2025 FSU Undergraduate Research Symposium

Lane Center

May 2nd, 2025
11:00 a.m.-2:00 p.m.

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THE ABSTRACTS

This Symposium includes presentations featuring the work of 122 students, mentored by 39 Faculty and Staff from all three Colleges of Frostburg State University and TRIO-Student Support Services. The projects presented at this Symposium took place in 2024 and 2025 and include coursework and independent study activities. Abstracts are organized alphabetically by college, then by department, and finally by project title. The location of the poster or physical display in parentheses following the title refers to the table locations in the ARMAH. Oral presentations are scheduled in Lane Center 108, 111 and 113. A map of the ARMAH and the schedule for the oral presentations are at the end of this abstract booklet. Each presentation includes the following information:

Project Title (Poster and/or Physical Display with Table Number; Oral Presentation with Room Number and Time)

Name(s) of presenting student(s)
Name(s) of contributing student(s) (if applicable)
Name(s) of faculty/staff mentor(s)

TRIO-STUDENT SUPPORT SERVICES

Intersectional Oppression-Based Stress, Anxiety and Depression among Multiracial LGBTQ+ Adolescents and the Moderating Role of Family Relationships (Poster: Table 3; Oral Presentation: Room 108 at 11:30 a.m.)

Presenting Student: Cayleah Anders
Staff Mentor: Mr. Chance Burchick

This study explores the relationship between intersectional oppression-based stress, anxiety, and depression in Multiracial LGBTQ+ youth. Research indicates that QTBIPOC (Queer, Trans, Black, Indigenous, People of Color) individuals face significant mental health disparities due to the intersection of their racial and sexual identities, yet there is limited research on how minority stressors (e.g., discrimination, racism, heterosexism) affect Multiracial LGBTQ+ youth. Pearson's correlation was used to examine the relationships among intersectional oppression-based stress, anxiety, and depression. Anxiety was measured using the 5-item Screen for Childhood Anxiety Related Emotional Disorders (SCARED), while depression was assessed with the Center for Epidemiological Studies Depression Scale (CESD-20). Intersectional oppression-based stress was measured with the Everyday Identity Stress Scale (EISS), and family relationships/support were evaluated using the Multidimensional Scale of Perceived Social Support (MSPSS). Findings revealed a positive correlation between intersectional oppression-based stress and anxiety ($r = 0.30$, $p < .001$) and depression ($r = 0.39$, $p < .001$). However, family support did not significantly mitigate anxiety ($B = 0.0021$, $p = .9413$) or depression ($B = -0.2023$, $p = .1312$). Future research should focus on the Multiracial LGBTQ+ population, considering intersectional risk factors to create effective interventions that address the impacts of intersectional oppression. It's important to explore protective factors beyond family relationships to gain a comprehensive understanding of support mechanisms. This study highlights key areas for further inquiry, providing a foundation for targeted interventions and policies that meet the unique needs of the Multiracial LGBTQ+ community.

Me Canso De Ser Hombre: Latino Men and Machismo on Social Media (Poster: Table 3; Oral Presentation: Room 108 at 12:00 p.m.)

Presenting Student: Emily Guardado Toledo
Staff Mentor: Mr. Chance Burchick

This study explored the ways in which young Latino men construct their masculinity and create conversations on social media regarding the way they were raised and socialized to be men. Machismo can be harmful to men who endorse it and for the people around them as well. Because machismo is prevalent in the Latino culture, a strengths-based lens was used to identify the negative aspects as well as the positive (caballerismo). Five videos found on TikTok were analyzed in their entirety for data collection. The videos ranged from 47 seconds to 44 minutes that included young

Mexican and Central American men identifying their struggles with machismo. Six themes were found throughout the 5 videos which were the topic for discussion in this paper. Findings suggest that young Latino men are leaving behind machismo and leaning towards caballerismo in their everyday lives. These men are choosing to ask hard questions about their masculinity and creating community on social media while also starting conversations around machismo and the harmful effects of it.

COLLEGE OF ARTS, HUMANITIES, AND SOCIAL & BEHAVIORAL SCIENCES

ENGLISH AND FOREIGN LANGUAGES DEPARTMENT

How the Influence of Peer Pressure and the Desire to Feel Valued Negatively Affects Teenagers' Self-Identity (Oral Presentation: Room 113 at 11:30 a.m.)

Presenting Student: Megan Gray
Faculty Mentor: Dr. Amy Branam Armiento

The purpose of this presentation is to inform people why teenagers change their style and personality to fit into popular groups. Teenagers change themselves because of peer pressure and wanting to be accepted. If teenagers do not conform to the popular ways of looking and behaving, they are more susceptible to bullying, low self-esteem, and loneliness. Yet following the crowd, losing their identities, and originality are all negative effects if they conform to fit in with popular groups. To end the peer pressure from teenagers who are trying to change others; style and personality, schools can help by having speakers come in and talk with students about being themselves and learning to love their differences. They can also have counselors come to classes once a month to talk about bullying prevention. Keeping a close eye on students and how they interact can help prevent further peer pressure and bullying. In this presentation, I will cover more steps teenagers can take, why they change their style and personalities, why teens succumb peer pressure and the negative effects of it, how changing themselves effects their mental health, why teens want to feel accepted, and why they should not conform with the rest.

How Nurture Affects Behaviors in Young Adults (Oral Presentation: Room 113 at 12:00 p.m.)

Presenting Student: Brian Mejia Ramos
Faculty Mentor: Dr. Amy Branam Armiento

The purpose of this presentation is to convince young adults about how nurturing has affected them. From hostile environments to happy upbrings, this presentation covers how the environment that a young adult grows up in affects them in their daily lives. Their characteristics, hobbies, or even personal traits are all influenced by their environment and the people around them. At the end of the presentation, I will show many instances of how young adults can improve themselves regardless of their upbringing.

In Service of Men: Women's Role's In Homer's Epics (Oral Presentation: Room 111 at 11:30 a.m.)

Presenting Student: Stella Beernink
Faculty Mentor: Dr. Naomi Gades

Since their original composition between the 8th -7th centuries BC, Homer's Iliad and Odyssey have stood the test of time, becoming one of the most popular surviving works of the era due to its epic portrayal of humanity, masculinity, and heroism. The consumer is invited into a world of gods and monsters, complex situations, heroes and villains that provide a rich host of characters to examine and enjoy. Despite this, female characters in both works are severely constrained into simple stereotypes of beauty, subservience, or villainy, often stripped of identity and autonomy entirely throughout the work. This research examines existing literature on the treatment of Homeric women to compile a profile of permitted female archetypes within the world and explores the broader implications the limited agency granted to female characters such as Helen of Troy or Clytemnestra have contemporary discussions on gender and sexuality. By examining how traditional gender roles are adhered to or subverted by women throughout the epics and the resulting response from the world surrounding them, this research aims to address how these representations reflect on Ancient Greek culture but also to highlight the persistent impact such caricatures of femininity have on contemporary gender narratives.

PHILOSOPHY DEPARTMENT

A.I. and Predictive Policing: An Ethical Issue Facing the Criminal Justice System (Poster: Table 9)

Presenting Student: Nicholas J. Agresta
Faculty Mentor: Dr. David Atenasio

As Artificial Intelligence (A.I.) becomes increasingly utilized by police departments both foreign and domestic, with it comes major implications on society. These departments, like many other facets of society, have embraced the recent rise of A.I. technology and utilize it to try and predict crime patterns through a method called predictive policing. Despite the potential positives that may come from A.I. being implemented into the criminal justice system, there are a number of ethical concerns that come along with A.I. being within this system that must be addressed. This paper criticizes the use of A.I. in the criminal justice system through three main arguments, the first being the racial bias that is overwhelmingly present in the predictions that some of these A.I. models produce. The second argument discusses the potential negative legal implications that these models can have on the criminal justice system, while the third cites John Locke's political philosophy to address the issue of A.I. possibly infringing on rights and privacy.

PSYCHOLOGY DEPARTMENT

Comparison of General Psychology Knowledge between Newly Declared Psychology Majors and Non-Psychology Majors (Poster: Table 8)

Presenting Students: Garrett Gladem, Chloe Warble, Daniel Palus
Contributing Student: Kendra Harpold
Faculty Mentors: Dr. Kathleen Jocoy, Dr. Christopher Masciocchi

A survey was conducted in a general psychology course testing their baseline knowledge of the topic. The purpose of this study was to compare both the general and discipline specific level of knowledge regarding psychology between newly declared psychology majors to non-psychology majors. Mean differences were examined using independent-samples t tests. The results show that in regard to scientific skepticism and clinical and counseling knowledge to majors and non-majors were not significantly different. However, discipline specific knowledge varied significantly, with majors performing far better than non-majors.

Examination of Item Quality through IRT, on a Survey of Psychological Knowledge (Poster: Table 8)

Presenting Students: Daniel Palus, Chloe Warble, Garrett Gladem
Contributing Student: Kendra Harpold
Faculty Mentors: Dr. Kathleen Jocoy, Dr. Christopher Masciocchi

A survey was conducted to test students at Frostburg State University on their baseline understanding of Psychology from 9 *Discipline Specific Perspectives*, including Critical Thinking, Biology, Abnormal Psychology, etc. The purpose of this examination is not to gauge their collective nor individual understanding, but rather to understand the quality of the survey itself through *Item Response Theory* (IRT), using a 3 Parameter Logistic Model. Our examination looked at all 66 items individually and we made recommendations for scale improvement.

SOCIOLOGY DEPARTMENT

Capitalism and Patriarchy: The Hidden Curriculum in Women's Artistic Gymnastics (Oral Presentation: Room 111 at 12:00 p.m.)

Presenting Student: Callie Miller
Faculty Mentor: Dr. Angela Luvara

Capitalism and Patriarchy are often thought of as two distinct systems, but they work together and reinforce one another. This presentation will first examine how the systems of capitalism and patriarchy operate and then provide an understanding as to why and how they are connected. Success under a capitalist system depends on women being labelled as inferior and their work being devalued. Research indicates that these systems are not only upheld through violence, but also by culture. Sports, especially in the context of Women's Artistic Gymnastics, where young girls training at a high level are spending more time in the gym than with their parents, are a significant component of this. This presentation examines the values and lessons taught under capitalism and patriarchy, as well as, how those values and lessons show up in the hidden curriculum of Women's Artistic Gymnastics. The history of the sport is riddled with lessons on body image, work ethic, and authority that have had dangerous consequences. This presentation will specifically look at what people in the Women's Artistic Gymnastics community refer to as "the Marta Era," and evaluate the culture of the sport through the lens of the intersecting systems of capitalism and patriarchy. Through a content analysis of social media data and various documentaries, this presentation explores how the infiltration of capitalism and patriarchy in the lessons and values taught by coaches, parents, and peers in the sport of Women's Artistic Gymnastics show up in practice.

From Rags to Riches: a Content Analysis of the Struggles and Successes of Southern Rappers (Poster: Table 8)

Presenting Student: Samantha West
Faculty Mentor: Dr. Angela Luvara

The south is a very unique place full of so much history and talent. Rappers of the south in the 90s talk about that history in a way that brings you along for the ride. The communities were being affected by the crack epidemic. The drug was breaking down communities just as much as it was bringing it up. In this research, I conduct a content analysis on hip hop music created by southern hip-hop artists, mostly from Houston, New Orleans, and Atlanta. The genre is looked at as all violence and drugs and yes on the surface that what it sounds like but when you take a deeper look it's just the artist showing you the violence that the crack epidemic created and the government's response with the war on drugs. I conducted a content analysis on 57 songs by 18 artists looking for themes of how the epidemic affected poverty and how it made few of them very fortunate in new way. Themes that have emerged from my analysis suggest that the crack epidemic provided an opportunity for acquiring wealth that was not otherwise available, but it also had serious impacts on individual and community well-being. This research is so important to me because these people

had a story to tell, and it's so often written off as glorification of violence and drugs. Giving these songs and the artist a close examination, the song lyrics suggest the artists are giving listeners a peek into the world the system forced them into.

