15th Annual Landmark Conference
Summer Research Symposium

July 18, 2024

Juniata College
PENNSYLVANIA
1876

15th Annual Landmark Conference
Summer Research Symposium

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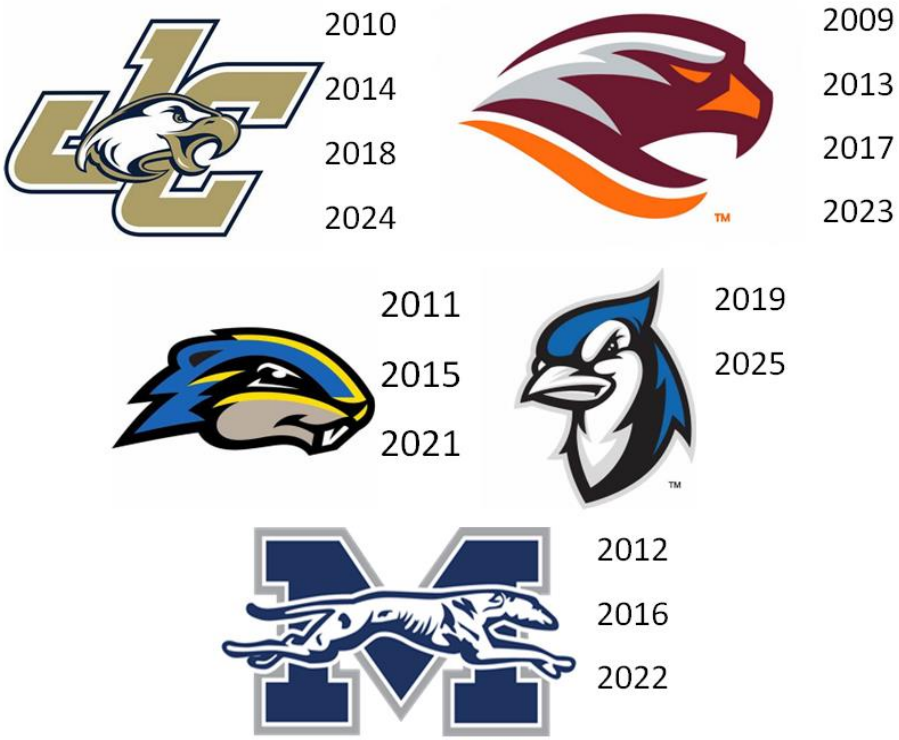
The Landmark Summer Research Symposium brings together undergraduate researchers from the Landmark Conference schools, providing an opportunity for students to showcase the results of their faculty/student collaborative research in poster and oral presentation session.

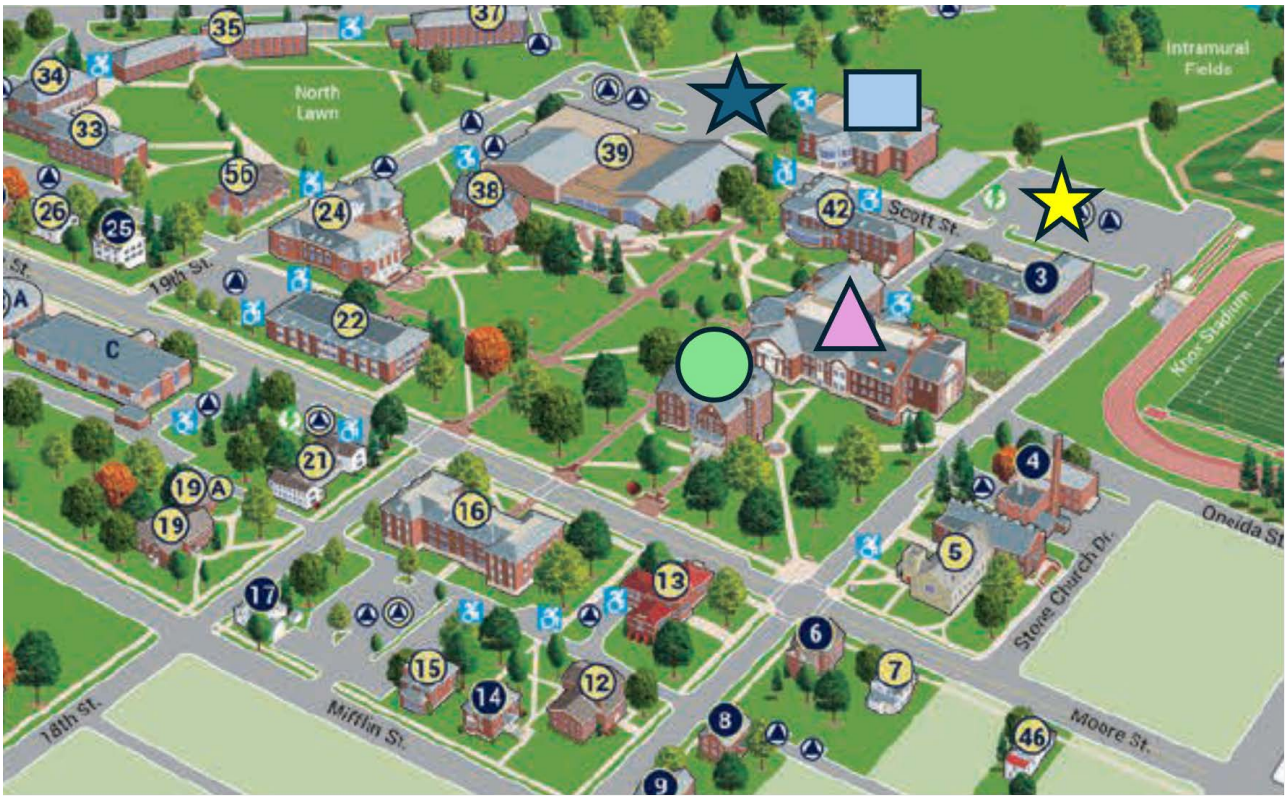
Landmark Conference Schools

The Catholic University of America
The University of Scranton
Elizabethtown College
Goucher College
Lycoming College
Juniata College
Moravian University
Susquehanna University
Drew University
Wilkes University

Landmark Summer Research Symposium History



Campus Map and Parking



Charter Bus Parking

General Parking

Ellis Hall

von Liebig Center for Science

Founders Hall

2024 Schedule

Time	Events	Location
11:30 AM – 12:30 PM	Lunch and Registration	Baker Refectory, Ellis Hall
12:45 PM – 12:55 PM	Welcome & Opening Remarks	Neff Lecture Hall VLCS
1:00 PM – 4:00 PM	Oral Session #0: Demo	Kiln Behind BAC
Oral Sessions		
1:00 PM – 2:00 PM	Oral Session #1	Room 406 Founders Hall
	Oral Session #2	Room 309 Founders Hall
	Oral Session #3	Room 420 Founders Hall
2:30 PM – 3:30 PM	Oral Session #4	Room 406 Founders Hall
	Oral Session #5	Room 309 Founders Hall
	Oral Session #6	Room 420 Founders Hall
Poster Sessions		
1:00 PM – 2:30 PM	Poster Session #1 1:00 PM- 1:30 PM: Odd Numbers 1:30 PM- 2:00 PM: Even Numbers 2:00 PM- 2:30 PM: Open	Sill Boardroom William J von Liebig Center for Science
2:30 PM – 4:00 PM	Poster Session #2 2:30 PM- 3:00 PM: Odd Numbers 3:00 PM- 3:30 PM: Even Numbers 3:30 PM- 4:00 PM: Open	Sill Boardroom William J von Liebig Center for Science
Prior to Departure		
4:00 PM – 5:00 PM	Light Refreshments	Lobby, von Liebig Center for Science

Presentations

All presentations will take place in the Statton Learning Commons.

Oral presentations should be no more than 12 minutes in length with 3 minutes allowed for questions. All presentation rooms will be equipped with appropriate audio/visual equipment. Please send your presentations prior to the symposium to Jill Keeney at keeney@juniata.edu. Alternatively, have your presentation on a drive (google, drop box, etc.) that you can access at registration so that all presentations are uploaded to Juniata's network prior to the start of the symposium.

Poster sessions will take place at the lower level of the Statton Learning Commons. Posters should be no larger than 40" x 30".

Special Thanks to:

Organization-Tracy White and Lorri Panaia

Web site-Isaac Baker

Parkhurst Food Service-Andy Liggett, Maranda Ashman

Landmark Conference-Sarah Twiggs, Assistant Commissioner

Presentation scheduling and program design-Kelliann Drummond, Sarah Halteman, Prev Ramakrishnan, Lex Viands

Campus Security

Sponsored by the Juniata College Provost's Office

List of Presentations

Oral Presentations:

Demonstration: 1:00-4:00 PM, Kiln behind BAC

O0-0: Reduction Cooling in Wood Fired Ceramics
Presenters: Natalie DuMars, Sam Betar and Emily Haritos Juniata College

Oral Session 1: 1:00-2:00 PM, Room 406 Founders Hall

O1-01: Elizabethtown College 125th Anniversary National Historic Preservation Trust This Place Matters Campaign & Campus Historic Building Survey Based on the National Parks Service Historic American Building Survey

Presenters: Ava Barton and Shawn Gipe Elizabethtown College

O1-02: Digitizing Humanities Through Oral History

Presenter: Cayden Tester Juniata College

O1-03: Policymaking Capacity in the United States Congress 1978-2023

Presenter: Patrick Snyder Elizabethtown College

O1-04: The Letter Versus the Spirit of the Law Post-Apartheid: Building an Interactive DH Website on Truth and Reconciliation in South Africa

Presenter: Kaden Josiah Wagner Elizabethtown College

Oral Session 2: 1:00-2:00 PM, Room 309 Founders Hall

O2-01: A yeast gene of unknown function may play a role in the regulation of cell wall maintenance and cell division.

Presenter: Prevena Ramakrishnan Juniata College

O2-02: The Impact of Pistachio Consumption on the Gut Microbiome and Glycemic Control in Individuals with Pre-Diabetes.

