Parkinson's disease, the goal has been to modulate the basal ganglia circuits in a way that is achieved with deep brain stimulation but with better spatial and temporal control. For Huntington's disease, circuit specific modulation to correct aberrant firing has shown promising rescue of motor deficits. For stroke, excitatory optogenetics has been used to strengthen the function of intact circuits so that they can restore lost motor function. After spinal cord injury, control of spinal neurons distal to the lesion established control of circuits that have been disconnected from brain control. We previously showed that systematically enhancing activity levels of pan-neocortical Emx1-positive pyramidal neurons during postnatal days 4 – 14 using non-invasive BioLuminescent-OptoGenetic (BL-OG)-mediated activation of luminopsin 3 (LMO3) led to decreased social interaction and increased grooming activity in adult animals. In vivo, both prefrontal neural activity and functional markers of cortico-striatal connectivity were impaired in developmentally hyperexcited adult Emx1-LMO3-positive mice.

A Method of Isolating Both Aged and Neonatal Microglia From Murine Species

Presenter: Andrew Drumheller

Faculty Supervisor: Yannick Marchalant

Abstract: The proposed thesis project for Andrew Drumheller is to develop techniques for the isolation of microglia, the brain's resident immune cells, from aged mice. Success in the development thereof will allow for better understanding of these cells following manipulation in cell culture, as is done in studies of neurodegenerative diseases like Alzheimer's disease. Many contemporary studies use microglia from younger mice to approximate the function of the cells of aged mice, which excludes the development that occurs with age. After obtaining the brains from our mice, we will use a density gradient to isolate the many different cell types in the brain from one another. Developing a reliable, reproducible method of isolating microglia from the brains of aged organisms will be useful in ensuring that research regarding aging can be conducted in a manner that is more relevant to a clinical setting.



Validation of Luminopsin Construct Expression in R6/2 Huntington's Disease Mice

Presenter: Madison Gott

Faculty Supervisor: Ute Hochgeschwender

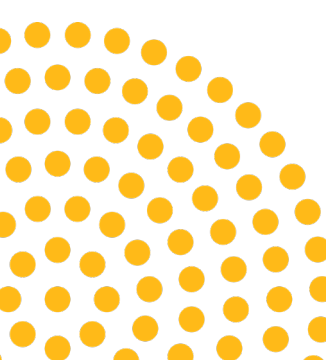
Abstract: Almost 30 years after identifying the genetic mutation underlying Huntington's disease (HD), treatments remain limited to managing late-stage symptoms of motoric, psychiatric, and cognitive deficits. Findings from patients and mouse models of HD point to pre-symptomatic imbalances in neuronal circuit activity, well before any overt symptoms are observed. Our central hypothesis is that manipulating the firing activity within selected microcircuits before the onset of symptoms by chemogenetic inhibition or excitation of key target populations will slow HD disease progression. For manipulation of neuronal activity, we utilized bioluminescent optogenetics (BL-OG) that employs light-emitting luciferases to activate light-sensing opsins (Luminopsin, LMO). We are testing the effects of circuit manipulation on preventing or delaying behavioral deficits in the R6/2 transgenic mouse model of HD. To selectively target cortical pyramidal neurons and parvalbumin interneurons, an AAV vector carrying a Cre-inducible inhibitory LMO (AAV-Ef1a-DIO-NCS3-hGtACR1) or excitatory LMO (AAV-Ef1a-DIO-NCS3-ChRmine) was injected into the cortex of 3-week-old mice. Following the completion of treatment and all behavioral tasks, we perfused all mice to validate the expression of the LMO constructs in the M1 cortex. Our study will identify if there are different expression patterns in individual mouse and if this is one of the reasons for the bimodal distribution in the rotarod test results.