VISUAL ARTS DEPARTMENT

My Internship with SMPA; An Analysis of the Underground Art Scene (Poster: Table 2)

Presenting Student: Phoebe Puffenbarger
Faculty Mentor: Dr. Travis English

During my internship with Savage Mountain Punk Arts (SMPA), I had the opportunity to delve deeply into the vibrant and transformative underground art scene, exploring its role as a vehicle for self-expression, community-building, and social change. The internship provided a dynamic environment to engage with various forms of art and culture, particularly those emerging from the punk ethos, which embraces nonconformity, rebellion, and resistance to mainstream societal structures. In my role, I assisted in organizing events, curating exhibitions, and interacting with artists involved in the local punk and underground art communi.es. My primary focus was on understanding how these movements, often seen as wild or subcultural, serve as powerful platforms for marginalized voices, offering spaces where individuals can challenge conventional ideas of art, identity, and politics. Through research and direct participation in events, I explored how underground art not only reflects social struggles but also shapes and influences movements of resistance. A key component of my internship was studying the relationship between underground art and alternative media, which plays a crucial role in promoting and documenting these movements. I investigated how punk art, with its DIY (do-it-yourself) ethos, is disseminated through non-traditional channels such as zines, underground publications, social media, and alternative galleries. This analysis emphasized the power of these alternative media outlets in circumventing commercial art spaces, allowing for more radical and authentic expressions of identity and culture. Additionally, I gained insights into the organizational challenges faced by underground art spaces, such as issues of funding, audience engagement, and maintaining the authenticity of the movement in an increasingly digital and commercialized world. The internship exposed me to how non-profits like SMPA navigate these obstacles, relying on community support, volunteer efforts, and alterna.ve funding strategies. This hands-on experience gave me a unique perspec.ve on the labor and dedication required to sustain a thriving underground art community. The internship also involved working with artists who utilize their craft to explore themes such as personal and collective identity, protest, and societal critique. I learned that underground art is not simply just aesthetics, it often fosters a dialogue around issues that are overlooked by mainstream art institutions. This analysis revealed that underground art serves as a critical space for dissent, where cultural outsiders can find a voice and push back against norms. Ultimately, my time at Savage Mountain Punk Arts reinforced my belief in the power of underground art to provoke social change and challenge dominant cultural narratives. Through this internship, I developed a deeper understanding of how alternative art movements not only reflect but also influence the broader socio-political landscape, positioning themselves as agents of transformation. This experience has shaped my passion for exploring the intersections of art, media, and social justice, and it has further fueled my desire to support and engage with alternative cultural spaces.

The Ambivalent Nature of Buddhist Yakshis and Yakshas (Poster: Table 2)

Presenting Student: Pyper Saeler
Contributing Student: Clayton Elder
Faculty Mentor: Dr. Travis English

In Buddhist art, male figures called Yakshas and female figures called Yakshis are earth spirits that represent fertility, peace, and abundance. These figures appear in sculptures at early Buddhist stupas, such as Bharhut and Sanchi, symbolically providing protection over the sacred stupa. While these figures share a common symbolism as male and female counterparts representing the same ideas, Yakshis have a history of ambivalence that Yakshas do not share. In stories about the Yakshi, they are described as dark and demonic, revealing that these retellings show the evils that women can wreak upon men. This demonic presence is not what is associated with the sculptures at Bharhut and Sanchi, as these figures are protective and peaceful, showing the Yakshi's conflicted nature. In stories, the malicious Yakshi's behavior is explained as an overwhelming need to reproduce, or an excuse to be overtly sexual towards men. Yakshis begin to represent an excess of abundance, one of the vices that Buddhism tries to squash. However, Yakshis dual nature begins with Hinduism, as seen in characteristics of the female divine in Hinduism. Yakshis can have both a protective presence and a fearful presence, indicating that they are ambivalent in nature.

COLLEGE OF BUSINESS, ENGINEERING, AND COMPUTATIONAL & MATHEMATICAL SCIENCES

COMPUTER SCIENCE & INFORMATION TECHNOLOGIES DEPARTMENT

3D Printer Actively-Heated Enclosure (Physical Display: Table 18)

Presenting Students: Andrew Naylor, Nathan Murphy, Noah Schlager
Faculty Mentor: Dr. Ying Zheng

We will be presenting our project, an actively heated 3d printer enclosure. The Goal of this project is to create an enclosure that will allow for effective 3D printing with filaments that require or benefit from a heated printing environment. We would like to have the 3D printer printing something during the presentation to demonstrate the enclosure in action.

A Personalized AI Game Recommender (Poster: Table 18)

Presenting Student: Jonathan William Smilek
Faculty Mentor: Dr. Xunyu Pan

This project showcases some uses of AI by demonstrating how it can recommend games. It utilizes a locally hosted website created via HTML in Microsoft Visual Studio to illustrate certain functionalities of AI. The site also uses CSS to style the website in a presentable way for users. To incorporate each functionality of the site, JavaScript is used to do so. One functionality includes a drop-down menu that users can use to select multiple options based on their preferences, and then, after the user inputs everything, they can press a submit button that runs GPT4 to generate a list of recommended games based on the user's input. Another feature is a search bar powered by GPT4 that produces a detailed description of any game entered by the user. Lastly, there is a chatbot imported to the website and created by using the platform "Voiceflow," in which its custom workflow assists users in finding anything on the site. To enable ChatGPT integration on the website, Node.js is employed to create the backend. Also, via an API key from OpenAI, it enables GPT-4 to be used for the website.

AI Amigo: An AI-Powered Spanish Learning Assistant (Poster: Table 15)

Presenting Student: Jason Haley
Faculty Mentor: Dr. Chung-Chi Huang

For many people who are beginning to learn a new language, the process can be challenging, especially when many learners lack consistent, personalized, and interactive tools to guide them along the way. This project aims to address that challenge in language learning with the

development of AI Amigo – a Spanish language learning assistant. This tool was designed to replicate some of the benefits of human tutoring by integrating open-source and publicly available APIs, Python libraries, and Artificial Intelligence (AI) to deliver an interactive and engaging learning experience. AI Amigo provides the user with four main features: (1) translation, (2) grammar correction, (3) pronunciation support, (4) and conversational practice. Each of these components was built through extensive testing for performance, accessibility, and integration compatibility. Throughout the development process, this project explored and showcased the capabilities of natural language processing and AI-driven tools in language education. By bringing these components together into a single application, AI Amigo offers a promising alternative for students seeking a more dynamic and personalized way to improve their Spanish language skills.

Analysis of Language in A.I. Models (Poster: Table 20)

Presenting Students: Nathan Schoffstall, Lucian Rectanus
Faculty Mentor: Mr. Steve Kennedy

This study explores the capabilities of three LLMs, ChatGPT, DeepSeek, and Claude in translating language and literary works across multiple languages. This study mainly analyzes the core linguistically rules that LLM's prioritize and focus on in the act of translation. Our process includes selecting English literary text, then sequentially translating this text through a specified series of languages, Mandarin, French, Dutch, and back to English. This iterative process reveals common linguistic properties across languages and examines how these models maintain semantic and cultural elements during translation. Our analysis shows varying degrees of preservation in language patterns. These findings provide perspective on how current language models function in cross lingual settings.

Ciren-Sense (Poster and Physical Display: Table 19)

Presenting Students: Annie Martz, Jada Fowler, Tehila Morgan
Faculty Mentor: Dr. Ying Zheng

Every year, an average of 37 children under the age of 15 die from heatstroke after being left in hot cars. In recent years, particularly from 2018 to 2019, this number has surged to over 50 deaths per year. Alarmingly, 52% of these incidents occur because a caregiver forgets that a child is in the car. Unfortunately, this deadly situation affects not only children but also pets. Implementing a monitoring system that alerts drivers when the vehicle becomes too hot could help prevent these tragic and unnecessary deaths. Our project, Ciren Sense, will notify the driver if the temperature in the car reaches unsafe levels and remind them with a picture of the vehicle's interior if they have left a child inside. The temperature sensor communicates with a Raspberry Pi (RPi) by collecting data. The RPi is connected to the sensors and is programmed to send out alerts whenever the temperature exceeds a safe threshold. The sensors can be accessed through the RPi's GPIO pins using libraries such as RPI.GPIO or Adafruit_DHT for DHT sensors. To notify the user of dangerously high temperatures, the system will first issue a warning with a message indicating that the car is

approaching concerning heat levels for passengers. If the warning is ignored, a more urgent alert will notify the driver that the car has reached a dangerously high temperature. The device will also have a camera attached to monitor the inside of the vehicle, which will work alongside the sensors to detect any distress. The Raspberry Pi acts as the central processor, controlling all connected devices and handling computations. It utilizes the Broadcom system-on-chip, which includes both a CPU and a GPU for efficient processing. The temperature sensor collects real-time data using specific device protocols, allowing continuous monitoring of the car's interior temperature. To communicate alerts, we will use a cellular network, ensuring that the driver receives notifications when the temperature inside the car becomes dangerously high. When excessive heat is detected, the system will trigger an alert sent directly to the driver's phone. Additionally, a small camera integrated into the system will capture an image of the car's interior, including all seats. This image will be attached to the notification, which will read: "Temperature alert: The inside of the car is dangerously hot. Is there a human or animal inside?" This approach ensures that the driver receives both a warning and a visual confirmation, enabling them to respond quickly to potential dangers. This technology has the potential to save lives by significantly reducing the risk of heatstroke for children and pets left in overheated vehicles. It is a pressing issue that affects hundreds of families across the nation. As we continue to develop our device, we may explore possible improvements, such as creating an app version. However, it is crucial to start somewhere, and our device aims to ensure the health and safety of those we care about.

Citations:

Hot car deaths - injury facts - national safety council. (n.d.-b). https://injuryfacts.nsc.org/motor-vehicle/motor-vehicle-safety-issues/hotcars/

No heat stroke. No Heat Stroke. (n.d.). https://www.noheatstroke.org/

Child passenger safety - national safety council. (n.d.-a). https://www.nsc.org/road/safety-topics/child-passenger-safety/child-passenger-safety-home

ComponentView GO: AI-Powered Computer Build Tips (Poster: Table 18)

Presenting Student: Reece Clem
Faculty Mentor: Dr. Xunyu Pan

Building your first computer can seem like a daunting task. There are many components that you will need that each have their own specific methods of installation. Taking the time to individually learn what each piece is and what the steps to install it are can be time consuming. My app, ComponentView GO, aims to make the experience of making your first PC build a breeze. The app contains artificial intelligence which runs entirely locally on the user's device. Users can take a photo of their pc component, and the AI will use built-in image recognition to tell the user what kind of component is pictured along with giving useful tips for installation. The reason I built this app because it something that I wish I would have had when building my first PC, so I hope that I can provide others with a much smoother first experience.

Creating a Programming Language Using LLMs (Poster: Table 20)

Presenting Student: Evan Shadel
Faculty Mentor: Ms. Rebecca Flinn

Large Language Models (LLMs) have become increasingly competent at writing functional programs from plain language prompts. Originally, context length restrictions meant adherence to detailed requests was nearly impossible. With the rise of freely-accessible models, long context lengths, and instruction fine-tunes, creating complicated software solutions with little direct human intervention is now possible. These combined give rise to a new software development paradigm and new challenges. People using LLMs to develop software must now carefully consider the long-term development roadmap and provide the proper context to restrict architectural decisions. LLMs can debug their code but, absent explicit instruction may create solutions that might fall outside the prompter's intent. Being intentional without micromanaging proves to be a tricky balance, but those who can manage the balance build quality large-scale apps quickly. Enter PseudoWoodo, an attempt at creating a functional interpreter that maximizes the use of LLMs. The syntax was initially devised in April 2023 to test ChatGPT's capabilities. At the time, context windows on freely accessible LLMs proved too restrictive to implement the entire design effectively. The project was shelved until the release of DeepSeek R1 in January of this year. The exceptional performance and gracious context length meant that DeepSeek R1 and V3 could handle nearly all the development. A test-driven approach was necessary to minimize regression and ensure the core functionality continued to work as development progressed. A high-level architecture is still necessary to ensure the code remains organized and readable, which was omitted in the first version of the interpreter class. The rewrite will include a more traditional parse, scan, and interpret approach, naturally refactoring the program into something more maintainable.