Presenter: Khushi Kanani Juniata College

O2-03: Impact of Dietary Polyphenols on Gut Microbial Composition and Function: A Metagenomic Analysis Stratified by BMI

Presenters: Linh Tong, Kavya Chheda, and Donovan McCammon Juniata College

O2-04: Modeling microbial metabolites: Integrating multi-omics data to analyze the role of Candida glabrata in the C. difficile infection

Presenters: Mohini Khedekar and Blake Cassel Juniata College

Oral Session 3: 1:00-2:00 PM, Room 420 Founders Hall

O3-01: "Are there any Public Comment?": The Controversy Surrounding the Old Crow Wetland

Presenter: Kaelonni Rae Lashinsky Juniata College

O3-02: Behind the Pulpit: Lived Experiences of Women Ministers in the Church of the Brethren

Presenter: Hannah Noel Smith Elizabethtown College

O3-03: Applying a social work lens to understand transportation barriers and solutions in a rural college community: A mixed-methods, grounded theory approach

Presenter: Ben Allen Juniata College

O3-04: Praying On the Police

Presenter: Emma Greggo Juniata College

Oral Session 4: 2:30-3:30 PM, Room 406 Founders Hall

O4-01: Eastern Mediterranean Balance of Power: Projections on the Future of Transatlantic Alliance

Presenters: Gabriel Karl and Jordyn Dutko Elizabethtown College

O4-02: Contemporary Travel Writing: Documenting British Culture Through Creative Expression Presenter: Kaitlyn Gilmore Elizabethtown College

O4-03: Personality and Characteristics of K-pop and Taylor Swift Fans

Presenter: Kathryn Mackey Elizabethtown College

O4-04: Attitudes and Access: How These Variable Affect Emerging Adults Mental Health Treatment

Presenter: Sara Colletti Elizabethtown College

Oral Session 5: 2:30-3:30 PM, Room 309 Founders Hall

O5-01: Militarization and Drug Enforcement: How Law Enforcement Agencies Justify Obtaining 1033 Program Items in the War on Drugs

Presenter: Daniela Scipioni Juniata College

O5-02: Evaluating General Chemistry Laboratory Skills through Evidence-Based Assessments

Presenter: Nicolette Guido Moravian University

O5-03: A Student's Perspective: Utilizing the Herbaceous Plant Species Self-heal as a Guide to Exploring the Natural World

Presenter: Lily L'Oiseau Goucher College

O5-04: Glial-specific GBA Expression in Drosophila: Unraveling its Role in Sleep and Protein Aggregation in a Parkinson's Disease Model

Presenter: Stephen Kataria Juniata College

Oral Session 6: 2:30-3:30 PM, Room 420 Founders Hall

O6-01: Nanoscience of 2D Materials: Preserving and Tuning their Electronic Properties

Presenter: Zachary W Henshaw Juniata College

O6-02: Fabricating Superconductive Circuits

Presenters: Sophia Reister and Eddie Desarro Goucher College

O6-03: The Belousov-Zhabotinsky Reaction: Wave Behavior and Bromide Concentration

Presenter: Neil Singer Divins Elizabethtown College

O6-04: Augmented Reality Tool for Engineering Analysis Presenter: Leif Erik Hoffman Elizabethtown College

Poster Presentations:

Poster Session 1: 1:00-2:30 PM, Sill Boardroom, von Liebig Center for Science

1:00 PM- 1:30 PM: Odd Numbers; 1:30 PM- 2:00 PM: Even Numbers; 2:00 PM- 2:30 PM: Open

P1-01: Feasibility Study: Elizabethtown College Going 100% Solar
Presenter: Emmanuel Attah — Elizabethtown College

P1-02: Heavy Metals, Heavy Breathing: The Effects of Cadmium Chloride on Protein Kinase Signaling in Lung Cells
Presenters: Lauren Berger and Emma Caszatt — Elizabethtown College

P1-03: Developing a Standardized Data Quality Index
Presenters: Lillian Bassett and Nahida Sultana Mim — Goucher College

P1-04: Bioinformatics Meets Benchtop: Determining Function of Proteins with Known Structure
Presenter: Sam Langer — Elizabethtown College

P1-05: A Comparison of CME and CIR Geomagnetic Storms Using ENA Measurements
Presenter: Andrew Younes — Moravian University

P1-06: The Impact of Polyethylene Microplastics on Perfluoroalkyl Carboxylic Acids Adsorption in Soil: Insights from Liquid Chromatography Mass Spectrometry
Presenter: Mariam Abdelrady — Goucher College

P1-07: Effect of Muscle Cell Specific Glucocerebrosidase Expression on Protein Aggregation and Sleep Regulation in Drosophila melanogaster
Presenter: Regan L Farringer — Juniata College

P1-08: Pathogen Prevalence and Diversification: Analysis of Huntingdon County Ticks Through the One Health Tick Initiative
Presenters: Kelliann Drummond, Sarah Halteman, and Alexa Viands; Juniata College

P1-09: Effect of Sulfuric Acid Concentration on Pattern Formation in BZ Chemical Reaction Systems
Presenter: Samantha Small — Elizabethtown College

P1-10: Synthesis of Furan-Based Terarylene for Photochromic Drug Delivery
Presenter: Alyssa Howell — Goucher College

P1-11: The biomechanics of an optimal sprint start
Presenter: Melissa Patton — Elizabethtown College

P1-12: Histone H2A Repression Domain Regulates Cell Cycle in the yeast Saccharomyces cerevisiae
Presenter: Kiara Senuthi De Silva Susquehanna University

P1-13: How Do Brown Trout Impact Brook Trout Spawning Ability
Presenter: Ignas Draugelis Juniata College

P1-14: The Effects of Ambient Light at Night on Anole Energetics
Presenter: Kerrigan E. Wilson University of Scranton

P1-15: Synthesis of a PNA 6-amino-5-triazolylpyridin-2(1H)-one nucleobase to improve PNA-RNA-RNA binding affinity and selectivity through pi-pi stacking
Presenter: Isabell Anderson Elizabethtown College

P1-16: G-Protein Coupled Receptor F35H10 effects on C. elegans Pharyngeal Pumping
Presenter: Stephanie Del-Pozo Goucher College

P1-17: Evaluating Machine Learning Algorithms for the Prediction of Urban Heat Islands in Baltimore City
Presenters: Anna Kulikova, Sakib Hussen, Marcellus Mwangi, and Abdul Siam; Goucher College

P1-18: Synthesis of a Thiophene Monoxide for Controlled Photochromic Drug Delivery
Presenter: Zoe Wright-Riley Goucher College

P1-19: How Storage Temperature relates to protein unfolding and the methodology of capturing dentatured proteins
Presenters: Grace K. McDonald and Seraphina E. Stager University of Scranton

P1-20: Development of a glial cell-specific zFUCCI system in zebrafish (Danio rerio)
Presenter: Cas Sturdivant Goucher College

P1-21: Design and Construction of Lab-scale Waterwheel System: A Practical Approach to Engineering and Sustainability
Presenter: Qiwen Wu Juniata College

P1-22: The Effects of the GPCR F35H10 on C. elegans Locomotion Towards Food
Presenter: Emily Hess Goucher College

Poster Session 2: **2:30-4:00 PM, Sill Boardroom, von Liebig Center for Science**

2:30 PM- 3:00 PM: Odd Numbers; 3:00 PM- 3:30 PM: Even Numbers; 3:30 PM- 4:00 PM: Open

P2-23: Synthesis of an O-linked isoorotamide PNA extended nucleobase targeting uracil for recognition of double-helical RNA
Presenter: Max Marra Elizabethtown College

P2-24: DuckieLearn: Simplifying Robotics for All
Presenters: Breanne Spencer and Cassie Lease — Juniata College

P2-25: Enhancing quercetin bioavailability and absorption through chemical modification
Presenter: Trevor Bao — Goucher College

P2-26: Standard Curve Analysis for Quantification of PFAS in the Susquehanna River and the Conodoguinet Creek
Presenter: Rachael Filip — Juniata College

P2-27: Influence of Varying Bromate Concentrations on Wave Activity in the BZ Reaction
Presenter: Andrew Hoch — Elizabethtown College

P2-28: Some Controls on the Development of Legacy Islands in the Susquehanna River
Presenters: Alexander D. Kauffman and Abigail D. Rutledge — Susquehanna University

P2-29: The effect of regulating TGFβ signaling during retinal neuron regeneration in zebrafish (Danio rerio)
Presenters: Katherine West and Isobel Buffum-Robbins — Goucher College

P2-30: H2B repression domain regulates the cell cycle in the yeast Saccharomyces cerevisiae
Presenter: Laura Mace — Susquehanna University

P2-31: Variable Diapause in Response to Changing Climates
Presenter: Brayden Todd — Juniata College

P2-32: Synthesis and characterization of tetradentate ONN Schiff base complexes
Presenter: Ethan Roe — Susquehanna University

P2-33: Larval Fish Habitat Ecology
Presenter: Brett Russotto — Juniata College

P2-34: Synthesis of a photochromic thiophene-based terarylene
Presenter: Azhar Tanat — Goucher College

P2-35: Behavioral Changes of Convict Cichlid Parental Pairs During Offspring Development in Response to a Predator
Presenters: Mariah N. Dixon and Hailey G. Perez — Goucher College

P2-36: METTL3 is required for Germline Function During Drosophila Spermatogenesis
Presenters: Rohan Harris and Jazmyn Moodie — Susquehanna University

P2-37: Perfluorosulfonic Acids (PFSAs) and Polyethylene Microplastics: Interactions in Soil

Presenter: Gedalia Bloomenstiel Goucher College

P2-38: Investigating Skin Permeability through Molecular Dynamics
Presenter: Sandy Milby Juniata College

P2-39: Enhancing Worm Behavior Analysis through Software Optimization and Machine Learning Model
Presenter: Mahade Mishuk Goucher College

P2-40: Geophysical Techniques for Locating Buried Foundations at Gustavus Adolphus Hall at Susuquehanna University
Presenter: Seth Corcelius Susquehanna University

P2-41: Picky pests: A study of the relationship between genetics and herbivory
Presenter: Tanise Thorton-Fillyaw Goucher College

P2-43: Synthesis and Molecular Structure Analysis of Tetradentate ONNO Schiff Base Copper (II) Complexes
Presenter: Tysean Johnson Susquehanna University

P2-44: The NativePlantApp: A Tool for Driving the Supply and Demand of Native Plant Species to Encourage Sustainable Landscaping
Presenter: Gianna Leone Juniata College

P2-45: Neurodevelopmental Impacts of Organophosphates on Late-Stage Amphibian Larvae
Presenter: Santoshi Mutyala Moravian University

P2-46: Analyzing Anti-Predator Responses of Tadpoles after Chronic Exposure to Nanoplastics
Presenter: Emma K. Pollackov Moravian University

List of Abstracts

Oral Presentations:

O0-0: Reduction Cooling in Wood Fired Ceramics
During the symposium I will be conducting my research as I fire a wood kiln. Wood kilns are powered by burning wood and used to fire ceramics. At the end of the firing, cooling slowly while keeping the atmosphere in reduction causes varying colors, with rich reds and oranges in higher iron clays. This summer, I am testing three clay bodies and reduction cooling them to different temperatures and examining the impact these changes have on the surfaces of my work. I will be conducting my first firing of the summer with the help of two other ceramics summer research students, Sam Betar and Emily Haritos.
Authors: Natalie DuMars, Sam Betar, and Emily Haritos
Faculty Advisor: Rob Boryk **Juniata College**

O1-01: Elizabethtown College 125th Anniversary National Historic Preservation Trust This Place Matters Campaign & Campus Historic Building Survey Based on the National Parks Service Historic American Building Survey
This project is a collaboration between the Public Heritage Studies Program, Honors Program, and The Office of Marketing and Communications at Elizabethtown College working together supervising honors students launching a National Historic Preservation Trust "This Place Matters" campaign for the 125th Anniversary Celebrations of Elizabethtown College. This project is based on the 1934 Historic American Building Survey, authorized by Congress as part of the Historic Sites Act, conducted by the National Parks Service. The pedagogy for this project is based on the National Collegiate Honors Council's Signature Program "Place As Text."™ The students are creating an architectural building survey interpreting the architectural style of every building on campus, writing a biographical sketch about the architect of each building, explaining the use and purpose of each building: past, present, and future, and writing a short biography of the person for whom the building has been named. Student reports, for each building, will be linked (online) to an ArcGIS map plotting all the buildings on campus. Students are designing a poster for each building for display in its vestibule. Through social media platforms students will invite alumni and faculty emeritus to share their memories about the buildings and the people for whom they were named. Through this architectural and biographical study, with alumni memoir, the history of Elizabethtown College will be documented and shared with the public.
Authors: Ava Barton and Shawn Gipe
Faculty Advisor: Jean-Paul Benowitz **Elizabethtown College**

O1-02: Digitizing Humanities Through Oral History
Juniata College prides itself on local engagement; this National Endowment for the Humanities research intends to strengthen overall understanding of the local, rural experience through conducting oral histories and making them available for the community.

The first step is to create a digital humanities hub; this hub will house student projects and make them available for community members to access and explore. This hub is being carefully crafted to work as an ever-growing archive to support all local engagement projects in a diverse collection of media styles.

The second part of this research is creating teaching supports for students to learn how to conduct and publish their own oral history. Conducting an oral history is a cornerstone for students research within the new Rural Experience courses at Juniata. Oral Histories allow students, researchers and community members to better understand the experiences of the rural world around them.

Author: Cayden Tester
Faculty Advisor: Dr. Amanda Page **Juniata College**

O1-03: Policymaking Capacity in the United States Congress 1978-2023

In recent decades, Congress has developed a reputation of ineffectiveness, with partisan gridlock characterizing its reputation more so than innovative policymaking. While there are no doubt many causes that may contribute to congressional dysfunction, one often overlooked is the capacity of congressional staffers. Staffers do much of the behind the scenes work on legislation, yet their path towards policy expertise is hampered by relatively small numbers, politically motivated turnover, and high burnout rates. This research examines congressional staffers and their turnover rates. How have turnover rates and staff experience changed over time? What could this say about staffer capacity and expertise? Could staffer experience correlate with congressional effectiveness? This project digitizes congressional telephone directories from 1978 to the present, creating a comprehensive dataset of congressional staffers across almost a half-century. The dataset will provide insight into congressional staffing changes over time and whether staffing changes contribute to congressional dysfunction.

Author: Patrick Snyder
Faculty Advisor: Nathan Gibson **Elizabethtown College**

O1-04: The Letter Versus the Spirit of the Law Post-Apartheid: Building an Interactive DH Website on Truth and Reconciliation in South Africa

The project is concerning the Truth and Reconciliation Committee's (TRC) completed report of the events of apartheid and recommendations to South Africa and the world to prohibit such atrocities from recurring. Specifically, the project seeks to gather scholars to annotate the TRC's documents and thereby to make them more interactive.

The presentation itself will include two separate but related parts. The first will be a simple and quick summary of what apartheid was followed by a guide through the website, its functions, and its goals. The second will be an intertwining between the goal of transparency and increased recognition of the events and effects of apartheid in South Africa, both in the past and today, which will be illustrated by the presenter's recent trip to South Africa. This trip included visits to key sites and museums, as well as attendance of the South African Historical Society's related conference at the University of Johannesburg.

In conclusion, the presenter will elaborate on the educational value of his findings, along with a newly developed glimpse of the cultural and historical position of South Africa.

Author: Kaden Josiah Wagner
Faculty Advisor: Dr. Patrick Allen **Elizabethtown College**

O2-01: A yeast gene of unknown function may play a role in the regulation of cell wall maintenance and cell division.

Saccharomyces cerevisiae, known as Baker's yeast, is an intensely studied model eukaryotic organism. Much of what we know today about eukaryotic cells and their functions is due to studying yeasts. However, after years of research, nearly 10% of yeast genes are still of unknown function. This study focuses on YKR004C, a verified gene of unknown function that is predicted to be involved in cell division and cell wall maintenance or composition based on previous high-throughput studies. To potentially gain insights into its cellular function, we investigated the sensitivity of a YKR004C deletion strain, as compared to wild type, to chemicals that impact cell wall integrity or induce stress. These results suggest that YKR004C is involved in the cell wall composition and/or maintenance as well as the regulatory pathway that determines when a cell is ready to divide.

Author: Prevena Ramakrishnan
Faculty Advisor: Dr. Jill Keeney **Juniata College**

O2-02: The Impact of Pistachio Consumption on the Gut Microbiome and Glycemic Control in Individuals with Pre-Diabetes

According to the Centers for Disease Control and Prevention (CDC) approximately 98 million American adults—more than 1 in 3—have prediabetes. Of those with prediabetes, more than 80% don't know they have it. Individuals with pre-diabetes face an elevated risk of developing type 2 diabetes and cardiovascular disease. While previous research has suggested the potential benefits of pistachios on glycemic control, the underlying mechanisms, particularly related to the gut microbiome, are poorly understood. Through a randomized crossover trial, this study investigates the impact of pistachio consumption on the gut microbiome and glycemic control in individuals with pre-diabetes. The primary objective is to elucidate specific changes in the gut microbiome induced by pistachio consumption and explore potential associations between the gut microbiome and markers of glycemic control. The study employs DNA sequencing of the 16S rRNA gene to analyze human fecal samples before and after a 12-week pistachio diet (n=51 individuals). Linear mixed models examined between-condition differences in community richness (α-diversity), community dissimilarity (β-diversity), and bacterial abundance. The results demonstrate that nightly pistachio intake, compared to a carbohydrate-rich snack, enriched butyrate-producing bacteria, such as Roseburia and Hydrogenoanaerobacterium, while reducing the abundance of potentially pathogenic consortia including Porphyramonas asaccharolytica, Eubacterium, Ruminococcus, and Peptococcaceae. These findings provide valuable insights into the intricate relationship between pistachio consumption, gut microbiota, and cardiometabolic health in individuals with pre-diabetes. Further research is warranted to deepen our understanding of how these microbial changes influence specific cardiometabolic markers. The knowledge gained from this study could pave the way for personalized dietary interventions aimed at mitigating the progression of type 2 diabetes and reducing cardiovascular risk in individuals with pre-diabetes.

Authors: Khushi Kanani, Justin Wright, Terrence Riley, Dr. Kristina Petersen, and Dr. Penny Kris-Etherton
Faculty Advisor: Dr. Regina Lamendella **Juniata College**

O2-03: Impact of Dietary Polyphenols on Gut Microbial Composition and Function: A Metagenomic Analysis Stratified by BMI

Research suggests that natural polyphenols present in tea, grapes, and berries may decrease the chances of developing illnesses such as diabetes mellitus, cardiovascular diseases, and cancer. Dietary polyphenols present prebiotic properties and exert antimicrobial activities against pathogenic microbes in the gut. Recent research has shown that polyphenols can influence insulin signalling and glucose metabolism, resulting in lower risks of diabetes sequelae. Essentially, insulin resistance and weight gain, which can lead to diabetes, can occur when the gut microbial populations are imbalanced. This study will investigate the impact of dietary polyphenols on the gut's microbial composition and its function using shotgun metagenomics to provide a better understanding of the long-term effects of a high polyphenol diet in people. Fecal specimens from 27 participant samples were collected and provided by the United States Department of Agriculture (USDA). These samples were collected at three time points: baseline, four weeks, and eight weeks into controlled diets, high in polyphenols, were administered. Data about participants' age, gender, and BMI were also collected. DNA was extracted from all fecal specimens and was subject to metagenomic DNA library preparation and high throughput sequencing. Sequences were annotated for microbial taxa and functional genes present. We then compared microbial taxa and gene abundance differences throughout the study and stratified by high and low BMI groups. Results showed enrichments in Akkermansia muciniphila, Lachnospiraceae, Roseburia, and Verrucomicrobia bacterial species associated with polyphenol metabolism from high and low BMI groups. Enrichment in beneficial bacterial species such as Eubacteriaceae, Clostridiaceae, and Ruminococcus were found in the high BMI group, while a decrease in pathogenic species Negativicutes was detected in the low BMI group and Corynebacteriales in the high BMI group. Both BMI groups displayed abundant functional genes, K0159 [KDO 8-P synthase], K01610 [phosphoenolpyruvate carboxykinase, and K00764 [Purine metabolism, Alanine, aspartate, and glutamate metabolism] related to insulin resistance and obesity. Polyphenol-rich diets seem to induce profound alterations in gut microbiota composition and function, suggesting a viable dietary intervention that mitigates the symptoms of chronic diseases.

Authors: Linh Tong, Kavya Chheda, Donovan McCammon, and Justin Wright
Faculty Advisor: Regina Lamendella **Juniata College**

O2-04: Modeling microbial metabolites: Integrating multi-omics data to analyze the role of Candida glabrata in the C. difficile infection

Clostridioides difficile infection (CDI) is the most common hospital-acquired disease, traditionally studied for its bacterial etiology. However, this study investigates the newly discovered impact of fungi on CDI, focusing on the potential trans-kingdom interaction between Clostridioides difficile and Candida glabrata. We employed CoCo-GEM, a novel tool designed to construct genome-scale metabolic models, and integrated it with data at both metagenomic and metatranscriptomic levels. By analyzing the metabolic interactions between C. difficile and

C. glabrata, CoCo-GEM provides a comprehensive understanding of the underlying mechanisms driving their co-occurrence. Preliminary results indicate a complex network of metabolic dependencies and interactions, offering new insights into the gut microbial ecology and potential fungal therapeutic targets for mitigating CDI severity. These metabolites and interactions will later be applied to ordinary differential equations models to further understand the interaction between C. difficile and C. glabrata. This study underscores the importance of investigating trans-kingdom interactions within the gut microbiome to develop more effective treatments and alternatives to antibiotics for CDI.