Targeted Circuit Manipulation for Ameliorating Huntington's Disease Pathogenesis

Presenter: Ebenezer Ikefuama

Faculty Supervisor: Ute Hochgeschwender

Abstract: Almost 30 years after identifying the genetic mutation underlying Huntington's disease (HD), treatments remain limited to managing late-stage symptoms of motoric, psychiatric, and cognitive deficits. Findings from patients and mouse models of HD point to pre-symptomatic imbalances in neuronal circuit activity, well before any overt symptoms are observed. Our central hypothesis is that manipulating the firing activity within selected microcircuits before the onset of symptoms by chemogenetic inhibition and/or excitation of key target populations will slow HD disease progression. For manipulation of neuronal activity, we utilized bioluminescent optogenetics (BL-OG) that employs light-emitting luciferases to activate light-sensing opsins. We are testing the effects of circuit manipulation on preventing or delaying behavioral deficits in the R6/2 transgenic mouse model of HD. To selectively target CPNs, an AAV vector carrying a Cre-inducible inhibitory LMO (AAV-Ef1a-DIO-NCS3-hGtACR1) was injected into the cortex of 3-week-old mice. Two weeks later, luciferin/vehicle were administered once every day for 2 weeks to decrease CPN firing. Rotarod, open field, and CatWalk were used to assess motor coordination, exploratory behavior, and gait function. We assessed cognitive behavior through water T-maze, novel object recognition test, and passive avoidance test. Our studies will contribute to understanding how microcircuit manipulation influences motor and cognitive behavior in HD.





Comparing Neuronal Activation In Vivo By Luminopsins With Different Wavelengths, Sensitivities, and Configurations

Presenter: Nathan Jacobs

Faculty Supervisor: Ute Hochegehwender

Abstract: Luminopsins (LMOs) are fusion proteins of a light emitting luciferase and a light sensing channelrhodopsin. The light emitted from the luciferase, called bioluminescence, activates the opsin, resulting in a change of membrane potential and a firing of the neuron. This allows experimenter-driven manipulation of genetically targeted neuronal populations. The luciferase can be from different organisms (copepod, shrimp), and the opsins can have a range of light sensitivities and wavelength preferences. Further, the arrangement of luciferase and opsin relative to the cell membrane can be varied. We have recently generated a number of excitatory LMOs that perform well in single cell recordings in HEK293 cells. To evaluate their performance in the intact brain, we will inject viral vectors carrying different LMOs into the barrel cortex of TRAP2::EYFP transgenic mice. These mice express a Cre-dependent version of EYFP and Cre recombinase under control of the c-fos promoter, allowing us to label activated neurons with the fluorescent reporter. We will compare the efficiency of neuronal activation by different LMOs through assessing the extent of reporter expression after luciferin application in mice.

Bioluminescent Kinase Sensors for Detection of Growth Factor and Inflammation Signaling

Presenter: Michael Chatterton

Faculty Supervisor: Eric Petersen

Abstract: Growth factor signaling is an important component of a large variety of cellular processes including metabolism, differentiation, proliferation, and migration. When growth factor signaling is altered it can lead to pathologies like cancer cells forming and proliferating within the body such as glioblastoma multiforme (GB). In this study, we focus on investigating and proposing novel therapeutic approaches utilizing genetically encoded Bioluminescent Kinase Sensors (BlinKS) to respond to growth factor signaling via kinases in the epidermal growth factor receptor (EGFR) signaling pathway. Specifically, this study is targeting the kinases within the MEK, RAS, and RAF signaling pathways. We are developing a rational library of BlinKS variants with altered phospho-amino acid binding domains (PAABD) as well as varying kinase substrate peptides and permutations of the linker regions, either flexible or rigid at the interfaces of the protein fusion sites. To test our BlinKS construct in association with U87 glioblastoma cells expressing our candidate sensor variants, treated the cells with epidermal growth factor (EGF) and measured the response of the BlinKS sensors allowing for light emitted by the sensor and by measuring an optogenetic transcriptional readout via a fluorescent reporter protein. Bioluminescence readings were conducted on a plate reader, and it was found that the cells treated with EGF produced more luminescence than those not treated with EGF and those treated with.