Data Analysis and Visualization with Music Listening History (Poster: Table 15)

Presenting Student: Spencer Mitchell
Faculty Mentor: Dr. Chung-Chi Huang

Music streaming services like Apple Music and Spotify store data that tells a lot about users' listening habits, likes, and dislikes. This project explores how we can analyze and visualize Spotify user data to generate personalized song recommendations. Spotify allows users to request their Extended Listening History, which contains detailed records of songs, podcasts, and audiobooks played on their account. With access to users' listening history, we can identify their favorite artists and songs, as well as listening patterns. We will implement a song recommendation system utilizing Spotipy, a Python library for the Spotify Web API, to recommend songs based on the listening history data and create playlists accessible through a Spotify user account. Overall, our project highlights the value of user data in enhancing music recommendations and, at the same time, raises awareness about the extent of data collected when using digital applications.

Epic Entrance – Door Sensor (Poster: Table 19)

Presenting Students: Jimmy Quach, Noah Logsdon, Jayden Tillery
Faculty Mentor: Dr. Ying Zheng

This project presents a magnetic door sensor system designed to enhance user convenience and automation in indoor environments. The system utilizes a contact sensor placed at the door to detect entry into a room. Upon activation, it automatically turns on the lights and plays music, creating an inviting atmosphere without manual input. The prototype integrates microcontroller-based components with programmable logic to demonstrate real-time responsiveness and customizable behavior. This research explores the potential of simple, low-cost automation to improve daily routines and user experience in smart homes and personal spaces.

Interactive Arctic Ocean Sample Mapping and Visualization (Poster: Table 17)

Presenting Student: Jaydason Miller
Faculty Mentor: Dr. Nooh Bany Muhammad

In recent decades, the Arctic Ocean has been a focal point for climate and environmental research due to its rapid changes and global significance. To support ongoing scientific efforts and improve community access to critical environmental data, I developed an interactive R and Shiny web application that visualizes over 20 years (1999–2019) of Arctic Ocean sample data. This platform was designed to make complex, large-scale datasets more accessible, interpretable, and usable for both researchers and the broader public. The web application enables users to explore and analyze temporal and spatial trends in the Arctic Ocean through interactive maps, plots, and user-driven filters. Researchers can identify patterns, observe changes over time, and compare variables, while community members gain insights into environmental shifts affecting the Arctic region. Additionally, the application includes a feature that allows users to download the raw data, encouraging further independent analysis and collaborative research. My poster highlights the value of data visualization as a powerful tool in scientific communication and research development. By transforming raw data into intuitive, interactive visual formats, we can bridge the gap between data complexity and public understanding. This approach not only supports more informed scientific inquiry but also fosters transparency and engagement with non-specialist audiences. Ultimately, this project demonstrates how accessible, well-designed data science tools can empower communities, enhance environmental awareness, and contribute to the advancement of Arctic research.

Investigating Cognitive Performance in Gamers and Non-Gamers (Poster: Table 20)

Presenting Students: Jimmy Quach, Spencer Mitchell, Kobe Duncan, Jennifer Pumphrey, Lily Morin
Contributing Students: eSports Club
Faculty Mentors: Mr. Steve Kennedy, Ms. Rebecca Flinn

As gaming becomes an increasingly prevalent form of entertainment, understanding its cognitive effects is essential. This study examines the relationship between video game experience and cognitive performance, focusing on reaction time and memory. We explore whether video game players demonstrate improved cognitive skills compared to non-players by analyzing data collected from student participants through online memory and reaction time benchmark tests. Additionally, we explore how different genres of games, as well as the duration and frequency of gaming, impact cognitive performance. By analyzing this data, we hope to evaluate cognitive performance found in student gamers and non-gamers. Our findings aim to clarify whether gaming is associated with enhanced cognitive abilities and to assess the extent to which different gaming habits influence performance. Ultimately, this research seeks to demonstrate that moderate video game play may provide measurable benefits in memory and reaction time, contributing to the broader discourse on gaming and cognition.

Sensor Squad: Sound-Driven Illumination (Poster: Table 19)

Presenting Students: Amanda Hawbecker, Chibuzo Okafor, Charlesima James, Clover Garrick Jr.
Faculty Mentor: Dr. Ying Zheng

This project demonstrates a sound-responsive smart lighting system using a Raspberry Pi 4, a single-board computer, integrated with a microphone sensor. The system analyzes clap patterns and sound intensity, allowing for control of smart light colors as well as responding to fluctuations in sound intensity within music. By employing an Application Programming Interface (API) and Python libraries, such as lifxlan, numpy, and sounddevice, clap patterns can be recognized and translated into a display of changing colors. With the installation of an Operating System and soldered sensor connected via General Purpose Input/Output (GPIO) pins, the project showcases software and hardware components of an automated lighting system. This project aims to leverage the capabilities of a Raspberry Pi and harness the power of sound to automate and create an interactive light experience.

The Human Factor in Multi-Factor Authentication: How Lack of Awareness and Carelessness Weaken Cybersecurity (Poster: Table 17)

Presenting Student: Madison Hooper
Faculty Mentor: Dr. Michael Flinn

A significant factor in cybersecurity vulnerabilities is human carelessness and lack of awareness (Alghazo, 2023). Despite the proven effectiveness in preventing unauthorized access, many users

continuously neglect to enable two-factor authentication (2FA) due to a lack of convenience and awareness (Marky et al., 2023). This study hypothesizes that users do not voluntarily enable two-factor authentication. Additionally, the study hypothesizes that a lack of awareness of cybersecurity threats as well as inconvenience contribute to the underuse of 2FA. The purpose of this study is to uncover the extent to which online users enable 2FA and whether they activate it (proactively) themselves or only when mandated (passively).

Tracking Biomarker Progression in Alzheimer's Disease through Mathematical Modeling (Poster: Table 15)

Presenting Student: Júlia Ramos Bentham
Faculty Mentor: Dr. Chung-Chi Huang

Alzheimer's Disease is a neurodegenerative illness that worsens over time and is characterized by abnormal brain alterations and cognitive deterioration. Finding trends in the development of biomarkers is essential for prognosis, early diagnosis, and treatment. This study uses publicly available datasets to track the evolution of important biomarkers including tau proteins, and amyloid-beta (Aβ) using mathematical modeling approaches like differential equations and statistical analysis. In order to create predictive models that measure the course of disease over time, I will be incorporating longitudinal biomarker data using wrangling techniques and Python-based data modeling. By evaluating different modeling approaches, this research seeks to enhance the predictive capabilities of biomarkers in Alzheimer's Disease diagnosis and prognosis, contributing to more effective decision-making in clinical and research settings.

Various Ways of Distributed Denial-of-Service (DDoS) Attack and Mitigation (Poster: Table 17)

Presenting Students: Carlos Quintero Rivas, Samuel Dolly, Kelechi O. Ironi, Justin C. Dowell, Ire D. Maboudou
Faculty Mentor: Dr. Wenjuan Xu

Denial of Service (DoS) attack is a malicious attempt to disrupt the normal operation of a computer system, network, or service by overwhelming it with excessive traffic or requests. This causes the system to become overloaded, resulting in significant slowdowns or complete failure, preventing legitimate users from accessing the service. In this study, we will investigate various types of DoS attacks, categorized into Flooding the Target, Exploiting Vulnerabilities, and Resource Depletion. For each category, we will explore the techniques commonly employed by attackers and simulate these attacks in a controlled virtual environment to demonstrate their impact. Furthermore, we will analyze the consequences of DoS and DDoS attacks, and we will present effective strategies for defending against DoS and DDoS attacks. These defense mechanisms include network configuration, rate limiting, load balancing, intrusion detection systems (IDS), and specialized DDoS mitigation services. By understanding these attacks and their defenses, we aim to help organizations build more resilient systems against the growing threat of DoS and DDoS attacks.

ENGINEERING DEPARTMENT

Automatic Cleaner and Eraser (A.C.E.) (Poster and Physical Display: Table 10)

Presenting Students: Jack Stover, Jarrett Pennington, Ben Smith, Galo Cappelletti, Peyton Bell
Faculty Mentor: Dr. Jamil Abdo

The Automated Cleaner and Eraser or A.C.E. is designed to aid teachers and professors in higher education by effectively eliminating the task of whiteboard erasing. This will save time and energy that can be better spent on tasks of higher importance. Through the use of the A.C.E., lecturers will be able to clean the board and leave the room at the push of a button. The A.C.E. system utilizes Arduino code along with a gantry-based system to move laterally across the whiteboard to remove dry erase marks and writing. The A.C.E. system also utilizes a reservoir and spray system to supplement the cleaning abilities of the dry erase erasers.

Field Hockey Stick Reinforcement and Composite Layer Repair (Poster: Table 4)

Presenting Students: Ike Higson, Nicole Gray, Lawrence Guy
Faculty Mentor: Dr. Kaimiao Liu

While field hockey sticks are designed with reinforced surfaces, repairing the outer layer when compromised presents a cost-effective and environmentally sustainable alternative to full replacement. The surface deformation can impact player performance, potentially can occur even shortly after purchase. This project aims to develop a stick with a replaceable and more wear resistant surface layer, enabling outer layer repairs while promoting the recycling of the stick's core structure. Based on preliminary design and market analysis of existing models, a removable outer layer can significantly reduce costs for players. Several removable adhesives were evaluated for their effectiveness in bonding the durable woven fiber layer to the stick’s core structure while remaining within FHS weight regulations. Additionally, an outer coating was applied to enhance the stability and protection of the woven fiber surface.

Pitch Return (Poster: Table 5)

Presenting Students: Blayze Cox, Samara Funk, Nathan Worgan, Nathan Yoder
Contributing Student: Ryan Adams
Faculty and Staff Mentors: Dr. Jamil Abdo, Mr. Aaron Turner

The Pitch Return is designed to alleviate stress on catchers in collegiate and professional baseball. It also increases the practice volume available to pitchers. In high-level baseball, pitchers usually far outnumber catchers, and this creates a significant strain on them. Another factor is time because a team with five pitchers to one catcher may not be able to get all pitchers warmed up in pregame. Pitch Return solves these issues by giving pitchers a game-like strike zone to pitch at and automatically returning them the baseball. Now, only one person is required for a pitcher to practice

or warm-up effectively. Nine squares already exist in baseball, but the problem is the pitcher must walk down and retrieve the balls from the catching device, usually a net on these designs. Pitch Return was created to prevent this need and save time and effort. The design uses foam pads to stop the baseball and then uses gravity to funnel the ball into a pitching machine which returns the ball. Also, force sensors are placed behind each of the nine individual pads, which are used to give feedback to the pitcher as to where he or she hit in the strike zone.

PowerCore: Advanced Internal Liner Reinforcement and Repair for Field Hockey Sticks (Poster: Table 4)

Presenting Students: Femke Hofkamp, Jacob Roten, Lindsay Poler
Faculty Mentor: Dr. Kaimiao Liu

The durability and performance of field hockey sticks are critical for player efficiency and comfort. However, current sticks suffer from premature inner liner failures, leading to increased replacement costs and compromised performance. This project aims to develop an advanced inner liner that enhances durability, improves shock absorption, and allows for repairability. By incorporating innovative materials such as urethane foam and a triangular orientation into the core, this design extends the lifespan of field hockey sticks while maintaining structural integrity. This project utilizes an onyx matrix with Kevlar fiber reinforcement for both stick core structure and inner liner and filling of polyurethane foam in between liner and core structure to address key concerns of the commercially available sticks.