Authors: Mohini Khedekar, Blake Cassel, Justin Wright and Jeremy Chen See
Faculty Advisor: Dr. Regina Lamendella **Juniata College**

O3-01: "Are there any Public Comment?": The Controversy Surrounding the Old Crow Wetland

For the community of Smithfield, located in Huntingdon County, PA, the space at the Old Crow Wetland has become a highly contentious issue within the past few years. With proposed plans to build a Rutters gas station on a site adjacent to the wetlands, a diverse group of individuals who are both for and against this proposal have emerged. In recent months, I have conducted research about land use and civic engagement. I have also interviewed people at the core of the controversy to learn more about why people react the way they do, and how they get informed within their communities. Literature about land use has been brought into this study to illuminate the controversy. I have also gone to the wetland just to put the proposal into perspective. All of this shows how civic engagement has brought the space of the wetland into a significant conversation. Throughout my research, I have seen how many outside people and members of the Smithfield Township have stepped up to discuss the controversy while attracting others to the issue. This presentation argues that some land use issues transcend political borders and catalyze citizens from outside of municipal limits.

Author: Kaelonni Rae Lashinsky
Faculty Advisor: Dr. Robb Conrad Lauzon **Juniata College**

O3-02: Behind the Pulpit: Lived Experiences of Women Ministers in the Church of the Brethren

Though women have made inroads into occupations traditionally dominated by men, there are still some jobs where women represent a significant numerical minority. One example of this is religious ministry. In 2022, only 19.3 percent of members of clergy nationwide were women. Interestingly, female representation in ministry within the Church of the Brethren is higher than the national statistic at 32 percent. This may reflect the openness to women in ministry roles which began at the 1922 annual meeting. Despite considerable research on women in male-dominated occupations, less is known about the experiences of women in ministry. This research examines the lived experiences of Brethren women ministers. The data for this research were obtained using interviews with women who were, or currently are, ministers in the Church of the Brethren denomination. The project is ongoing and preliminary findings will be shared.

Author: Hannah Noel Smith
Faculty Advisor: Dr. Michele Lee Kozimor **Elizabethtown College**

O3-03: Applying a social work lens to understand transportation barriers and solutions in a rural college community: A mixed-methods, grounded theory approach

This exploratory study examined student transportation experiences at a small rural liberal arts college while identifying transportation barriers and challenges based on the built environment and sociodemographic factors. The researchers first used a mixed-methods survey design to identify key quantifiable characteristics of the student transportation experience. Most transportation-specific quantitative items were adapted from the Transportation Security Index (University of Michigan, n.d.) and the Perceived Accessibility Scale (Lättman et al., 2016, 2018). Sociodemographic subgroup analyses were conducted to identify any disparities in these metrics based on gender identity, transgender status, sexual orientation, disability, citizenship status, racial/ethnic identity, parent educational attainment, class year, and access to a private vehicle in the household/on campus. The findings of these analyses suggested significant disparities in both transportation insecurity and perceived accessibility between international and domestic students, with international students facing greater difficulty on average. Several qualitative items were also included in the survey, which assessed issues of perceived pedestrian safety and barriers to vehicle access. Common themes mentioned in responses included financial barriers and high cost of vehicle access, safety concerns related to walking off campus and/or at night, and a desire for access to rideshare and shuttle services. While the results of the mixed-methods survey provided valuable foundational insights into the transportation needs of the community, the design was limited in its lack of comprehensiveness and its largely micro-level area of inquiry. To account for these limitations, the research team then transitioned towards a qualitative, grounded theory approach, supplementarily examining the issue at the mezzo and macro-level. This methodology consisted of semi-structured interviews with key stakeholders from the institution and its surrounding community, and an iterative approach to data collection and analysis. This stage of the study is still ongoing as of July 18, 2024.

Keywords: Built environment, active transportation, transportation insecurity, college students, rural transportation

Author: Ben Allen

Faculty Advisors: Lee Ann Deshong-Cook and John Crum Juniata College

O3-04: Praying On the Police

Recent events, like college campus protests, have brought police militarization back into the national spotlight. These police-citizen interactions underscore how policing, political ideology, and religion are becoming increasingly intertwined. The polarization of belief systems has made it difficult to understand and comprehend the varying opinions in the American public. Little prior literature has examined citizen perception on police militarization with many prior surveys being reanalysis of the data. While criminological research has examined how political ideology shapes opinions on police, no current research has examined how religiosity impacts views of police militarization. This research fills the gap in the literature by conducting a survey of religious community members across several faith communities in a local Pennsylvania county. The 22-item survey utilizes three scales, the Perception of Police Scale (POPS), Centrality of Religion Scale (CRS), and Christian Nationalism Scale (CNS), and other demographic questions to

assess perception of the police, knowledge of policing, religious preferences, religiosity, and thoughts on police militarization. With the upcoming election, these perceptions are vital to know as religious communities stress their voices on issues like policing. Results from this analysis will aid in understanding how religion shapes public policy and citizen involvement in local policy making.

Author: Emma Greggo
Faculty Advisors: Dr. John Crum and Lee Ann DeShong-Cook Juniata College

O4-01: Eastern Mediterranean Balance of Power: Projections on the Future of Transatlantic Alliance

Especially since Summer 2020, there are alarmingly frequent iterations of the diplomatic term casus belli (cause for war) on both sides of the Aegean (in Turkey and Greece), representing a serious Security Dilemma, indicating a significant potential for intra-alliance conflict. This study examines how the different foreign and domestic policy interests and national priorities of four NATO allies in the Eastern Mediterranean (the US, France, Greece, and Turkey) impact the future of the NATO Alliance. The Cyprus conflict, disputed maritime boundaries in the Eastern Mediterranean, and the future of Libya and Syria serve as case studies and are examined through a comparative foreign policy lens using neo-classical realist theory. Our findings indicate growing amounts of soft balancing and "boundary breaking" behavior (Dursun-Ozkanca 2019) as well as limited hard balancing.

Authors: Gabriel Karl and Jordyn Dutko
Faculty Advisor: Dr. Oya Dursun-Ozkanca Elizabethtown College

O4-02: Contemporary Travel Writing: Documenting British Culture Through Creative Expression

This talk will introduce the idea of poetry of place, a concept that describes the geographical and cultural aspects of a place. I will explain the characteristics of market-focused travel writing and share my process of drafting pieces, including a social media takeover that was featured as part of my summer research project. I will conclude the presentation with a reading of some of my travel writing pieces and selections from my poetry of place portfolio.

Author: Kaitlyn Gilmore
Faculty Advisor: Dr. Tara Moore Elizabethtown College

O4-03: Personality and Characteristics of K-pop and Taylor Swift Fans

We examined the relationship between personality, music preference, and fandom – specifically the fandoms of Taylor Swift and BTS. This research also links the psychology of music preference and music use to fandom and how being a fan impacts a person's identity and self-esteem. There were 101 participants who responded to the survey online, which asked a battery of questions on music preference, music use, identity development, personality, self-esteem, dedication to an artist as a fan, and the use of the fan community around the artist. We concluded that there were higher levels of devotion, feelings of belonging, purpose, and escape among fans than nonfans. Fans, both of K-pop and Taylor Swift were using music for background stimulation and for emotional regulation. The use of music for emotional

regulation means that fans are using music to enhance or change certain emotions. The use of music as background stimulation can be both in social settings, with music playing in the background of the party or gathering, or individual use to study, work, exercise, drive, or other solo activities. We also found that K-pop fans tended to have a broader range of musical preference than Taylor Swift fans. These results show that fans used their artists as well as the fandom to regulate their emotions and to form a community and connection with others.

Author: Kathryn Mackey
Faculty Advisor: Dr. Michael Roy **Elizabethtown College**

O4-04: Attitudes and Access: How These Variable Affect Emerging Adults Mental Health Treatment

Current emerging adults have more recorded mental health problems than previous generations and a sizable portion of this population is not receiving quality mental health care. Individuals' perception of stigma and one's barriers to access is correlated with their overall willingness to seek out services. A survey was disseminated to various members of this population to assess factors such as their endorsed societal stigma, endorsed self-stigma, anticipated stigma, and barriers to access such as transportation, cost, accessibility, and insurance related barriers. We hypothesized that for emerging adults lack of access would present a greater barrier than stigma, with many participants endorsing that they would be interested in seeking out easily accessible therapy. This project strives to assist practitioners in addressing the factors that may deter emerging adults from seeking out treatment.

Author: Sara Colletti
Faculty Advisor: Dr. Jean Pretz and Mike Shook **Elizabethtown College**

O5-01: Militarization and Drug Enforcement: How Law Enforcement Agencies Justify Obtaining 1033 Program Items in the War on Drugs

Drug enforcement remains a key duty of law enforcement in the United States. However, in recent years the landscape of drug enforcement has changed as drug laws and perceptions of drugs have altered. More violent tactics on citizens, such as deadly drug raids, has increased scrutiny of police actions and the militarized equipment that they use during them. A key mechanism for acquiring militarized equipment is the Department of Defense's (DoD) 1033 Program, which transfers militarized equipment to law enforcement agencies (LEAs). Little research has examined the program with a focus on drug enforcement, which was a main rationale for the program's inception. This research utilizes DoD data on LEA justifications from the 1033 Program from 2020-2022 to understand how LEAs justify obtaining militarized items for drug enforcement. The data contains over 91,000 requests from LEAs for equipment, which were qualitatively coded based on the rationale. Data is gathered from police departments of all state, municipal, and county level across the country. Results from the analysis show LEAs give different justifications for acquiring items for drug enforcement. Adapted through Grounded Theory, seven categories of justifications were discovered. While police work justifications were primarily given, these requests varied regarding drug type and police strategy to reduce drugs. The results show that narcotics enforcement is a focus to obtain equipment for drug enforcement, while eradication and interdiction remain key strategies to

fight drugs. The results will be used to inform policy decisions on obtaining militarized items for drug enforcement in the country.