Method for Optimizing Imaging Parameters to Record Neuronal and Cellular Activity at Depth With Bioluminescence

Presenter: Alexander Silvagnoli

Faculty Supervisors: Eric Petersen, Ute Hochgeschwender

Abstract: Genetically encoded fluorescent activity sensors of calcium, neurotransmitters, and voltage are commonly used for optical recording of neuronal activity. However, fluorescence imaging is limited to superficial regions for in vivo activity imaging due to photon scattering and absorbance. Bioluminescence imaging offers a promising alternative to achieve activity imaging in deeper brain regions without hardware implanted within the brain. The use of enzymatic photon production enables prolonged imaging sessions without the risk of photobleaching or phototoxicity, making bioluminescence suitable for non-invasive imaging of deep neuronal populations. To facilitate the adoption of bioluminescent activity imaging, we sought to develop a low cost in vitro method to simulate in vivo conditions to optimize imaging parameters for low-light emission data capture. We developed an assay for modeling in vivo optical conditions with a brain tissue phantom paired with engineered cells that produce bioluminescence. We then used this assay to limit-test the detection depth vs maximum frame rate for bioluminescence imaging at experimentally relevant tissue depths using off the shelf imaging hardware. We developed an assay for modeling in vivo optical conditions with a brain tissue phantom paired with engineered cells that produce bioluminescence. We demonstrated an improved method for optimizing imaging parameters for activity imaging in vivo with bioluminescent sensors.

Antineoplastic Effect of AVIL Knockout in U87 Human Glioblastoma Cells Using CRISPR/Cas9

Presenter: Arjun Poudel

Co-Presenters: Jonathan Smith, Claire Noe, Bhairavi Srinageshwar

Faculty Supervisors: Julien Rossignol, Jesse Bakke, Gary Dunbar

Abstract: Glioblastoma multiforme (GB) is a grade IV astrocytoma, the most common and malignant adult central nervous system tumor. Current standard treatment for GB includes cytoreduction surgeries by surgical resection of the tumor, radiation therapy, and temozolomide (TMZ) therapy. In recent years, GB research has focused more on gene therapies. AVIL gene which encodes protein Advillin (p92) is overexpressed in almost every GB cell and is essential for proliferation and migration of GBs. In this study, we knocked-out AVIL in U87 human glioblastoma cells, in vitro using CRISPR/Cas9 gene editing tool and investigated its effects on downstream proteins, Foxm1 and tumor suppressor protein p53. We used Lipofectamine CRISPRMAX to transfect U87 human glioblastoma cells. Transfected U87 cells were analyzed for knockout via Sanger sequencing and for protein expression using Western blot and immunocytochemistry (ICC). Sanger sequencing of transfected U87 showed 55% knockout after 3 days of transfection. We used HEKT293 cells as controls, which showed 22% knockout under the same conditions. Western blot showed reduced expression of p92 protein in U87, as well as in HEKT293 cells, confirming the gene knockout and reduced expression of downstream protein Foxm1 in both U87 and HEKT293 cells. ICC results revealed increased expression of p53 protein expression. This preliminary study shows that CRISPR/Cas9-mediated AVIL knockout as a novel and potential antitumor treatment option for GB.



Biosensor Optimization Through Optimized Cellular Trafficking Proteins

Presenter: Hunter Galvin

Faculty Supervisor: Eric Petersen

Abstract: Optical imaging is an evolving and promising technology to enhance indications of biological processes to study biological function and disease conditions. By using discrete membrane trafficking proteins, protein-based biosensors can be improved for their ability to report specific cellular processes and utilized to efficiently observe biological mechanisms and neurotransmitters levels.

Neurotransmitters are chemical communicators between neurons. Our lab has developed several genetically encoded neurotransmitter sensors based on bioluminescence which are trafficked to the membrane and displayed on the surface of the cell. One common issue with our sensor's response to the extracellular detection of neurotransmitters is efficient membrane trafficking. We sought to improve this by utilization of possible membrane trafficking peptides for improved trafficking of the sensors. The purpose of this experiment is to enhance the response of an existing glutamate sensor by testing a variety of membrane trafficking peptides. To address this problem, the current glutamate sensor was augmented with glycosylphosphatidylinositol (GPI) inserts, COBL9 and NGR. Preliminary results suggest that the addition of COBL9 can improve bioluminescent response to glutamate when compared to the current sensor. The introduction of certain GPI anchors to current bioluminescent sensors has proven to be useful in neurotransmitter sensing and shows promise for additional testing and use in animal studies.