Precision in Motion: Robotic Arm Assembly and Integration (Poster: Table 4)

Presenting Students: Savannah Hines, Renee Phillip, Ashley Bailey, Randy F. Hinestroza
Faculty Mentor: Dr. Tariq Masood

This capstone project demonstrates the precision of automated tasks using a robotic arm in the manufacturing and assembly industry. The project uses SCORBASE programming software to control the SCOROT-ER4u robotic arm provided by the school, enabling precise and efficient automated operations that mimic industrial production scenarios. Deliverables include comprehensive hardware documentation, detailed programming narratives, schematics, testing results, and a final report, all supported by a video presentation, poster, and digital archive that collectively capture the project's technical depth and practical applications. We, as a team composed of students with backgrounds in mechatronics, electrical and project engineering, and hands-on experience in software implementation, including Arduino, MATLAB, and exploring potential AI integration collaborate to explore and refine automated task execution in industrial applications. This collaborative effort not only bridges academic theory with real-world practice but also cultivates essential skills for future innovations in automation.

MANAGEMENT DEPARTMENT

Advances in Human Resource Management: Employee Monitoring (Oral Presentation: Room 108 at 12:30 p.m.)

Presenting Student: Stella Beernink
Faculty Mentor: Dr. Kenneth Levitt

In a world that is quickly evolving technologically, concerns about employee efficacy during work and a desire to ensure corporate standards are continually being met have led to an increase in popularity for the implementation of employee monitoring methods. With the rise of innovations such as keystroketracking programs and digital accountability control systems, it is easier than ever to collect workplace data for use in human resource decisions, especially in regard to employee management. However, these programs have been labelled invasive, raising serious legal and ethical concerns about their usage that has created a conflict between the benefits to company productivity and the threat to individual privacy. This research examines methods of employee monitoring, including areas such as behavioral tracking and digital surveillance, and the technological innovations that have allowed them to rise in popularity. In reviewing case studies, existing legislation, previous literature, and emerging trends in human resource management, this research aims to provide a comprehensive look at employee monitoring, explore how organizations can successfully and ethically implement monitoring programs while maintaining employee trust, and discuss the potential future of workplace surveillance in terms of technological and legal development.

Different Generations in the Workplace (Poster: Table 9)

Presenting Students: Jillian Davis, Amari Sanders, Owen Doyle
Faculty Mentor: Dr. Kenneth Levitt

When it comes to workplace dynamics, there are notable differences between each new generation that joins the workforce. With more generations overcrossing within organizations, issues arise with how to best handle employees' needs while also positively impacting the business. From Generation X, Millennials, to Generation Z, these conflicts of interest are evident in their perspectives of work/life balance, communication preferences, and values/loyalty. The purpose of this research is to consider how different generations desire different things at work and provide potential solutions to make the working environment the most ideal for all generations in the workplace. As later retirements continue to grow, more and more generations will need to work together within a business, thus emphasizing the need to understand how to best meet the demand of each generation reasonably.

MATHEMATICS DEPARTMENT

A Deep Dive into Triangles (Poster: Table 14)

Presenting Student: Cayden Palamar
Faculty Mentor: Dr. Mark Hughes

In the field of Euclidean geometry, there are numerous theorems and concepts that provide profound insights into the properties of triangles and their relationships to other geometric figures. This paper delves into three such concepts: the Simson line, the Steiner deltoid, and the nine-point circle, each of which plays a pivotal role in the understanding of triangle geometry. By exploring these concepts and their interconnections, this research aims to deepen the comprehension of their significance and uncover the intricate relationships that exist between them. The Simson line is a geometric construct associated with a point on the circumcircle of a triangle. It is defined as the line formed by the feet of the perpendiculars drawn from the point to the sides of the triangle. This line illustrates the fascinating property of collinearity and reveals the symmetry between the point on the circumcircle and the vertices of the triangle. The concept of the Simson line is important for understanding the symmetries of triangle geometry and offers valuable insights into advanced geometric theory, particularly in relation to triangle centers. The Steiner deltoid is another key geometric figure examined in this paper. It is a special curve that is formed by revolving one circle inside a larger circle with properties derived from the nine-point circle of a triangle. Additionally, the Steiner deltoid has a key connection to the collection of Simson lines. The study of the Steiner deltoid enhances our understanding of triangle geometry and its underlying structures. The nine-point circle, which passes through nine significant points of a triangle, such as the midpoints of its sides and the feet of its altitudes, is a central concept in this paper. This circle is closely associated with the triangle's centroid and Euler line, providing a deeper understanding of the triangle's geometry. The nine-point circle connects to various triangle centers, offering an elegant framework for analyzing the relationships between these centers and their geometric significance. By analyzing these geometric constructs in relation to one another, this paper highlights the interconnectedness of classical geometric figures and their role in triangle geometry. The findings illustrate how each of these concepts—the Simson line, Steiner deltoid, and nine-point circle—offers unique insights into the properties and symmetries of triangles. Furthermore, the interrelationships between these constructs provide a more comprehensive understanding of triangle geometry, unveiling deeper connections and "hidden" properties that have not only theoretical value but also practical implications in the broader field of geometry. Through this exploration, the paper encourages further research into advanced geometric phenomena and their applications.

Continued Fractions (Poster: Table 14)

Presenting Student: Gabriel Hicks
Faculty Mentor: Dr. Mark Hughes

In this presentation I explore the topic of continued fractions. I define some basic terms and provide examples of how rational and irrational numbers can be represented by continued fractions, and then go over a general history of the usage of continued fractions and their development as a field. Then I prove some theorems on the convergents of continued fractions and the values of infinite simple continued fractions, with the ultimate goal of proving that the best approximations of irrational numbers are the convergents of its infinite simple continued fraction. Finally, I provide an example of an application of continued fractions in regards to music, specifically our modern tuning system and how it approximates an ancient musical scale.

Patterns and Probabilities: Simulations for Strategy, Scoring and Fairness in Azul (Poster: Table 14)

Presenting Student: Beckett Bowser
Faculty Mentor: Dr. Justin Dunmyre

This study aims to explore game strategy, scoring, and fairness in the board game Azul. This research investigates the relationships between player strategies, scores, score margin of victory, and game length. These factors are explored through game simulations in R. Core game mechanics implemented include choosing tiles from factory displays or the table center, negative points for tiles placed in the floor, and rules for moving tiles from the pattern lines to the tile wall. These simulations aim to compare different game strategies for choosing tiles in addition to row, column, and color completion rates. This approach to collecting scoring data provides insight for players on optimal strategies, game-balancing mechanisms, and scoring for Azul players and players of similar strategy games.

RECREATION AND PARKS MANAGEMENT DEPARTMENT

Athletes' Participation in Intramurals (Poster: Table 7)

Presenting Students: Wesley Phillips, Jaxon Jones, Graham Allison
Faculty Mentor: Dr. Curtis Clemens

This study examines the factors contributing to the low participation of student-athletes in intramural activities at Frostburg State University. Despite the availability of these programs, involvement among student-athletes remains notably low. Data will be collected through online surveys, and basic descriptive analysis will be used to explore the most common barriers hindering participation. Key variables under consideration include time-related conflicts with athletic commitments, overall awareness and interest, and the prioritization of varsity sports over non-competitive recreational engagement. The dual responsibilities of athletic and academic performance often result in heightened stress and time scarcity, significantly limiting student-athletes' availability for additional activities (Lopes Dos Santos et al., 2020). In alignment with hierarchical leisure constraints theory, barriers to intramural participation can be understood through intrapersonal (e.g., fatigue or disinterest), interpersonal (e.g., lack of peer availability), and structural (e.g., scheduling) factors (Godbey et al., 2010). Research also suggests that students, including athletes, often find existing intramural offerings or clubs misaligned with their interests or schedules (Mackie, 2016). Importantly, prior research has demonstrated that participation in co-curricular activities such as clubs and intramural sports is positively associated with academic performance, student engagement, and personal development (Mayhew et al., 2019). The lack of student-athlete participation in such beneficial programs therefore raises important questions about equity, inclusion, and institutional support. Findings from this study will guide recommendations for improving participation among student-athletes, including possible adjustments to program timing, increased promotion of intramural and club opportunities, and program modifications that better reflect the needs and interests of student-athletes. This research aims to contribute to ongoing efforts to create more inclusive and engaging recreational and co-curricular opportunities on campus. Results are pending at the time of presentation submission.

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FSU Student Interest and Barriers to Collegiate Intramurals (Poster: Table 7)

Presenting Students: Jocelyn Cacek, Birtukan Sherburne, Isabel Meyer
Faculty Mentor: Dr. Curtis Clemens

Intramural sports offer college students valuable physical activity, social engagement, and overall well-being opportunities. This research presentation explores the factors that influence participation in intramural programs and the impacts such participation has on student life. Selvaratnam (2020) identifies key elements such as awareness, motivation, and organizational facilitators that affect student involvement in campus recreation while also highlighting the role of social and structural constraints. Ward (2015) supports these findings by demonstrating the benefits of intramural sports in improving physical health, reducing stress, and fostering a sense of belonging. Prochnow, Park, and Patterson (2023) further emphasize the social dynamics of participation, linking strong intramural networks to improved student retention and greater community engagement. Adding depth to the understanding of participation barriers, Mackie (2016) explored constraints using focus groups and found that students experience all three types of constraints—intrapersonal, interpersonal, and structural—with notable gender differences. Female students, in particular, were more constrained by lack of knowledge, negative past experiences, and difficulty finding enough participants, especially in women-only leagues. These nuanced insights emphasize the importance of removing participation barriers and adapting program offerings to student needs. Godbey, Crawford, and Shen (2010) support this view by analyzing the Hierarchical Leisure Constraints Theory, which frames participation as a process influenced by layered constraints that must be navigated and negotiated. The current research investigates these dynamics within the context of Frostburg State University. Results are pending.

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Godbey, G., Crawford, D. W., & Shen, X. S. (2010). Assessing hierarchical leisure constraints theory after two decades. *Journal of Leisure Research, 42*(1), 111–134. https://www.nrpa.org/globalassets/journals/jlr/2010/volume-42/jlr-volume-42-number-1-pp-111-134.pdf

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Social Media on Adventure Tourism: Trends, Popularity, and Economic Influence (Poster: Table 7)

Presenting Students: Shenandoah Wolf, Quinn Williams
Faculty Mentor: Dr. Curtis Clemens

In recent years, social media has significantly influenced the landscape of adventure tourism, shaping trends, destinations, and economic outcomes (Benesh, 2025). This study examines the historical evolution of adventure tourism and analyzes how digital media platforms have altered the types of activities and locations that gain popularity. The rise of digital technologies, particularly social media, has empowered tourists to gather unbiased information and make informed travel decisions, while also providing tourism organizations with new ways to engage with potential visitors. Social media platforms such as Facebook, Instagram, Twitter, and YouTube have become instrumental in sharing authentic travel experiences, influencing traveler preferences, and promoting adventure tourism destinations (Hussain et al., 2024). Recently, visitation has increased and shifted back to pre-1990 trends, with U.S. national parks experiencing consecutive years of record-high visitation levels. This rise in visitation to public lands presents challenges for state and federal land managers, who must balance recreation opportunities with conservation efforts. Journalists frequently attribute the growing crowds on public lands to social media photo-sharing apps, particularly Instagram, as park managers report an increase in "selfie traps"—locations of considerable natural beauty that attract large crowds seeking to capture and share their experiences online (Mackenzie et al., 2024). By investigating shifts in traveler preferences driven by online exposure, this research explores the role of social media in promoting specific adventure experiences, as well as its impact on local accommodations and economies. A meta-analysis of articles provides findings highlighting the interplay between digital influence and tourism development, offering insights into how adventure tourism adapts to evolving media trends and consumer behaviors.