Author: Daniela Scipioni and Megan McConnell
Faculty Advisor: Dr. John Crum **Juniata College**

O5-02: Evaluating General Chemistry Laboratory Skills through Evidence-Based Assessments

Students can come to an introductory General Chemistry course with little to no experience with hands-on laboratory skills. This difference in prior experience can be exacerbated when introductory laboratory experiments are done in pairs or groups where each individual student may not perform each hands-on skill for completion of the experiment. To probe student prior experience and assess their achievement of basic hands-on laboratory skills, we designed and modified authentic skills assessments. These extra credit assignments (with rubrics) require students to record and submit a narrated video of themselves properly performing that skill. Students were queried about their experience and confidence level with each skill (1) prior to the course, (2) following a laboratory experiment in which the skill was introduced, and (3) following the extra credit video assignment. Preliminary results from a pilot study (n=14) indicate that student experience was variable at the start of the course, and that student experience and confidence increased, not only after a skill was introduced in the laboratory, but additionally after they submitted and received feedback on their video. Results from the pilot study will be discussed as they relate to the design of a larger experiment to explore the impact of reward (like digital badging) on laboratory skill assessment in General Chemistry.

Author: Nicolette Guido
Faculty Advisor: Dr. Shari U. Dunham **Moravian University**

O5-03: A Student's Perspective: Utilizing the Herbaceous Plant Species Self-heal as a Guide to Exploring the Natural World

Young adults can often find themselves feeling that their impact isn't significant enough to change the world. So, it's important to provide opportunities for young adults to contribute and participate in the process of finding solutions, especially in the environmental arena, where we will need competent, consistent, and confident leaders of the future. These opportunities will allow young people to stand strong in our capabilities. The goal for this summer's research project was to start the process of creating an easily accessible platform that simplifies and condenses the first steps of getting into the environment and learning about it. There's value in students having the space to see the significance in their individual perspectives, knowledge, creativity, and curiosities. My gateway into learning about the natural world was utilizing Seek and iNaturalist: two apps that allow for quick identification of species in the environment. The easy access to these tools helped me to step readily into learning more about the environment. From creating this platform, I hope to encourage and inspire my peers to see the value in gathering knowledge about the environment.

What led me to feel the significance in my efforts to learn about the natural world, was coming across plant samples that previous Goucher students gathered from the 1950s to the early 2000s. I found comfort in the fact that Goucher students before me were interested in things I was interested in; I felt less alone in my endeavors. With details from the samples, I could refine the places I would venture to: Stimson Hall, the Bio Pond, and Goucher's trails. And to that list, I

added the creek that's past the equestrian stables as another biodiverse space on campus. While exploring, I wanted to reflect on the contrasts between these areas and happen upon a plant species I could investigate further. It was the herbaceous plant species self-heal (Prunella vulgaris) that caught my eye. I began to see variations in the way in which it grew. I became fascinated with the range in which a species could present itself.

Next, I had to figuring out how I could quantify my observations. By standardizing these observations into general environmental descriptors, I could present them as data that could be analyzed. I noticed self-heal presented differently depending on the following conditions: sunlight exposure, available shade, types of coverage on bare ground (for example, rocks, dead leaves, mulch, etc.), and if the plant is flowering. I discussed these parameters with my mentor for this summer's research experience, and we went out to find and survey areas with Self-heal. We recorded percent cover, the number of flowering Self-heal, other species in the plot, ground coverage, and heights of randomly selected Self-heal plants. From each plot, we also randomly gathered 10 Self-heal leaf samples and a soil core. With the leaf sample and soil cores, I could measure specific leaf area, dry leaf mass, some soil nutrients, and soil pH. Noting my thoughts as I learned more about the campus' environment, prepares me for building a digital platform that supports students venturing out into the natural world in ways that could further research in the field of environmental science. The success of this platform would be found in its ability to be accessible, build the Goucher community, be valid for future scientific research, and create connections with those the field of environmental science.

Authors: Lily L'Oiseau and Tanise Thornton-Fillyaw
Faculty Advisor: Dr. Akana Noto **Goucher College**

O5-04: Glial-specific GBA Expression in Drosophila: Unraveling its Role in Sleep and Protein Aggregation in a Parkinson's Disease Model

Mutations in the glucocerebrosidase (GBA) gene represent a significant genetic risk factor for Parkinson's disease (PD). This study investigates the role of GBA in Drosophila melanogaster, focusing on glial-specific expression and its impact on sleep patterns, a common non-motor symptom of PD, as well as protein aggregation, a symptom of many neurodegenerative diseases including PD GBA-deficient Drosophila exhibit phenotypes reminiscent of PD, including shortened lifespan, impaired locomotion, and increased protein aggregation, showcasing neurodegeneration. Notably, these flies demonstrate altered sleep patterns, characterized by decreased total sleep duration, particularly during the night, and reduced sleep recovery following deprivation. Glial expression of GBA has been found to be crucial for maintaining neuronal health, influencing neurite outgrowth, and potentially exerting non-cell autonomous effects. Using the UAS/GAL4 system, we generated fly lines with controlled GBA expression in glia. Four experimental groups were established: wild-type controls, GBA total knockouts, glial-specific GBA expression rescue flies, and glial-GBA overexpressing controls. This approach allows for a comprehensive analysis of GBA's glial-specific functions. We will examine the flies' sleep patterns and head vs. body protein aggregation. In the future we plan to assess the flies' climbing ability. We expect our findings to highlight GBA's multifaceted role in neuroprotection, synaptic connectivity, and sleep regulation. The study may provide insights into the mechanisms by which GBA mutations contribute to PD pathogenesis, particularly in relation to

sleep disturbances. Understanding GBA's diverse functions in non-neuronal contexts may offer new avenues for therapeutic interventions in GBA-associated neurodegenerative disorders.

Author: Stephen Kataria
Faculty Advisor: Dr. Kathryn Jewett **Juniata College**

O6-01: Nanoscience of 2D Materials: Preserving and Tuning their Electronic Properties

Monolayer (ML) metals are of great interest due to their unique electronic structures and tunable properties, which deviate significantly from the bulk. These nanoscale materials are experimentally grown on a bulk SiC(0001) surface, where graphene buffer layers are formed prior to intercalation of the metal atoms and formation of the ML metal layer. Experiments have revealed that graphene stabilizes the ML metal formation, protects against environmental degradation, and potentially preserves the electronic properties of the underlying ML metal. Using density functional theory (DFT), we investigated a graphene ML-Ag SiC(0001) heterostructure and calculated the interfacial interactions between the graphene and underlying ML-Ag. We explored the quantum-chemical details of the ML-Ag layer by varying the structural arrangement of the atoms near the heterostructure surface and compared the results to experimental measurements. We further investigated the tunability of these 2D metals by alloying the ML-Ag with V to induce a localized magnetic-spin moment in the ML-alloy layer at the V site. These results highlight the fascinating properties of nanoscale metal systems and how their unique electronic structures can be tuned via structural adjustments and alloying.

Authors: Zachary W Henshaw, Chengye Dong, Anthony R. Richardella, and Joshua A. Robinson
Faculty Advisor: Dr. William H. Blades **Juniata College**

O6-02: Fabricating Superconductive Circuits

Bismuth Selenide:

This research’s purpose is to create superconducting circuits by annealing bismuth selenide crystals with palladium and determine the most consistent method of crystal deposition. To make superconducting circuits with bismuth selenide, we deposit small crystals (less than 100nm thick) onto a specific spot on a substrate. We achieve this by placing the crystals onto a strip of thermal release tape, then using a manipulator to line up the crystals and the substrate under a microscope. Through various methods of deposition, we have found the use of thermal release tape to be the most effective and least contaminated way to perform crystal deposition.

Nanoprinting:

The purpose of this research is to explore the possibilities of superconductivity through the fabrication of textured wires using a lab designed nanoprinter. The nanoprinter works by moving a mask with nanopores over a sample during deposition leading to more intricate designs, including the ability to make wires with varying heights or textures. However, the device currently lacks a way to angularly align the mask with the sample. In response to this issue, we are developing an angular alignment sensor that uses a parallel-plate capacitor system of a unique shape and area. With this system, we can use the capacitance at the time of alignment to estimate the degree to which the sample is rotated with respect to the mask. Thus

far, we have observed that there is consistency between trials for graphs of the changing capacitance over a 15-degree rotation in both the clockwise and counterclockwise direction.

Authors: Sophia Reister and Eddie Desarro
Faculty Advisor: Nina Markovic **Goucher College**

O6-03: The Belousov-Zhabotinsky Reaction: Wave Behavior and Bromide Concentration

The Belousov-Zhabotinsky (BZ) reaction is an oscillating chemical reaction involving continual oxidation and reduction of metal catalysts like ferroin (iron), cerium, and manganese. The BZ solution—consisting of a metal catalyst, bromate, bromide, sulfuric acid, and an organic substrate—generate propagating wave patterns when placed into an unstirred petri dish. Despite the BZ reaction's versatility as a model for biological phenomena, there is little research on the relationship between wave behavior and reagent concentrations. This study investigates how varying the BZ reaction's concentrations alter wave behavior. This experiment focused on changing the bromide concentration and overall BZ reaction dilution. An Amscope Microscope Digital Camera was used to take images of the BZ reaction's wave patterns. The velocity, wavelength, and period of propagating BZ waves were measured using MATLAB. Dilute solutions exhibited less wave activity than non-dilute solutions within a bromide concentration range of 0.00125 M to 0.24 M. Preliminary results suggest that wavelength and period increase exponentially when bromide concentration increases. Additionally, the BZ reaction's wave velocity and overall wave activity decrease with increased bromide concentrations. This information could help researchers develop better models by raising bromide concentration if they need to reduce the number of waves present.

Authors: Neil Singer Divins, Andrew Hoch, Samantha Small, and Desmond Yengi
Faculty Advisor: Dr. Desmond Yengi **Elizabethtown College**

O6-04: Augmented Reality Tool for Engineering Analysis

Moments is one of the first challenging concepts that engineering students encounter in mechanics. As static analysis involves looking at the effect of loads on bodies that are motionless, visualization of force effects is essential. However, it is possible for students to struggle with visualization, making it difficult for them to grasp the many concepts in statics, including moments. To solve this issue, we have created an Augmented Reality application that will enable students to see the effects of a force on an object and its moments. Created in Unity, this app will help engineering students visualize moments, as well as provide other application opportunities within the engineering profession, such as previewing the effects of loads on structures.