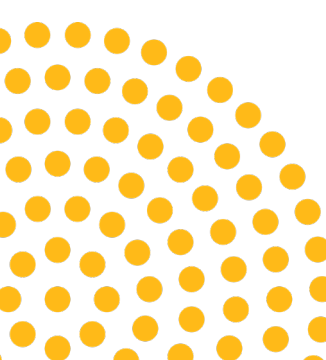
Progesterone Reduced Behavioral Deficits in MCAo Stroke Rats When Delivered Intraperitoneally Using PAMAM Dendrimers

Presenter: Anusha Uprety

Co-Presenters: Arjun Poudel, Max King, Bhairavi Srinageshwar, Noah Day, Justin Gross, Reagan Schalau, Lianna Bolen, Sara Schwind, Brody Galvin, Shofikur Shuhag, Oliva Smith

Faculty Supervisors: Julien Rossignol, Ajit Sharma, Doug Swanson, Gary Dunbar

Abstract: A stroke occurs when the blood supply to a specific area of the brain is interrupted, resulting in brain tissue damage leading to loss of brain function, and neuroinflammation. Ischemic stroke, the most common type, happens when blood supply to brain is blocked due to a blood clot or narrowed artery supplying to brain region. Previous studies have shown progesterone has anti-inflammatory properties, so, we used G4 PAMAM dendrimers to systemically deliver progesterone in rat models with middle cerebral artery occlusion (MCAo). The rats received intraperitoneal (IP) injections of dendrimer-progesterone complex, progesterone, dendrimer only, and HBSS every other day for 10 days, starting on the sixth day after surgery. Behavioral assessments, including the ladder test, cylinder test, and modified Garcia scale for neuro-scoring, were conducted weekly to evaluate motor function. Results of the ladder test and cylinder tests showed improved function of left paw in dendrimer-progesterone and dendrimer-only treated MCAo rats compared to untreated rats. The neuro-scoring test showed improvement in score in dendrimer progesterone-treated MCAo rats. These findings confirmed that dendrimers could cross the blood-brain barrier when injected intraperitoneally. These results further suggest that dendrimers have potential as a promising delivery method for drugs. Currently, we are performing IHC imaging to analyze GFAP and IBA-1 expression in brain sections.



Histopathological Analysis of Dendrimer Progesterone in Stroke Rat Brain

Presenter: Lianna Bolen

Co-Presenters: Arjun Poudel, Anusha Uprety, Maxwell King, Bhairavi Srinageshwar, Noah Day, Justin Gross, Regan Schalaus, Sara Schwind, Brody Galvin, Shofikur Shuhag, Olivia Smith

Faculty Supervisors: Julien Rossignol, Ajit Sharma, Douglas Swanson, Gary Dunbar

Abstract: Stroke is the top cause for disability and second most cause of death in the world. Ischemic stroke occurs when blood clot or narrowed artery blocks the blood flow into the brain resulting in neuroinflammation and hypoxic brain damage, which results in brain function loss. Progesterone may be a possible treatment for stroke, due to its neuroprotective and anti-inflammatory characteristics. However, progesterone does not cross the blood brain barrier (BBB) making it impossible to deliver to brain. We used PAMAM dendrimers which can cross BBB and deliver progesterone into MCAo rat brain. The rats underwent stroke or sham surgery, treatment injection, and euthanization. The brains then were extracted, stored in the freezer, then sliced into 30 μm thick tissue slices. We performed hematoxylin and eosin staining to quantify the stroke volume in different treatment groups. We performed immunohistochemistry (IHC) staining to quantify the expression of GFAP and IBA-1 in different treatment groups. After the IHC brains were mounted, and cover slipped. We saw a decrease in stroke volume in MCAo rats treated with progesterone-dendrimer complex and dendrimer alone. We also saw a reduction in GFAP and IBA-1 expression in progesterone dendrimer and dendrimer alone treated MCAo rats. Our result showed that dendrimer was able to cross BBB and deliver progesterone into the brain. Moreover, our results showed dendrimer itself has anti-inflammatory properties, confirming our previous findings.