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SUSTAINABLE CONSTRUCTION MANAGEMENT PROGRAM

Advancing 3D Printing with Natural Reinforcement for Concrete Applications (Poster: Table 3)

Presenting Students: Alique Collins, Samuel Dominguez, LaJess Jordan, Aaliyah Ushry
Faculty Mentor: Dr. Thomas Cadenazzi

Perhaps one of the biggest challenges that we currently face in construction is sustainability, and environmental sustainability above all. This project aims to incorporate durable and more sustainable materials for construction applications to kickstart the problem-solving era in the world of construction specifically centered on building materials sustainability. This study investigates the tensile behavior of 3D-printed specimens made from hemp-PLA composite and pure PLA materials, with a focus on compliance with ASTM testing standards. The research encompasses the design, fabrication, and mechanical evaluation of specimens intended as sustainable alternatives to steel rebars in concrete applications. Initially, specimens were printed using PLA filament to assess dimensional accuracy and optimize print parameters. Following the calibration of the tensile testing equipment and the unsuccessful initial test, an alternative 3D printer was evaluated for hemp-PLA compatibility. Upon verification, both PLA and hemp-PLA samples were fabricated using ASTM-compliant geometries derived from standard ASTM profiles. By utilizing filament formulations with varying hemp-to-PLA ratios (0%, 7%, and 10% hemp by weight, with the remaining composition consisting of PLA), we conducted standardized tensile tests to determine the maximum load-bearing capacity of each composition and analyze their failure behavior under uniaxial stress. Stress-strain curves were generated for each specimen, enabling the comparison of mechanical performance across different material blends. These curves illustrated not only the elastic and plastic response of every mix but also served as the basis for extrapolating potential performance at higher hemp content percentages, beyond what current 3D printers can achieve. These extrapolations are critical for informing future research and guiding manufacturers in the development of high-hemp-content structural components through pultrusion techniques, which could ease the production of environmentally friendly, durable, non-metallic reinforcement bars suitable for actual construction use.

COLLEGE OF EDUCATION AND HEALTH & NATURAL SCIENCES

BIOLOGY DEPARTMENT

An Observation of Black Vulture Conspecific Scavenging in an Area of High Avian Influenza (Poster: Table 16)

Presenting Student: Kevin Wise
Faculty Mentor: Dr. Cody Kent

Black vultures (*Coragyps atratus*) play a key role in the ecosystem by scavenging the dead carcasses of other animals. However, the conspecific consumption among black vultures is not well documented. On 13 April 2024, I observed a flock of black vultures consuming a recently deceased black vulture carcass at the Conowingo Fisherman's Park, Harford County, Maryland, USA. Several more observations were made on the 14 and 19 April, where the carcass was consumed to the bone over that timeframe. Confirming this behavior can provide a crucial insight into black vulture behavior and the possibility of conspecific consumption among new world vultures. Moreover, as this site has been known for large vulture die offs due to avian influenza over the last few years, this behavior can be a possible explanation for the spread of avian influenza among black vultures and can lead to possible management strategies.

Bacteriological Analysis of Water Collected from Maryland (Poster: Table 1)

Presenting Student: Tessa Hoppe
Faculty Mentor: Dr. Kumudini Munasinghe

Water is a primary source of infections, with bacteria playing a critical role in waterborne outbreaks. While drinking at least two liters of water daily is essential for cellular metabolic activities, ensuring the safety of drinking water is equally important. The objective of this project is to develop rapid protocols for testing water, including drinking water, for potential contaminants. Six different water samples were collected and transported on ice to the microbiology lab at Frostburg State University, Maryland, where they were stored in a cold room at 4°C until analysis. The membrane filtration technique was initially used to isolate bacteria from the water samples. The bacteria were then cultured on various microbial growth media, including EMB agar, TSA, nitrate reductase broth, and KF Streptococcus agar, for bacteriological analysis. In addition to microbiological testing, parameters such as oxygen concentration, pH, and bromide concentrations were measured. Water samples were also sent to an external laboratory for testing of pesticides, metals, and volatile organic compounds (VOCs). Oxygen concentrations, bromide concentrations, and pH levels were recorded for each sample. Oxygen concentrations of the samples ranged from 5mg/L to 12mg/L, with a mean

concentration of 10.17mg/L. The samples had pH levels ranged from 6.39 to 7.40, with a mean of 7.00. Bromide concentrations of the samples were all found to be 0mg/L. TSA is a non-selective medium that supports the growth of most bacterial colonies, whereas EMB and KF Streptococcus agars are selective for fecal coliforms. Microbial biochemical tests further assisted in the identification of bacterial species. The development of faster, more efficient methods for water testing has the potential to offer significant benefits, including cost reduction and more timely identification of contaminants.
Keywords: Water testing, filtration technique, biochemical reactions

Digitization and Collection Trends of the Frostburg State University Herbarium (Oral Presentation: Room 113 at 12:30 p.m.)

Presenting Student: Lily Ridgell
Faculty Mentor: Ms. Clara Thiel

The Frostburg State University Herbarium (FSUH) is a library of dried and mounted plant specimens, each given a label noting collector, date, species, and habitat. The collection currently houses over 15,000 dried plant specimens that span many taxa collected over six countries and 43 U.S. states. It also highlights important regional collectors, including Franklin C. Lane, after whom the Lane Center is named. Until recently, FSUH's collection was entirely unknown. To better understand its contents, recent digitization efforts in partnership with the Mid-Atlantic Herbarium Consortium (MAHC) have aimed to create a database that assists in its accessibility and organization. Using this database, the collection is currently being analyzed to detect trends in taxonomy, location, and distribution. These analyses will assist future collectors by identifying gaps in species and regions within the FSUH inventory. Digitization of the FSUH and other small herbaria will improve the accessibility of its collection for future research and data sharing throughout central Appalachia and the greater Southeastern U.S.

From Guts to Glory: Methodology of Staining and Mounting Parasites (Poster: Table 11)

Presenting Student: Wyatt Dicken
Faculty Mentor: Dr. Kate Sheehan

Voucher specimens are preserved samples of organisms maintained in museums or collections to provide consistent references for researchers conducting identifications or comparative studies. These specimens cover a wide range, including mounted slides, frozen tissue samples, preserved media for DNA research, genetic sequences, and containers with whole or partial organisms. In order to provide long-term repository preservation for current and upcoming research at Frostburg State University, this study focuses on preparing voucher specimens for submission to the Smithsonian Invertebrates Collection. At Frostburg State University, the Parasites and Plastics Ecology Group performs research on dozens of species of host organisms with an emphasis on avian groups. In doing this, we have the need to create voucher specimens for hundreds of parasites. For

example, bycaught birds collected by the National Oceanic and Atmospheric Administration (NOAA) are part of an ongoing project on Red-Throated and Common Loons. Additionally, USDA/APHIS/Wildlife Services partners with FSU to assess waterbirds collected from shrimp aquaculture facilities in Florida and Alabama (7 species), and blackbirds on baitfish aquaculture in Arkansas. All these federally associated contracts require formal documentation of parasites assessed, and voucher submission assists in this process. Here, we outline the procedure for obtaining and preparing parasites from bird hosts in order to produce stained and mounted voucher specimens. Bird organs are first removed from their carcasses and scrutinized under stereomicroscope to extract obvious parasites like flatworms, roundworms, and thorny-headed worms (acanthocephalans). Smaller parasites including trematodes like *Microphallus*, and echinostomatids and cestodes like *Tetrabothriidea* are then collected and preserved in formalin or ethanol for long-term maintenance. Depending on the taxonomic group, different preparation techniques are utilized: Platyhelminthes are stained with Acetocarmine, while Nematodes and Acanthocephalans are cleared in Glycerol then preserved in Ethanol within borosilicate vials. For stained specimens, a dehydration approach using increasing ethanol (EtOH) concentrations is required before the tissues can be mounted in Canada balsam for long-term storage. If water molecules persist in the parasites' tissues, they will blacken, and morphological features will not be distinguishable. A baseline guideline for these techniques is included in this study, along with process modifications intended to speed up preparation and boost productivity. Thus, we build upon classic techniques long applied for parasite voucher specimens while promoting efficient and repeatable procedures that promote the long-term preservation and scientific research utility of our samples.

From Infection to Connection: Parasites in Food Webs (Poster: Table 6)

Presenting Student: Julia Davis
Contributing Student: Ellie Olsen
Faculty Mentor: Dr. Kate Sheehan

In coastal and marine environments, waterbirds are top predators and help connect terrestrial and marine ecosystems. Parasites play significant roles in shaping ecosystems by affecting the behavior, health, and survival of the animals they infect. Oftentimes, parasites must infect several species of hosts to complete their life cycles. For example, many parasites that infect waterbirds, like tapeworms, roundworms, and flukes, need to pass through other animals, such as snails or fish, before they can reach maturity in the bird hosts. The disruption of these complex life cycles by the loss of one or more required hosts in a parasite's life cycle can extirpate the parasite from an ecosystem. Factors such as climate change, pollution, or overfishing have the potential to disturb these ecosystems and can alter the number and types of hosts available, creating stressors that impact parasite populations. Thus, the absence of parasites from a system indicates the loss of intermediate hosts from a system. Conversely, the presence of parasites within a system indicates the persistence of an intact food web that supports sufficient transmission of the parasite's life cycle. To better understand these dynamics, we obtained waterbird specimens from the USDA Wildlife Services (WS), which was culling nuisance predators from sportfish aquaculture facilities in the southeastern United States. WS collaborators poured PBS buffer into the gullets of diseased birds in

the field to stop digestion, emptied the gastrointestinal tract (GIT) contents into either buffered formalin or 80% ethanol, and shipped the contents to FSU for evaluation. Here, we scrutinized the gut contents for any animal parasites and preserved them for morphological identification. Following the identification of the parasites, we sourced intermediate host lists that had previously been reported for each parasite from peer-reviewed literature and online museum records. With these host-parasite accounts, we developed matrices for predator-prey interactions, developed trophic networks (i.e., food web models), and compared their topologies based on each host's parasitic community. In doing so, we evaluated the trophic community that each waterbird effectively interacts with from an energetic standpoint. This research highlights the necessity of considering parasites in ecological studies and conservation planning, emphasizing their role as key players in maintaining biodiversity and ecosystem balance.

Genetic Profiling of Various Hemp Samples from Alternate Seed Suppliers Using Microsatellites (Poster: Table 6)

Presenting Students: Lilly Rakes, Blake Varela, Benjamin Twigg, Julia Bannister
Faculty Mentor: Dr. David Puthoff

Cannabis sativa L, better known as hemp, is a plant primarily grown for industrial and consumable purposes. Hemp is widely used commercially in textiles, construction, cosmetics, and is even used as a biofuel. One important benefit of hemp over common alternatives is hemp's eco-friendly properties. The plant can also be consumed in different forms. It is a great source of healthy fat, protein, minerals, and fiber, which can improve health. These benefits positively impact the human body in a variety of ways. They provide protection for the brain, reduce inflammation, and even improve skin conditions. To access these last benefits, Cannabidiol (CBD) is purified from the female flowers of the plant and is applied topically or taken internally. This project means to provide the tools to keep hemp varieties consistent. This is needed due to the fact that hemp/Cannabis breeding has been done in "backroom" for decades. The purpose of this research is to compare the genetic profiles of a specific strain of hemp, Cherry, to samples from different distributors to verify if the genetic structure is consistent between each seed distributor. To generate the genetic profiles DNA was extracted from each of approximately 100 seeds. DNA quantity was assessed using the Nanodrop spectrophotometer, then subjected to the polymerase chain reactions (PCR) to amplify hemp microsatellites loci. Thirteen microsatellite loci were amplified in all. Microsatellite alleles were scored based on size using agarose gel electrophoresis. The genetic structure of the Cherry populations (i.e., different distributors) were analyzed using various statistical programs in R-studio.