Author: Leif Erik Hoffman
Faculty Advisor: Dr. Jean Batista Abreu **Elizabethtown College**

Poster Presentations:

P1-01: Feasibility Study: Elizabethtown College Going 100% Solar

In this project, I explore the feasibility of Elizabethtown College offsetting 100% of its electricity consumption by installing solar panels on campus buildings and parking lots. Approximately

20% of the college's electricity consumption is currently sourced from the campus's solar array. While investing in the design and installation of solar panels of this magnitude would represent a substantial cost, it has the potential to save the college a significant amount of money over the long term.

Author: Emmanuel Attah
Faculty Advisor: Dr. Brenda Read-Daily **Elizabethtown College**

P1-02: Heavy Metals, Heavy Breathing: The Effects of Cadmium Chloride on Protein Kinase Signaling in Lung Cells

Asthma is a chronic lung inflammatory disease that is difficult to effectively treat. Therefore, better treatment options are required for people suffering with asthma and other similar diseases. This study has taken the first steps into analyzing the inflammatory pathway of this disease. Both A549 and BEAS-2B cell lines were grown, and the effects of cadmium chloride, a toxic substance often found in cigarette smoke, was analyzed in both cell lines. The A549 line consists of non-small cell lung cancer cells (NSCLC), while the BEAS-2B are healthy bronchial epithelial cells. These cell lines were used to compare the cell proliferation in asthma, as induced by a growth factor and cadmium chloride, and cancer in terms of these treatments. Several inhibitors, including U0126 (MEK), BVD-523 (ERK), and Falcarindiol (AP-1), were tested on both cell lines in order to determine the effects of inactivating different steps in the ERK pathway. Proliferation and viability assays, as well as Western Blots, were conducted in order to better analyze the ERK pathway and its influence on the bronchial epithelial cell proliferation that leads to asthma inflammation. Another goal of this study is to optimize the chromatin immunoprecipitation (ChIP) and cDNA transfection assay methods in order to eventually better understand the DNA and protein interactions that occur in these cell lines.

Authors: Lauren Berger and Emma Caszatt
Faculty Advisor: Amy Defnet **Elizabethtown College**

P1-03: Developing a Standardized Data Quality Index

Many authors across different fields have discussed and attempted to create metrics for measuring data quality. However, a simple unified method for expressing data quality of publicly available datasets does not exist. In fact, most publicly available datasets do not include comprehensive information regarding their quality. In this poster, we propose a complex indicator that measures the quality of a dataset by combining information from 77 dimensions gathered into eight categories: completeness, reliability, validity, accessibility, linkage, reputation, timing, and ethics. Each category's metrics are then combined into a single indicator. These eight indicators can be used together as a "data quality report card" and combined into a single "standardized data quality index" (SDQI). The SDQI takes values between zero and one and can be used to cross-compare the quality of different types of datasets. We demonstrate the utility of the SDQI by calculating it for several datasets that result from different data collection techniques and are represented through various types of data structures.

Authors: Lillian Bassett and Nahida Sultana Mim
Faculty Advisor: Dr. Jana Asher **Goucher College**

P1-04: Bioinformatics Meets Benchtop: Determining Function of Proteins with Known Structure

Proteins are essential to the functioning of every cell and are the target for many therapeutic drugs. After comparing the DNASU Plasmid Repository for Bacteria, Alpha Fold Software, and Protein Data Bank (PDB) three plasmids were selected for further testing. These proteins' structures have been identified. However, their function and activity have not yet been characterized. By observing and comparing the targets' structures to fully characterized proteins, Sprite and Chimera Software were used to find potential active sites for each protein. To determine the substrate in the potential active sites InterPro and Blast searches were performed. After a substrate was identified, SwissDock software was used to determine the position of the substrate at the expected binding site. While waiting for the plasmids to arrive, the expected procedure was done on the protein with PDB ID 3H04. The protein was grown, purified, and run on a gel to ensure purity. The SDS-PAGE resulted in a molecular weight of over 75 kD, though the expected was ~30 kD, suggesting a potential dimer. A Bradford Assay was done to determine protein concentration, and enzyme activity assay were performed using 4-Nitrophenyl phosphate (PNPP) to determine the rate of reaction for the protein at a pH of 6, 7, and 8. The plasmids later arrived and were transformed into BL21(DE3) E. Coli competent cells. Similar activity tests are being performed on proteins of PDB IDs 2AN1, 2AP1, and 3PU9.

Author: Sam Langer

Faculty Advisor: Dr. Defnet **Elizabethtown College**

P1-05: A Comparison of CME and CIR Geomagnetic Storms Using ENA Measurements

While the difference in effects from CME and CIR storms is often subtle, the risks they pose to Earth and space-based infrastructure are somewhat different. The rapid onset of CME events tends to lead to more rapidly changing magnetic fields in the lower atmosphere. This has the potential to induce large currents in our electric power grids, destroying transformers and leading to wide-spread blackouts. Alternatively, the hotter particles emitted during a CIR storm, combined with the typically longer duration, lead to a very dangerous environment for satellites. The loss of even a few satellites can lead to issues with world-wide communications and cost many billions of dollars to repair.

In this project, we have taken several steps with the goal of discovering differences in magnetospheric or ionospheric currents between the two types of storms. First, we have examined publicly available data on the solar wind and magnetosphere using Goddard Space Flight Center's OMNIWeb during the interval in which the Two Wide-angle Imaging Neutral-atom Spectrometers (TWINS) mission was active (2006-2013). All geomagnetic storms have been recorded and analyzed for determination of type. Two storms were selected: a CME which occurred on the 17th of March, 2015, and a CIR which occurred on June 1st, 2013. TWINS data for each of these storms has been used to calculate magnetospheric currents at the Earth's northern ionosphere at multiple times throughout each storm. Differences in the structure of the currents are noted.

Author: Andrew Younes

Faculty Advisor: Dr. Keith Wood **Moravian University**

P1-06: The Impact of Polyethylene Microplastics on Perfluoroalkyl Carboxylic Acids Adsorption in Soil: Insights from Liquid Chromatography Mass Spectrometry

Polyfluoroalkyl substances (PFAS) are a class of persistent environmental pollutants, known for their resistance to degradation and widespread use in various industrial applications. This research delves into the behavior of PFAS containing Carboxylic acid functional groups with varying carbon-fluorine chain lengths, and their adsorption dynamics on soil. A unique aspect of this study is the exploration of how polyethylene microplastic contamination in soil influences PFAS adsorption percentages. Soil samples contaminated with PFAS of various chain lengths were analyzed to uncover adsorption trends. It was observed that PFAS with shorter chain length exhibit significantly higher adsorption on soil. However, the introduction of polyethylene microplastics into the soil matrix affects this adsorption, which suggests that microplastics may interfere with PFAS adsorption either through competitive mechanisms or by altering soil characteristics. These findings not only enhance our understanding of PFAS-soil interactions but also underscore the pressing need to factor in microplastic pollution when evaluating PFAS environmental behavior. This study offers vital insights for developing more effective soil remediation strategies and pollution management policies in the face of growing environmental challenges.

Authors: Mariam Abdelrady
Faculty Advisor: Rebekah Gray **Goucher College**

P1-07: Effect of Muscle Cell Specific Glucocerebrosidase Expression on Protein Aggregation and Sleep Regulation in Drosophila melanogaster

Parkinson's disease (PD) is the second most common neurodegenerative disorder trademarked by problems with movement, tremors, and balance and can be associated with mutations in the gene for expressing glucocerebrosidase (GBA). Mutations within the GBA gene are associated with Parkinson 's-like symptoms in the flies, including sleep changes, protein aggregation, decreased lifespan, and a decrease in climbing ability. This project aims to discover the effect of muscle-specific GBA expression on sleep disturbances and overall protein aggregation. We will measure the difference between flies without the GBA gene, those with the GBA gene occurring naturally, those without the GBA gene but have GBA ectopically expressed in muscle cells using the GAL-4/UAS system, and finally those with the GBA gene occurring naturally as well as ectopic muscle cell GBA expression . First, the flies with the appropriate genotype were generated. The flies were then sorted based on their phenotype into 4 groups: control, deletion, rescue, and overexpresser. These flies are then aged to and frozen on day 10 when Parkinson-like symptoms are strongly present in the GBA deletion flies. We will measure the protein aggregation using a western blot procedure. We expect to see higher levels of protein aggregation in our deletion flies as compared to the rescue flies, which should be similar to the control flies. Additionally, we plan to record their sleep on the Drosophila Activity Monitoring System. We hope to see that the rescue flies express fewer sleep disturbances as compared to the deletion group showing there was a neurological effect mediated by muscle cell GBA expression as non-cell autonomous effects have been observed in this model previously.

Author: Regan L Farringer
Faculty Advisor: Kathryn A. Jewett **Juniata College**

P1-08: Pathogen Prevalence and Diversification: Analysis of Huntingdon County Ticks Through the One Health Tick Initiative

Given the forested nature of the Raystown Lake area and surrounding Huntingdon County regions, visitors who partake in the popular outdoor recreation activities have an increased risk of contracting tick-borne diseases (TBDs). TBDs pose a significant and debilitating threat to public health. There is a current lack in knowledge about the prevalence and identity of tickborne pathogens, making it increasingly difficult to protect the public and reduce the risk of contraction. Specifically, the extent of tick abundance and tickborne pathogens within Huntingdon County need to be determined to effectively educate the public and safeguard their health. Therefore, we collected tick specimens using the CDC tick collection protocol, which utilizes drag netting, on ten different, heavily trafficked trails throughout Huntingdon County. In addition to tick population abundance, other parameters including terrain, temperature, humidity, canopy cover, location, and time of day were recorded. The collected specimens were speciated, and a subset of the samples will have DNA isolated and analyzed for a full panel of tickborne pathogens. A subset of pathogen-containing ticks will be subsequently sequenced and the genomic data analyzed. Supporting conclusions drawn from this study in 2023, the current 2024 data shows that a majority (62.2%) of the collected ticks were found in leaf litter with more than half (59.7%) of the ticks being in the larva life stage. In addition, analysis of the 2023 tick specimens revealed that 25.0% tested positive for Borrelia species (the bacteria that cause Lyme disease), 13.5% tested positive for Babesia species (the bacteria that cause babesiosis), and 2.1% tested positive for the human variant of Anaplasma phagocytophilum (the bacterium that causes anaplasmosis). By studying current and emerging tickborne pathogens, we can identify trends in pathogen diversification and geographic expansion, which are crucial for effective disease management and prevention strategies to better educate the public across the impacted county.