Physics

Workflows to Study the Dopability of Thermoelectric Materials

Presenter: Xander Ault

Faculty Supervisor: Marco Fornari

Abstract: Thermoelectric materials are a promising source of energy amongst the growing threats of a global energy crisis and global warming. However, much advancement needs to be made for the alternative energy source before it is viable for everyday applications. We create a computational workflow utilizing the strength of AiiDA, a computational workflow manager for Python, to model, dope, and analyze materials almost entirely hands-free. Linking AiiDA with DFT codes such as QuantumESPRESSO and post-processing applications like BoltzTraP2, one is able to extract relevant thermoelectric properties of a material entirely from first principles. We analyze the viability of doped SrTiO₃ as a thermoelectric material specifically studying Y, Bi, Na, and Cs defects placed on the A site.

Observing Solar Radio Activity With a Software Defined Radio

Presenter: Lucas Folkert

Faculty Supervisor: Aaron Lacluyze

Abstract: Although Central Michigan University possesses an observatory capable of gathering both visual and spectrographic data about celestial bodies, it has always lacked the necessary equipment for radio astronomy. This project aims to not only acquire and set up the necessary equipment for limited radio astronomy at Central Michigan University, but also to use this equipment to attempt observation of solar radio activity. The first goal was accomplished through the acquisition and installation of a Radio Jove 2.0 Telescope Kit, which includes a dual dipole antenna capable of picking up various astronomical phenomena and the necessary software for observation and data collection. The latter was accomplished through the observation of solar activity on a radio spectrograph during periods of active solar storms, as predicted by NOAA's Space Weather Prediction Center, where solar material reaches Earth's ionosphere and causes increases in radio activity across a wide range of frequencies. As a stretch goal, observations of short wave radio bursts produced by interactions between Jupiter and its moon Io were also attempted, though the probability of these signals being received was low due to both how faint these signals are and nearby sources of signal interference.

Meteorites and Their Connection to the Presolar Nebula

Presenter: Savannah Nahodil

Faculty Supervisor: Aaron Lacluyze

Abstract: Unknown samples were tested using x-rays to determine chemical composition. This data helped us determine these samples to be meteorites. We can investigate the processes needed to form these meteorites. Comparing their chemical composition to the known compositions of asteroids and the spectra of the Sun and neighboring stars, we can determine the composition of the presolar nebula and the ISM at the formation of the solar system.



Solar Imaging and Sunspot Enumeration: A Machine Learning Approach for Automated Analysis

Presenter: Jordan Nether

Faculty Supervisors: Aaron Lacluyze, Ajit Sharma, Douglas Swanson, Gary Dunbar

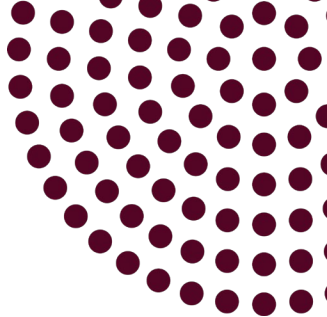
Abstract: Sunspots, the dark regions peppering the solar surface, stand as proof of solar activity, wielding profound influence over the Earth's space environment. Although significant, it can be difficult to find and count them if not done in a sensible manner, and thus, can compromise timely forecasting of solar phenomena. In response, we offer a thorough investigation into the transformative potential of well-thought-out machine learning methods to automate the detection and tabulation of sunspots, ushering in a new era of precision solar dynamics analysis. At the heart of our struggle lies the meticulous construction and refinement of a machine learning algorithm, trained on a collection of solar images sourced from the HMI solar imager. By employing a suite of refined techniques, including data augmentation, we can reinforce the model's resilience to variability in solar conditions and in images themselves. The findings collected from our research highlight the proficiency of the developed machine learning framework, not only in accurately identifying groups of sunspots but also in picking out individual sunspots from those groups. This study represents a leap forward in the realm of solar analysis, heralding a fundamental change in perspective towards automated, data-driven methodologies. By rising above limitations of manual approaches, our plan accelerates the pace of solar research and holds the idea of enhancing the accuracy and timeliness of space weather forecasting.