Molecular Characteristics of Bacteria Isolated from Arizona, New Mexico, and Maryland Soil (Poster: Table 1)

Presenting Student: Carly Gillette
Faculty Mentor: Dr. Kumudini Munasinghe

The soil microbiomes play a critical role in identifying the ecosystem's health, yet their diversity and functional potential lack exploration. This study focuses on the molecular characterization of bacteria isolated from soils in Arizona, New Mexico, and Maryland, contributing to the Earth Microbiome Project (EMP). This research aims to improve our understanding of soils microbials ecology, antibiotic resistance, and potential industrial/medical applications by analyzing the bacterial genetic diversity and functional traits. The study also seeks to identify potential pathogens to the ecosystem's soils and assess their impact on the environment's microbial communities. The soil samples collected and transported to Frostburg State were stored at 4°C until transfers and isolation. Bacterial samples were isolated from the soils collected from Arizona, New Mexico, and Maryland and transferred to TSA agar slants. DNA extractions are then performed followed by Polymerase Chain Reaction (PCR), which is utilized to amplify specific DNA sequences. Agarose gel electrophoresis is then used to separate DNA fragments by size and weight. Next-generation sequencing (NGS) will be employed to obtain genetic data, followed by bioinformatic analysis of DNA which identifies bacteria species and strains. Due to ongoing analysis, results remain unknown still. This research highlights the importance of understanding soil microbial communities across diverse geographic regions.
Keywords: Soil bacteria, DNA, next generation sequencing

Next Generation DNA Sequencing of Isolated Bacteria from Farmers Market (Poster: Table 1)

Presenting Student: Christina Richardson
Faculty Mentor: Dr. Kumudini Munasinghe

Farmers markets are popular for their farm to table atmosphere and sense of local community. Produce sold at open-air farmers' markets have a stereotype of being fresher and healthier compared to retail produce. Increased urbanization in the Northern Hemisphere has shifted the way people shop for fresh fruits and vegetables. Farmers markets bring small farmers more consumers as well as lowering the carbon footprint from chain produce companies shipping from further locations into cities. This research explores the reality of different lethal bacteria present on produce in Allegany County Maryland open-air farmers' markets. These small farmers are not legally required to follow the same USDA and FDA guidelines as chain companies if they meet certain criteria. This is dangerous for communities because the bacteria that are living on the produce can be lethal and spread rapidly. Lettuce, cucumbers, strawberries, and tomatoes from various open-air farmers' markets in Allegany County Maryland were gathered and tested through bacteria isolation and next generation DNA sequencing. The inoculated broth from the produce replicates was used along with the QIAquick DNeasy Ultraclean microbial kit which extracts and purifies DNA from isolated bacteria.

DNA concentrations and purifications were tested using Nanodrop to ensure purification standards in order for PCR amplification to be successful. PCR will be performed with AccuPower® Taq PCR PreMix and the previously extracted DNA. This DNA will be sent to Azenta for further DNA sequencing and bioinformatics analysis.
Keywords: Bacteria isolations, PCR, and DNA next generation sequencing

Nutrient Abundances at Different Stream Orders (Poster: Table 11)

Presenting Student: Lacey Moyers
Faculty Mentor: Dr. Kate Sheehan

This study investigates the variation in nutrient abundances across different stream orders, aiming to understand how stream size and order influence nutrient concentrations in freshwater ecosystems. By examining streams of varying orders, the research analyzes the distribution and potential sources of key nutrients such as nitrogen and phosphorus. The findings highlight the dynamic relationship between stream order and nutrient levels, offering insights into how riverine systems' hydrological and ecological factors shape nutrient cycling. This work contributes to better management practices for water quality and ecosystem health in fluvial environments.

Observing Parasitic Diversity in Canadian Coastal Birds (Poster: Table 6)

Presenting Student: Elizabeth Kays
Faculty Mentor: Dr. Kate Sheehan

Parasitism is the most common mode of heterotrophy, with more animals exhibiting this mode of nutrient acquisition than predation and herbivory combined. Most free-living animal species are infected by at least 2 distinct species of parasitic animals. Many parasitic organisms have complex life cycles that move through intermediate hosts in order to complete one generation. In doing this, definitive hosts, like seabirds could consume the same prey items. We would expect birds that eat the same prey to contain similar parasites. This study examines the parasitic diversity in two seabird species, the Common Eider (*Somateria mollissima*) and the Black Guillemot (*Cepphus grylle*), collected in the same region of Newfoundland and Labrador, Canada, to better understand the ecological relationships between these birds in relation to their feeding ecologies. Using the collection of parasitic worms infecting their gastrointestinal tracts (endoparasites), we compared their parasite prevalence and diversity. Each digestive tract was separated into distinct segments and dissected to find and identify parasites and plastics in the individuals. Preliminary findings suggest notable differences in parasite richness, abundance, and host specificity between the two species, potentially linked to variations in diet, migration patterns, and nesting habits. Additionally, we take note of parasites that could be a risk to human populations by impacting the health of the bird through muscular contamination, bloodborne secondary infections, or other pathological conditions. This study was performed using birds hunted for human consumption by an Inuit community. We intend to follow up with the community to perform additional surveys of hunter-collected specimens on fresh-caught birds for future analyses. This research contributes to the

broader understanding of parasitic interactions within coastal avian communities and underscores the need for ongoing monitoring of seabird health in the face of environmental change.

Parasitology of Freshwater Gamefish in Maryland (Poster: Table 11)

Presenting Student: Luis Cervantes
Faculty Mentor: Dr. Kate Sheehan

In aquatic environments, symbiotic relationships frequently occur. In fact, many people might be surprised to know that most organisms are infected with parasites. For many parasitic organisms, their survival relies on the presence of intermediate hosts. For example, in Piney Reservoir, the trematode *Posthodiplostomum minimum*, is an obligate parasite in centrarchid fishes. If the fish were absent from the lake, the parasite would no longer occur in that system. Likewise, parasites are a very important biotic factor of ecosystems, with hosts' survival, growth, and reproduction being greatly impacted by parasitic infections. Maryland has a high diversity of game fish species, many of which contribute not only to the health of aquatic ecosystems, but also to the public via recreational and economic value. Unlike states in other regions of the country, there are few records of the parasitic infections of freshwater habitats in Maryland. Here, we initiated a sampling program of sunfish from Piney Reservoir located west of the city of Frostburg, Maryland where the city's drinking water is sourced. We collected specimens of the genus *Lepomis* as they are popular for recreation and consumption. We predicted that internal parasites would be most common in the liver and gastrointestinal track of the fish. We dissected the liver, stomach, intestines, heart, kidneys, and gills. We found that in both species of *Lepomis* the liver is the most infected organ, with Class Trematoda having the highest prevalence in both species. *Lepomis gibbosus* was found to be infected at a significantly higher rate than *Lepomis macrochirus,* likely due to differences between the feeding behaviors of the species. These parasites are ultimately fatal to the fish, as centrarchids are an intermediate host, with the definitive host being piscivorous birds. We plan to continue with this research in other species of gamefish and sample other bodies of water to better understand the patterns of parasitic infections of fishes in Western Maryland.

Physical and Chemical Characteristics of *Mycobacterium smegmatis* (Poster: Table 1)

Presenting Student: Nia Ivanov
Faculty Mentor: Dr. Kumudini Munasinghe

Mycobacterium smegmatis belongs to the same genus as several dangerous pathogens, including *Mycobacterium tuberculosis*, the causative agent of tuberculosis, and *Mycobacterium leprae*, the causative agent of leprosy. Unlike these pathogens, *M. smegmatis* is nonpathogenic and grows faster than other species in the genus, making it a valuable model for studying pathogenic mycobacteria. This experiment studied the physical and chemical characteristics of *Mycobacterium smegmatis* using various microbiological techniques. Bacterial growth was initially assessed using two different media: TSB and Middlebrook 7H9 Broth. Growth was observed in the TSB medium,

with a slight presence in the Middlebrook 7H9 Broth tube. Over a period of five days, bacterial growth was further monitored using TSA plates, and bacterial concentration was measured via spectrophotometry. On Day 1, the spectrophotometric readings for the TSB medium were 0.018, 95.9%, and C 0.018 for absorption, transmission, and concentration, respectively. On Day 5, the readings were 0.361, 42.7%, and 0.361 absorption, transmission, and concentration, respectively. These results, along with observations from TSA plates, TSB, and Middlebrook 7H9 Broth, indicate that *M. smegmatis* growth significantly increases over time to perform antibiotic testing. Additionally, the acid-fast staining technique was performed to examine the *M. smegmatis*, which has a waxy layer outside the cell wall. Furthermore, antibiotic resistance testing was conducted on Mueller-Hinton agar plates, assessing the efficacy of several antibiotics: Polymyxin, Ticarcillin, Streptomycin, Ampicillin, and Chloramphenicol. The inhibition zones were measured, and the results, listed in order of decreasing resistance, were as follows: Ticarcillin (2.7 cm), Ampicillin (2.4 cm), Chloramphenicol (2.3 cm), Streptomycin (2.0 cm), and Polymyxin (1.1 cm). The combination of these microbiological techniques provides valuable insights into the characteristics of *M. smegmatis* to understand pathogens in the same genus.

Keywords: *Mycobacterium smegmatis*, Spectrophotometer readings, antibiotic testing

Seasonal Patterns of Diversity and Richness of Carnivores in Greenridge State Forest (Poster: Table 16)

Presenting Students: Allison Kitchel, George Watson
Faculty Mentor: Dr. Thomas Serfass

This poster will show the seasonal trends in diversity and richness of carnivore species in Greenridge State Forest over the course of one year. There are 12 carnivore species extant in Maryland, but for the consideration of this study we did not include the Northern Raccoon (*Procyon lotor*) in our list. Instead, we considered the Virginia Opossum (*Didelphis virginiana*) a carnivore because they fulfill a similar niche in the area. Both of us assisted Dr. Serfass in the monitoring of nineteen camera traps that were placed in Greenridge State Forest prior to this study. Over the course of the spring semester, we have gone to Greenridge State Forest every few weeks and collected the SD cards from the cameras before replacing both the cards and bait. The SD cards were cleaned and downloaded on a laptop. Using the laptop, we moved through the pictures, separating the mammals from the uncleaned pictures, then going through them a second time and separating the carnivores from the mammal pictures. To compile the data and compare the frequency of species occurrence based on season, we plan on using the program Timelapse. This will help us in separating the finalized pictures by species. We will then calculate the species richness and diversity within each season and compare them.

Species Identification of Rabbits through Variations in Mitochondrial DNA (Poster: Table 16)

Presenting Students: Reagan Mangum, Nathaniel Poulin
Faculty Mentor: Dr. William Seddon

Two species of cottontail rabbits, the eastern cottontail (*Sylvilagus floridanus*), and the Appalachian Cottontail (*Sylvilagus obscurus*) call Western Maryland home. Distinction between these two species can only be made through morphological measurements on deceased individuals or complex DNA analysis, neither of which are practical when applied to wild populations. Using DNA extracted from tissue of roadkill rabbits obtained by Maryland DNR, we are evaluating the use of a noninvasive PCR method of species evaluation. The method employs a set of primers (designated RabCytB F, Cyt B-R-210-NEC, and Cyt B-R-EC) that amplify sequences of mitochondrial DNA. These have been used previously to distinguish between the two species using DNA extracted from scat. PCR products will be analyzed using gel electrophoresis and a species determination will be made based on the results obtained. This data will be compared to species identifications determined independently by morphological examination of suture patterns in skulls of the roadkill rabbits. The goal of this research is to optimize the PCR protocol and determine its effectiveness in identifying the rabbit species of interest.