Authors: Kelliann Drummond, Sarah Halteman, and Alexa Viands
Faculty Advisors: Dr. Jill Keeney and Dr. Regina Lamendella Juniata College

P1-09: Effect of Sulfuric Acid Concentration on Pattern Formation in BZ Chemical Reaction Systems

The Belousov-Zhabotinsky (BZ) reaction is a homogenous, non-equilibrium system that serves as a promising oscillatory model for biological systems. The BZ solution consists of bromate, bromide, organic substrate, sulfuric acid, and a metal catalyst (usually ferroin (iron), ruthenium, cerium, manganese, etc.). The main reaction involves an oxidation-reduction reaction that is easily visualized when a ferroin catalyst is used, which appears red in its reduced state and blue in its oxidized state. The unstirred catalyzed-BZ solution generates blue chemical waves traveling through red medium as the catalyst oscillates between oxidized and reduced states. In this study, varying concentrations of sulfuric acid, from 0.2M to 0.8M, were applied to investigate the effect on wave velocity, wavelength, period, and pattern. Images of the unstirred BZ system were taken in 3-second intervals with an AmScope Digital Camera and analyzed utilizing MATLAB software. Preliminary results suggest that velocity is unaffected, but wavelength and period may decrease with increased sulfuric acid. Double inward spirals were observed in all concentrations. These findings suggest that pH may be a useful tool to

specifically alter wavelength and period of oscillations in this model without affecting velocity and pattern formation.

Authors: Samantha Small, Andrew Hock, and Neil Divins
Faculty Advisor: Dr. Desmond Yengi **Elizabethtown College**

P1-10: Synthesis of Furan-Based Terarylene for Photochromic Drug Delivery

Photochromic drug delivery occurs when light-sensitive compounds undergo a change in structure in response to irradiation with specific wavelengths. This light response is important for activating and deactivating the drug delivery to specific areas on demand. The diarylethene (DAE) compounds consist of a core providing an alkene and two adjacent substituents, each providing one more alkene for a six-membered cyclic formation upon light exposure. In this research, we focus on creating a terarylene that, after affixing to a potential drug, becomes photochromic and will lock and unlock its structure towards drug release when exposed to short and long wave lights. A Suzuki coupling reaction between 3,4-dibromofuran and an aryl boronic acid was performed to synthesize the target molecule concisely. Next, we experimented with maleimide as a test drug to observe if the target molecule would go through a Diels-Alder reaction and potentially become photochromic. The furan-based terarylene was synthesized and combined with maleimide, and its photochromic properties are currently being investigated using spectrophotometry.

Author: Alyssa Howell
Faculty Advisor: Dr. Kevin Schultz **Goucher College**

P1-11: The biomechanics of an optimal sprint start

Track and field sprinting demands exceptional precision, with victories often determined by milliseconds. The critical nature of every step and moment underscores the importance of optimal technique, particularly in the starting block setup. Previous research has extensively explored various aspects of the block start, revealing that many athletes begin with their feet positioned closer together than optimal. Studies indicate that the most effective block spacing occurs when the distance between the feet is approximately 45% of the athlete's leg length. However, these studies typically assume a standard one-foot distance from the front starting block pedal to the starting line, without examining the impact of varying front block placements. This study aims to address this gap by maintaining the block spacing at 45% of the leg length while testing front block distances of 45%, 57.5%, and 70% of the leg length from the starting line. The hypothesis posits that there will be no statistically significant difference in the velocity of athletes when the starting blocks are set at these varying distances. Nonetheless, it is anticipated that placing the blocks closer to the starting line will result in the first step being further down the track, potentially affecting overall performance.

Author: Melissa Patton
Faculty Advisor: Dr. Kurt DeGoede **Elizabethtown College**

P1-12: Histone H2A Repression Domain Regulates Cell Cycle in the yeast Saccharomyces cerevisiae

The DNA of eukaryotic cells is wrapped around histone proteins to form complexes called the nucleosome core particle, the basic repeating unit of chromatin. Most nucleosomes comprise a

pair of canonical histones, H2A and H2B forming a heterodimer and H3 and H4 forming a heterotetramer. Histones are encoded by replication-dependent genes and are expressed during the S phase. Studies have identified a small portion (amino acids 16-20) on the N-terminal domain of histone H2A that regulates global transcription. This particular domain, termed the H2A Repression (HAR) domain, suppresses the expression of approximately 4% of the yeast genome. Loss of the HAR domain leads to sensitivity to DNA damaging agents. Previous studies have indicated that loss leads to delayed growth relative to the wild type under standard growth conditions. Interestingly, loss of the HAR domain, leads to hydroxyurea and nocodazole sensitivity, indicating a cell cycle malfunction. These data indicate a defect in a cell's progression through the cell cycle. We treated cells with either hydroxyurea or nocodazole for two hours. Following treatment, we released the cells and grew them for two additional hours. We used bud morphology to assess cell cycle progression. Our data indicate that the HAR deletion mutant has defects either entering or exiting the cell cycle, likely in either the S phase or mitosis. Initially, the mutants treated with hydroxyurea experienced a significant delay in comparison to wild type; however, within 90 minutes the cells overcame the initial delay. These results were identified with bud morphology and flow cytometry data which does not explain the significant delay seen in the growth data of the mutants. This observation has led to the investigation of the progression of cells through the cell cycle in a different phase to better address the significant delay seen in mutants. Cells were arrested at mitosis with nocodazole, and bud morphology and flow cytometry data was collected.

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Faculty Advisor: Dr. Michael Parra **Susquehanna University**

P1-13: How Do Brown Trout Impact Brook Trout Spawning Ability

Brook Trout (Salvelinus fontinalis) are a native, highly threatened species of salmonidae across eastern United States. Their populations are threatened by many factors including warming temperatures, habitat degradation, and invasion of exotic species. The most notable exotic species that has been researched and studied countless times to impact Brook Trout populations are Brown Trout (Salmo trutta). Brown Trout are recorded to impact Brook Trout through a variety of mechanisms including competition for food, predation, temperature tolerance disparity, and breeding location. This study tackles one of these mechanisms in an attempt to spatially quantify trout spawning redd placement and success within streams where both species exist. This study is in progress, I am searching for 6 streams that are most physically, chemically, and geologically similar; 3 with only Brook Trout and 3 with mixed Brook and Brown Trout. This homogeneity allows for a controlled comparison of the ecological interactions and potential competition between the two species, minimizing the influence of environmental variability on the outcomes. The study area is in the bullseye of Brook Trout distribution, the streams are all located along the Allegheny Front, ensuring similar geology and stream morphology. The data collection on the redds and spawning distribution will happen during fall months, utilizing a drone attached with green LiDAR technology and a software to project and interpret the data collected by the drone and LiDAR. The study is designed to be able to show how Brook Trout and Brown Trout may be competing for spawning area and show differences if they exist. From the conclusions of this study, many management implications can

be drawn to inform conservation strategies, and fisheries management policies to help conserve Brook Trout.

Author: Ignas Draugelis
Faculty Advisor: George Merovich **Juniata College**

P1-14: The Effects of Ambient Light at Night on Anole Energetics

Prolonged exposure to ambient light at night (ALAN) can be linked to increased glucocorticoid concentrations in the body, causing disruption to circadian rhythms, hormone regulation, immune function, and reproductive processes, all of which can influence an organism's body condition. Organisms living in habitats exposed to ALAN may need to cope with physiological effects or may be able to use behavior to avoid ALAN. The objective of this project was to measure the metabolic rates, food consumption, behavior, and body condition of Green Anoles (Anolis carolinensis) exposed to ALAN and to determine if anoles could use behaviors and/or energy reallocation to cope with the ALAN stressor. For nine weeks following a one-week acclimation period (10 weeks total), anoles (n = 18) were kept in either a room with constant ambient light or (n = 18) were kept in a room with a 12:12 Light:Dark cycle. Half of the anoles were provided a hide box where they could escape ambient light. Metabolic rates were measured at the beginning and end of the project. Anoles were fed crickets every 3-4 days and monitored daily to determine food (i.e., energy) consumption. Preliminary results have shown disruption in circadian rhythms regarding metabolic rates, no change in body condition, increased food consumption, and possible reallocation of energy from other physiological processes (i.e., reproduction). This project aims to expand on these preliminary results and improve knowledge of how environmental stressors physiologically affect an organism's homeostatic state.

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P1-15: Synthesis of a PNA 6-amino-5-triazolylpyridin-2(1H)-one nucleobase to improve PNA-RNA-RNA binding affinity and selectivity through pi-pi stacking

RNA has a variety of different functions, from translating DNA into proteins to catalyzing reactions. Currently, certain types of noncoding RNA are not yet fully understood. Regions of these non-coding RNAs can fold into double helices, which is just one type of the many secondary structures that are able to form, making them ripe for molecular recognition. This recognition can be achieved using triplex-forming oligonucleotides (TFO's), which employ Hoogsteen hydrogen bonds to connect with the double-stranded RNA, forming a triple helix with the double-helical RNA. More specifically, the TFO being used in this study is peptide nucleic acid (PNA), which is ideal due to its neutral charge. So far, the synthesis of PNA nucleobases that can aid in strong, selective recognition of purines has been successful. However, the same cannot be said for pyrimidines. One way to solve this problem is to increase the pi-stacking interactions between nucleobases on the PNA strand through the introduction of heterocycles, such as triazole and imidazole. The presence of these additional heterocycles should allow for an increase in binding affinity through pi-pi stacking interactions. In this project, a triazole group is being added to the well-studied J nucleobase. Through a series of

synthetic steps, a triazolyl J base will be prepared and ultimately studied in an effort to increase the pi-stacking ability of the base and aid in binding affinity and selectivity.

Author: Isabell Anderson
Faculty Advisor: James A. Mackay **Elizabethtown College**

P1-16: G-Protein Coupled Receptor F35H10 effects on C. elegans Pharyngeal Pumping

Caenorhabditis elegans is a model organism with known neurological pathways. They exhibit behaviors like pharyngeal pumping, which is the visual measuring of the contractions around the pharynx. G-Protein Coupled Receptor F35H10 is a 7 trans-membrane protein thought to be located at the neuromuscular junction. Our lab is exploring if C. elegans pharyngeal pumping will be affected by the overexpression or removal of the F35H10. The pharyngeal pumping of six different strains of C. elegans were recorded in their fed, starved, and recovered states. It is hypothesized that the overexpression or removal of the G-Protein Coupled Receptor F35H10 will affect the pharyngeal pumping of the nematode. F35H10, being the protein that corelates with pharyngeal pumping, will impact how C. elegans consume energy.