Ferroelectrets Microstructures: Fabrication, Characterization and Simulation

Presenter: Nil Prasad Upadhya

Faculty Supervisor: Axel Mellinger

Abstract: Ferroelectrets, distinguished by their charged polymeric composition and inherent piezoelectric activity, emerge as promising materials for applications in electromechanical sensors, actuators, and energy harvesters. While conventional manufacturing involved foaming thin polypropylene sheets, modern 3D printing technology enables the creation of ferroelectret films with meticulously designed morphologies. This research focuses on ferroelectrets film fabrication, characterization and simulation. Improving the piezoelectric characteristics of few polymer materials by systematically varying thin film design parameters, void structure, thickness, and void height. Experimental methods, complemented by computer simulations using the Finite Element Method (FEM) with software tools such as Gmsh and Elmer, were employed to explore the impact of these design variations. Notably, the simulated results demonstrated a high degree of agreement with experimental measurements, affirming the efficacy of the proposed methodology for enhancing the piezoelectricity of ferro- and piezoelectrets.



Fabrication and Characterization of High Density Polyethylene Foils for Use in Heavy Ion Beam Experiments

Presenter: Keegan Binder

Faculty Supervisor: Georgios Perdikakis

Abstract: This presentation will answer questions regarding the processes of fabricating High Density Polyethylene foils for use in experiments at FRIB, and its characterization. The methodology involves the creation of a High Density Polyethylene solution, followed by a solution setting, and a subsequent after-treatment. I will test different methods for each step to determine the best process at which to develop the desired thickness for each foil, 300-400 micrograms, while keeping the required strength and stability to be used in heavy ion beam experiments.


Space-Time Map:

Physical Representation of Lorentz Transformations on a Space-Time Diagram

Presenter: Dalton Brindley

Faculty Supervisor: Matthew Redshaw

Abstract: Special Relativity was published in 1905 by Albert Einstein to discuss special cases of vast energies, relativistic speeds, and astronomical distances without the influence of gravity. The existence of particles such as muons have been justified by special relativity due to the nature of their detection. A muon's lifetime is roughly $2.2 \mu\text{s}$ and should not be detectable on earth's surface unless affected by special relativity. To better visualize the effects of special relativity Lorentz Transformations were formed to mathematically show how traveling at relativistic speeds with massive energies affects the time, length, and position of objects within the reference frame as compared to everything outside of the reference frame. The device created utilizes the Lorentz Transformation of position to map out the space time curves of (ct) , speed of light times time from outside the reference frame, vs (x) position from designated (ct') , speed of light times time from inside the reference frame, values. To obtain the curves we used multiple velocities at relativistic speeds and used the velocities to calculate γ . With these we are able to represent the transformation of space-time to mimic the effects of special relativity. Then Fusion 360 was used to create the parts and assemble the diagram.



Statistics, Actuarial & Data Science

Predicting Asthma Using Imbalanced Data Modeling Techniques: Evidence from 2019 Michigan BRFSS Data

Presenter: Nirajan Budhathoki

Faculty Supervisor: Carl Lee

Abstract: Previous studies have examined asthma prevalence and associated risk factors in the United States using data from national surveys. However, the findings of these studies may not be relevant to specific states because of the different environmental and socioeconomic factors that vary across regions. The 2019 Behavioral Risk Factor Surveillance System (BRFSS) indicated that Michigan had higher asthma prevalence rates than the national average. In this regard, we applied various modern machine learning techniques to predict asthma and identify its associated risk factors among Michigan adults. A sample of 10,337 individuals was selected for analysis, of which 10.8% reported having asthma during the survey period. Machine learning techniques often perform poorly due to issues with imbalanced data. To overcome this challenge, we employed two synthetic data generation techniques: Random Over-Sampling Examples (ROSE) and Synthetic Minority Over-Sampling Technique (SMOTE), and compared their effectiveness. The performance of machine learning models was improved using both methods. Due to ease of interpretability, logistic regression was chosen for further exploration of risk factors. We conclude that the findings could assist in the early screening of at-risk asthma patients and in the design of targeted interventions to improve care practices.