Sustainable Practices: Using Eco-Friendly Natural Predators of Cattle Flies at Leaning Pines Farm (Poster: Table 11)

Presenting Students: Elijah John, Allison Kitchel
Faculty Mentor: Dr. Kate Sheehan

Agricultural practices are a method to supply the population with consistent and cost-effective food resources; however, the animals that we farm are not free of pathogens and diseases. Preventative measures to reduce disease include pesticides and parasitic preventatives; however, the use of pesticides in commercial farming introduces trace amounts of potentially harmful chemicals to the food we consume. For example, most agents used to control fly populations and parasitic infections are mixed with diesel or kerosene fuels for application. One local cattle farm, Leaning Pines, has adopted an eco-friendly alternative to chemical-based pesticides by practicing an intensive rapid rotation method where they move cattle across their pastures on a highly frequent schedule. Additionally, they have agreed to introduce natural predators of cattle flies to the farm: insectivorous birds. Here, we have built, painted, and installed 42 bird boxes at two densities onto the Leaning Pines property and will be monitoring their establishment and use by birds over the next several months. We will be surveying the boxes weekly and updating a website with their activity on an outward-facing information platform for community members to monitor. Endpoints that we will be measuring over the next several years include insect community metrics, soil organic content, vegetation diversity within the pastures, and plastic debris inclusion within bird nesting materials. We expect to expand this project over the next 4 years until there are a total of 200 nest boxes on the Leaning Pines farm with a range of densities.

Tick Surveillance and Public Health Implications in the Western Maryland Region (Poster: Table 16)

Presenting Students: Grace Sarver, Olivia Looker
Faculty Mentor: Dr. Rebekah Taylor

In an effort to assess the prevalence of the pathogens that cause Lyme disease and Anaplasmosis in the western MD/PA/WV region, a total of 523 black-legged deer ticks (*Ixodes scapularis*) were donated from private citizens. The ticks were identified and their genomic DNA extracted. Polymerase chain reaction (PCR) was used to amplify the ospA gene, a marker exclusively present in *Borrelia burgdorferi,* the causative agent for Lyme disease. Additionally, the GE 16S rRNA gene was amplified and used to facilitate the identification of ticks carrying *Anaplasma phagocytophilum.* PCR results were visualized by gel electrophoresis. Results of tick testing were analyzed and then sent to the public in the form of an anonymous survey. The survey aimed to communicate findings regarding the prevalence of tick-borne diseases, raise awareness, gather feedback concerning personal preventative measures, and explore the implications of the escalating tick population on public health and personal experiences. Here, we share the tick surveillance data that was collected and the public survey results.

CHEMISTRY AND PHYSICS DEPARTMENT

Analyzing Peptidase Activity of Commercial Gluten Digestive Aids (Poster: Table 12)

Presenting Student: Bailey Werner
Faculty Mentor: Dr. Holly Currie

Celiac disease is a chronic autoimmune disorder in which gluten consumption triggers an inflammatory response in the small intestine, leading to gastrointestinal symptoms and nutritional deficiencies. In children, it can cause growth stunting, mood disturbances, weakened bones, and failure to thrive. The only available treatment is a strict gluten-free diet, which is difficult to maintain due to hidden gluten sources and cross-contamination. Despite adherence, individuals may still unintentionally consume trace amounts of gluten daily, leading to ongoing symptoms and intestinal damage. Commercial gluten digestive aids claim to degrade gluten proteins and offer additional protection. However, their effectiveness remains uncertain, as they are hypothesized to perform similarly to papain, a well-studied proteolytic enzyme, and may not sufficiently break down gluten's most toxic fragments. The 33-mer peptide, a highly resistant gluten fragment, is particularly problematic because it remains intact in the digestive system and triggers strong immune responses in individuals with celiac disease. Identifying whether these supplements can effectively degrade this peptide is crucial in assessing their potential as a complementary strategy to a gluten-free diet. This study evaluated the peptidase activity of several commercial gluten digestive aids compared to papain to assess their efficacy. A bicinchoninic acid (BCA) assay was used to quantify protein degradation. Further experimentation will involve gel electrophoresis to detect the presence of the 33-mer peptide after digestion. Preliminary findings suggest that gluten digestive aids and papain exhibit similar effectiveness, raising concerns about their ability to degrade the 33-mer adequately. The results of this study will provide insight into whether these supplements can support gluten management in individuals with celiac disease or if more effective enzymatic solutions are needed.

Biomedical Application of MoS_2 Nanoparticles for Potential Use in Urea Absorption from Waste Dialysate (Poster: Table 12)

Presenting Student: Owen Sealy
Contributing Students: Ty Kashporenko, Nathaniel Lamb
Faculty Mentor: Dr. Fayan Meng

A wearable artificial kidney (WAK) is designed to provide continuous dynamic dialysis for uremia patients. The idea of a worn artificial kidney has been investigated by a multitude of independent researchers and research groups. However, commercial use is held up due to the low urea absorption capacity of materials used to absorb urea from waste dialysate. This research aims to investigate the urea absorbance capacity of MoS_2 and surface modified MoS_2 nanomaterials from aqueous urea solution and waste dialysate. MoS_2 nanomaterials hold many characteristics that increase their potential as a urea adsorbent, such as a layered hexagonal structure and easy access

to sulfur-binding sites that bond to urea's amino group. A series of experiments conducted by incubating MoS_2 with urea aqueous solution in a concentration (300 mg/L) comparable to the urea concentration of chronic kidney disease patients at 37 °C. One sample will be removed at ten-minute intervals and, while the rest are allowed to continue to react, this process is repeated for 60 minutes. The samples are then centrifuged to separate the urea solution from the MoS_2. Then, 5mL of the treated aqueous urea are extracted from the sample and stored for spectrophotometric analysis. The experiment results show that, over time, the absorption capacity of MoS_2 is 44.12 mg/g under 30 minutes incubation, which is higher than activated carbon's absorption of urea and comparable to many other materials. The modification of the surface of MoS_2 which could increase the absorption capacity is ongoing,

Keywords: Wearable artificial kidney; MoS_2; Surface modification; Adsorption; Dialysate, Urea

Carbon Nanotubes in Biomedical Application: Synthesis, Surface Functionalization and Use for Urea Absorption from the Waste Dialysate (Poster: Table 12)

Presenting Student: Ty Kashporenko
Contributing Students: Nathaniel Lamb, Owen Sealy
Faculty Mentor: Dr. Fayan Meng

The development of sorbent-based filtration systems for a wearable artificial kidney (WAK) is crucial, as it has the potential to save time and lives. Currently, dialysis filters are primarily available in hospitals, requiring patients to undergo treatment in a clinical setting. Some exceptions exist, as certain patients can afford overnight dialysis at home. However, a major challenge in creating a portable dialysis system is the efficient filtration of dialysate—the fluid that removes toxins, urea, and other waste products from the blood. Existing technology does not allow for sufficiently fast, cost-effective, and efficient filtration to enable continuous use in a wearable device. This research focuses on improving sorbent-based filtration to enhance dialysate regeneration, making a wearable artificial kidney a viable option for dialysis patients. This study investigates the interactions between urea and multi-walled carbon nanotubes (MWNTs) and their derivatives to determine whether MWNTs can efficiently absorb urea at a capacity suitable for use in a WAK. Due to their large surface area, MWNTs have the potential to enhance toxin removal from dialysate, improving filtration efficiency in portable dialysis systems. This experiment utilizes several key techniques, including centrifugation, spectrophotometry, standard curves, and chemical reactions, to analyze MWNT and urea interactions by measuring absorbance. 50 mg of MWNTs or their derivatives is added to a 15 mL centrifuge tube with 10 mL of a 0.3 g/L urea solution. The tubes are then placed in a precision shaking machine at 37°C and agitated at 15-minute intervals (sample 1: 15 min, sample 2: 30 min, sample 3: 45 min, etc.). After shaking, samples are centrifuged at 12,000 RPM for 10 minutes, separating the MWNTs from the supernatant. Next, 5 mL of the supernatant is mixed with 5 mL of 5 g/L methylaminobenzaldehyde solution and 2 mL of 2M sulfuric acid. This reaction produces a yellow-colored solution, which is analyzed using a spectrophotometer to measure absorbance. The absorbance values are compared to a standard curve to determine the remaining urea concentration. Preliminary results indicate that MWNTs and their tested derivatives, including those with NH_2 functional groups, do not absorb urea. The control group showed the same urea

concentration as samples 1–6, suggesting that MWNTs do not effectively remove urea. Even though MWNTs do not absorb urea, this finding is still valuable. By confirming these materials are ineffective for urea filtration, researchers can focus on more promising alternatives, saving time and resources. Understanding what does not work helps refine future approaches to developing an efficient WAK. Future studies can explore other nanomaterials, chemical modifications, or alternative filtration mechanisms. Additionally, this research highlights the importance of testing potential sorbents before large-scale development. By eliminating MWNTs as an option, this study contributes to improving portable dialysis technology.

Detecting Heavy Metals Using a Modified Carbon Paste Electrode (Poster: Table 13)

Presenting Student: Dakota Donaldson
Faculty Mentor: Jerald Simon

Detecting levels of heavy metals in soil samples has been an important task for environmental scientists and health officials due to serious complications that irregular quantities can inflict on the environment and human health. Heavy metals can pose a threat to ecosystems and agriculture while being immediately harmful or causing long-term health effects at high concentration levels in humans. Drinking water and seafood are especially susceptible if not closely monitored. Many methods have been created for detecting heavy metals, with electrochemical methods being recognized as a powerful tool for its cost efficiency and data reliability. In the chosen method, we use a carbon paste electrode modified by a bismuth film and an ionic liquid, n-octlypyridiunium hexafluorophosphate (OPFP). This electrode is aimed at simultaneously determining cadmium (Cd) and lead (Pb) ion concentrations, two of the most dangerous non-essential heavy metals. Using standard additions, a sample of tap water is analyzed for Pb content and the electrochemical method is compared with atomic absorption spectroscopy (AAS) to result in strong quantitative analytical characteristics for the modified carbon paste electrode.

Fe_3O_4 Nanoparticles in Biomedical Application: Synthesis, Surface Functionalization and Use for Urea Absorption from the Waste Dialysate (Poster: Table 12)

Presenting Student: Nathaniel Lamb
Contributing Students: Ty Kashporenko, Owen Sealy
Faculty Mentor: Dr. Fayan Meng

This study focuses on the development of sorbent-based filtration systems for wearable artificial kidneys (WAK) by investigating the potential of magnetite (Fe_3O_4) nanoparticles to efficiently absorb urea. This research aims to enhance dialysis portability by improving dialysate regeneration, making WAKs a more viable option for dialysis patients. Magnetite, known for its magnetic properties, stability, and ability to adsorb various substances like heavy metals, organic pollutants, and nutrients, will be tested for its capacity to absorb urea. The goal is to determine if magnetite can efficiently remove urea at levels suitable for use in WAKs, thereby improving filtration efficiency in

portable dialysis systems. In the experiment, magnetite will be added to a urea solution, with samples shaken at both 37°C and 25°C at 15-minute intervals. After incubating, the samples will be centrifuged at 12,000 RPM for 10 minutes to separate magnetite from the supernatant. To analyze urea concentration, 5 mL of the supernatant will be mixed with 5 mL of a 5 g/L methylaminobenzaldehyde solution and 2 mL of 2M sulfuric acid solution. The absorbance of this solution will be measured using a spectrophotometer, and the urea concentration will be determined by comparing the absorbance to a standard curve. The results will provide insight into whether magnetite can effectively absorb urea, and the comparison between control and test samples will be compared to find its efficiency in urea removal.

GEOGRAPHY DEPARTMENT

Marie Tharp and Her Contributions to Geography (Oral Presentation: Room 113 at 1:00 p.m.)

Presenting Student: Rebecca Lee
Faculty Mentor: Ms. Tracy Edwards

Alfred Wegener's continental drift hypothesis was ridiculed for the many years it stayed shunned by the scientific community. It wasn't until Marie Tharp and Bruce Heezen worked together to propose and put together a mechanism that supported the hypothesis was it then accepted. Since she was born, Tharp was surrounded by geography. She received 4 degrees across 3 universities and became the first woman to work at the Earth Observatory in Columbia University. Throughout her career Marie Tharp faced many obstacles due to the fact she was a woman in a field dominated by men. Tharp's research was scrutinized, stolen, and erased. Despite this, Marie Tharp continued to map the entirety of the ocean floor. From this she then discovered a 40,000-mile-long ridge that supported the concept of seafloor spreading. Through Marie Tharp's diligent research in mapping the ocean floor, we came to better understand the world that surrounds us and the history behind it. Without this concept, the fundamentals of geology may not have been laid.

NURSING DEPARTMENT

Overuse and Misuse of Over-the-Counter Medications (Poster: Table 9)

Presenting Student: Sidnee Stewart
Faculty Mentor: Jaime Striplin, MSN, RN

Over-the-counter (OTC) medications are an excellent option for consumers when it comes to availability, perceived safety, and self-management of health. Although they seem harmless, there is still a potential risk for physical, psychological, social, and economic disturbances. Individuals who misuse or abuse these medications are at a higher risk of experiencing adverse effects. The misuse of an OTC drug means using these products for their designed purpose in larger doses and for longer durations than recommended. Abuse occurs when products are used for purposes other than their approved medical intentions. Individuals of any age group and from every demographic background, regardless of their socioeconomic status, racial identity, or gender, can misuse or abuse OTC drugs. Although the products varied across select individuals, five primary categories of OTC medications were identified in this literary review: codeine-based analgesics, cough suppressants containing dextromethorphan, sedative antihistamines, decongestants, and laxatives. All OTC products can potentially be misused but certain products showed higher rates of recreational misuse and abuse. Many times, especially in older adult populations, OTC medications can be misused unintentionally due to the fine print labels and the health literacy level of the consumer. This may lead to the overuse of medications and drug-drug interactions. To decrease misuse and abuse rates, strategies should focus on supply restrictions, enhanced public awareness efforts, the initiation of support groups, and encouraging healthcare providers to educate patients about these products. The misuse of over-the-counter medications needs more quantitative research along with intervention evaluations to establish effective regulatory measures.

SOCIAL WORK DEPARTMENT

Intergenerational Housing: Bridging Generations for Inclusive Campus Living (Poster: Table 13; Oral Presentation: Room 111 at 12:30 p.m.)

Presenting Student: Amya James
Faculty Mentor: Dr. Nancy Giunta

The rising challenges of housing insecurity, social isolation, and community integration affect both college students and older adults, particularly those within the LGBTQ+ community. This research explores the development of an intergenerational housing model on campus, fostering a shared living environment between university students and older adults. By providing a space where different generations can coexist, our project aims to address key social issues such as loneliness, financial hardship, and a lack of intergenerational understanding. Our research incorporates interviews, surveys, and case studies of existing intergenerational housing programs to analyze the benefits and challenges of implementation. We also examine how university policies, funding structures, and community partnerships can support such an initiative. By integrating intergenerational living into the campus community, this project proposes a sustainable and inclusive approach to housing that enhances well-being, fosters meaningful connections, and promotes lifelong learning across generations.

Liberation in Action: The Brownsville Volunteer Collective (Poster: Table 13; Oral Presentation: Room 111 at 1:00 p.m.)

Presenting Student: Tiara Halder
Contributing Students: Hailie Toro, Madison Gregory
Faculty Mentor: Dr. Nancy Giunta

Liberation in Action: The Brownsville Volunteer Collective is an initiative developed through The Brownsville Project, a grassroots organization committed to accountability and reparations for the Brownsville Community. The Brownsville Community, a historically African-American community in Frostburg, Maryland, was systematically erased over the course of a century to make way for Frostburg State University's upper quad. Through storytelling, live performances, and community facilitation, The Brownsville Project seeks to educate, build community wellness, and healing. As the Volunteer Program Coordinator, I am developing a liberatory volunteer program that recruits both students and local community members. Our program is designed to build solidarity across intersectional identities, fostering relationships rooted in collective care and shared responsibility. A critical aspect of my role involves designing trainings for volunteers, with the ideal structure consisting of 12 sessions. These sessions serve as an entry point into developing critical consciousness and equip participants with the tools to assess power dynamics in everyday interactions, institutions, and systemic structures. Our approach incorporates a variety of frameworks, including caucusing and mutual aid, as well as analytical models such as the continuum of violence; hierarchy of power, privilege and oppression; and the matrix of domination. We employ

socio-political education methods, presenting scenarios from films, videos, or lived experiences to critically examine how race, sex, gender identity, age, citizenship status, disability, accessibility, class, sexual orientation, and physical presentation shape societal outcomes. By cross-analyzing the experiences of individuals across identity spectrums, we foster deeper conversations on systemic inequities and pathways toward change. Grounded in the principles of transformative justice, our program seeks to empower those with the least institutional power in our community. Rather than replicating traditional hierarchical structures that uphold patriarchy and white supremacy, we operate as a collective-based initiative. This ensures that decision-making and leadership are distributed equitably, centering the voices of those most impacted by systemic injustice. Through this work, we aim not only to unearth and acknowledge histories of racial erasure but also to forge new, justice-oriented systems that honor and uplift historically marginalized communities. This project serves as a model for how grassroots organizing, historical accountability, and abolitionist praxis can intersect to create sustainable, community-driven change.

FSU Undergraduate Research Symposium Committee

Karen Keller, Biology (Chair)
Phillip Allen, Geography
Hayley Baer, Chemistry and Physics
Matthew Crawford, Chemistry and Physics
Erica Kennedy, Psychology
Marc Michael, Mathematics
Eric Moore, Chemistry and Physics
Benjamin Norris, Chemistry and Physics
William Seddon, Biology
Kate Sheehan, Biology
Rebekah Taylor, Biology
Keith Terry, Assistant Dean of the College of AHSBS
Clara Thiel, Biology
Gregory Wood, History

Lawrence Weill, Interim Provost
(Opening Remarks)

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Frostburg State University
Undergraduate Research Symposium 2025

Poster Presentations

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Biology	*1, 6, 11, 16*
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Philosophy	*9*
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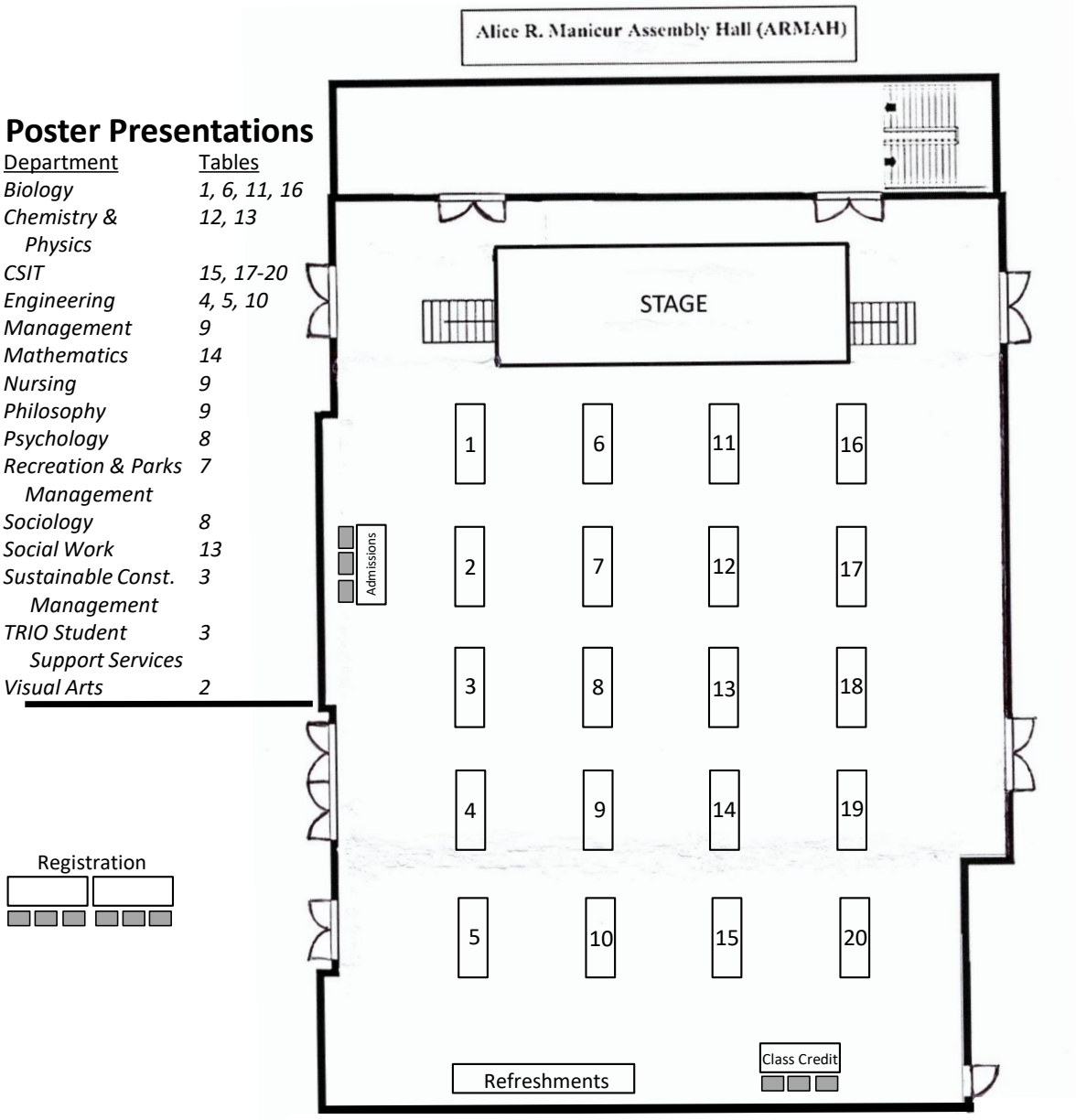
Recreation & Parks Management	*7*
Sociology	*8*
Social Work	*13*
Sustainable Const. Management	*3*
TRIO Student Support Services	*3*
Visual Arts	*2*



Oral Presentations are in Rooms 108, 111, and 113

LANE CENTER ROOM 108	
Time	**Oral Presentation and Presenters**
11:30-12:00	**Intersectional Oppression-Based stress, Anxiety and Depression among Multiracial LGBTQ+ Adolescents and the Moderating Role of Family Relationships** *Cayleah Anders*
12:00-12:30	**Me Canso De Ser Hombre: Latino Men and Machismo on Social Media** *Emily Guardado-Toledo*
12:30-1:00	**Advances in Human Resource Management: Employee Monitoring** *Stella Beernink*

LANE CENTER ROOM 111	
Time	**Oral Presentation and Presenters**
11:30-12:00	**In Service of Men: Women's Role's In Homer's Epics** *Stella Beernink*
12:00-12:30	**Capitalism and Patriarchy: The Hidden Curriculum in Women's Artistic Gymnastics** *Callie Miller*
12:30-1:00	**Intergenerational Housing: Bridging Generations for Inclusive Campus Living** *Amya James*
1:00-1:30	**Liberation in Action: The Brownsville Volunteer Collective** *Tiara Halder*

LANE CENTER ROOM 113	
Time	**Oral Presentation and Presenters**
11:30-12:00	**How the Influence of Peer Pressure and the Desire to Feel Valued Negatively Affects Teenagers' Self-Identity** *Megan Gray*
12:00-12:30	**How Nurture Affects Behaviors in Young Adults** *Brian Mejia-Ramos*
12:30-1:00	**Digitization and Collection Trends of the Frostburg State University Herbarium** *Lily Ridgell*
1:00-1:30	**Marie Tharp and Her Contributions to Geography** *Rebecca Lee*