Author: Stephanie Del-Pozo
Faculty Advisor: Dr. Jay Garaycochea **Goucher College**

P1-17: Evaluating Machine Learning Algorithms for the Prediction of Urban Heat Islands in Baltimore City

Urban Heat Islands (UHIs) are areas in cities that experience higher temperatures than surrounding areas due to features such as buildings, roads, and lack of vegetation. UHIs pose a threat to public health and increase energy usage. This study investigates the potential for machine learning and local weather stations to become a new method of predicting UHIs in Baltimore, Maryland when NASA/USGS Landsat satellite data are unavailable. We study four summer days in 2023 comparing local weather stations/machine learning predictions of land surface temperature with known Landsat results. We categorize weather station data by distance from the Landsat observations (less than 1 km to greater than 4 km). Two machine learning models, a random forest and a neural network, are compared for UHI prediction. The neural network achieved superior performance, successfully predicting UHIs 24 hours in advance with low error (mean absolute error of 2.1 degrees).

We further identify Normalized Difference Vegetation Index (NDVI), UV index, average wind speed and direction, and pressure trend as the most significant factors influencing UHI formation. Our findings suggest that increasing NDVI, potentially through urban greening initiatives, could be a crucial strategy for mitigating UHIs in Baltimore. This information can empower city planners and residents to proactively address the risks associated with UHIs, potentially reducing heat-related illnesses.

Authors: Anna Kulikova, Sakib Hussen, Marcellus Mwangi, and Abdul Siam
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P1-18: Synthesis of a Thiophene Monoxide for Controlled Photochromic Drug Delivery

Light-initiated photochromic drug delivery is a drug administration method that uses light to induce a chemical reaction resulting in controlled release of a drug. Nitroxyl (HNO), a highly reactive chemical messenger that is commonly used as an anti-cancer agent, is one example of

such a drug that is delivered in this way due to its reactivity. This type of drug delivery involves "locking" the HNO on to a hetero-Diels-Alder cycloadduct initiated by one light frequency and "unlocking", or releasing, the HNO with a different light frequency by a retro Diels-Alder reaction. Our research involved the multi-step synthesis of a diarylethene (DAE) composed of a thiophene monoxide core with the furfural substituents at the 3,4 positions. With Diels-Alder reactions, thiophene dioxides release sulfur dioxide (SO_2), rendering a Diels-Alder reaction irreversible, however, thiophene monoxides behave as normal dienes and readily undergo hetero-Diels-Alder (DA) reactions. Upon synthesizing the target DAE, we will investigate its photochromic properties.

Author: Zoe Wright-Riley
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P1-19: How Storage Temperature relates to protein unfolding and the methodology of capturing dentatured proteins

Protein misfolding in the brain, resulting in the exposure of hydrophobic amino acid residues and aggregation, has long been associated with aging and aging-related neurodegenerative disorders. However, the precise nature of the conditions promoting aberrant surface hydrophobicity and aggregation among brain proteins and the identities of these proteins remain to be systematically investigated. The present study uses soluble protein fractions from commercially available rabbit brains to effectively capture and identify the proteins that most readily denature in response to multiple different perturbates, with heat being the most effective thus far, as marked by an increase in 8-anilino-1-naphthalenesulfonic acid (ANS) fluorescence. Protein fractions were subjected to temperatures varying from -80°C to 40°C over several days to trigger the unfolding of proteins and expose hydrophobic residues to the surface. Surface hydrophobicity was measured using the fluorescent probe ANS mentioned before. Preliminary data from this method appeared to indicate that storage of protein at 35°C promotes the exposure of hydrophobic residues. However, further evaluation using hydrophobic interaction chromatography (HIC) did not confirm these preliminary findings, indicating that aggregation is likely occurring. The continuation of this study will include optimization and comparison of HIC methods, capture of hydrophobic proteins using Triton X-114 phase partitioning, and identification of individual proteins exhibiting dissociation-induced hydrophobicity using phenylarsine oxide-affinity. The results are expected to advance the understanding of the nature of protein unfolding and assess the methods of capturing soluble proteins from the brain with the greatest potential for surface hydrophobicity and the methods for denaturing proteins to obtain higher levels of surface hydrophobicity without degradation of the sample.

Authors: Grace K. McDonald and Seraphina E. Stager
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P1-20: Development of a glial cell-specific zFUCCI system in zebrafish (Danio rerio)

Unlike mammals, zebrafish and other teleost fish are capable of regenerating photoreceptors in the retina from Müller glia. Müller glia typically support neuronal homeostasis and synaptic regulation, but following retinal lesion in zebrafish, Müller glia will dedifferentiate and proliferate to support neuron regeneration. To observe cell cycle dynamics during this process,

we are modifying a zebrafish fluorescence-based cell cycle indicator (zFUCCI) to contain the glial cell specific promoter for glial cell fibrillary acidic protein (gfap). The zFUCCI system indicates gap one of interphase with an mCherry construct tagged with a fragment of chromatin licensing and DNA replication factor 1 (CDT1), gfap:mCherry_Cdt1, and S through M phases with an mAzamiGreen construct tagged with a fragment of geminin, gfap:mAG_Gem. After propagating the constructs in E. coli, their sequences were confirmed. Linearized plasmid DNA was then injected into fertilized zebrafish eggs. Expression of both constructs was confirmed in the injected fish, and we are currently working to identify founders carrying the construct in the germline. Once a transgenic line carrying the gfap:zFUCCI constructs is established, it will be used to study the impacts of signaling pathways on the glial cell cycle during retinal neuron regeneration.

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P1-21: Design and Construction of Lab-scale Waterwheel System: A Practical Approach to Engineering and Sustainability

Waterwheels are simple mechanisms that convert gravitational energy into rotational energy. Among various designs, the overshot waterwheel has been found to be the most efficient type as it utilizes both the static weight of water and the momentum acquired before water strikes the wheel. This study proposes an optimal waterwheel configuration that maximizes efficiency for integration with an alternator, converting rotational energy into electricity. The waterwheel model was designed in Autodesk Fusion and fabricated using a Prusa 3D printer. The research method involved separating the contributions of the water-driven paddle and calculating the resultant rotational energy through angular speed measurements. The models were tested under different flow rates using water tap and the efficiency coefficient was determined by comparing the rotational energy to the gravitational energy of water. This electric waterwheel system presents a sustainable energy solution with potential applications in impoverished areas needing additional electricity. The end goal of this project is to construct a functioning waterwheel as a demonstration piece for Juniata College. The built model will be housed in the engineering laboratory, as a learning tool to reinforce theoretical knowledge through practical visualization. This can be used in different courses to explain the concepts of energy conversion, and mechanism of electricity generation from water. The model can also be used during high school camps/fairs to raise awareness and interest in the STEM field among high school students.

Author: Qiwen Wu
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P1-22: The Effects of the GPCR F35H10 on C. elegans Locomotion Towards Food

Caenorhabditis elegans are microscopic nematodes that exhibit consistent basic behaviors like locomotion towards food. The G-Protein Coupled Receptor F35H10 is suspected to be a glutamate receptor in the neuromuscular junction of C. elegans. This experiment seeks to understand the function of the GPCR in C. elegans by testing how the knockout and overexpression of the GPCR will affect its ability to locate and reach bacteria. Six strains of nematodes, fed and unfed, are washed and placed in the middle of an assay plate with E. coli

strain OP50 at one end and LB broth at the other end. The nematodes are left on the plate for 3 hours during which, the number of nematodes at the bacteria is counted every 30 minutes. It is hypothesized that the nematodes with the GPCR knocked out or overexpressed will have a change in their movement towards food compared to the wild-type strain. The gene F35H10 may impact the survivability of the nematode C. elegans.

Author: Emily Hess
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P2-23: Synthesis of an O-linked isoorotamide PNA extended nucleobase targeting uracil for recognition of double-helical RNA

In the central dogma of molecular biology, RNA is known as the intermediate between DNA and proteins; however, there is still much to learn about RNA. Many RNAs are not part of translation. Noncoding RNA can fold and create regions of double-helical RNA (dhRNA) which are notable targets for molecular recognition. The end goal of the MacKay research group is the sequence selective recognition of dhRNA strands using peptide nucleic acids (PNA) modified with synthetic nucleobases. To achieve selective recognition, each RNA base will bind to a unique nucleobase. Currently there are methods of polypurine recognition but even a single pyrimidine such as U or C decreases binding affinity of PNA. In an effort to solve the long-standing problem of U-recognition, the goal of this project is to synthesize an extended nucleobase that is derived from isoorotamide nucleobases Io1 and Io4. The Io bases have had success binding to adenine, which allows for the Io scaffold to be used to bind with uracil in a reversed orientation with Hoogsteen hydrogen bonding to both uracil and adenine. Here we report a route to the desired target IR1by first synthesizing a polyfunctional pyridine and ultimately coupling to isoorotic acid.

Author: Max Marra
Faculty Advisor: James MacKay **Elizabethtown College**

P2-24: DuckieLearn: Simplifying Robotics for All

Today, the amount of data that is generated by both humans and machines far outpaces humans' ability to absorb, interpret, and make complex decisions based on that data. Artificial intelligence can take in mass amounts of data, learn from it, and make complex decisions by analyzing it. This data intake can then form the basis for all computer learning and is the future of all complex decision making. Autonomous driving is one of the most talked about forms of AI. With Human error being responsible for the vast majority of traffic accidents, leading to countless injuries and fatalities every year, autonomous vehicles, which do not suffer from distractions, fatigue, or impaired judgment, can drastically reduce these accidents. There are also great legal, social, and ethical issues surrounding autonomous vehicles. This research focuses on better methods to teach the technology of autonomous driving in the class, “Living with AI”, a general education course that will cover the history, ethics, and current application of AI with hands-on projects such as AI art and writing, image recognition, and autonomous robots. In our research we have been using a robotics platform called Duckietown where we are able to develop python programs that teach our Duckiebots how to avoid duckie pedestrians, lane follow, and more. While developing these programs, we found that it requires a higher level of understanding in Python, GitHub, and how to navigate a terminal window at

the command line than general education students will have. We want to make this classroom experience available to all majors regardless of their previous experience with robotics. Using teaching methods such as collaborative learning and the copy, paste, change coding style, students from different majors will be able to effectively learn how code is structured and write functions by examining and modifying existing code, while also limiting the frustration that comes from creating code from scratch. We also know from researching teaching methods, that when students that have previous coding experience work with students that haven't, this promotes pair coding where students learn from each other. Artificial intelligence and autonomous driving are very powerful tools, but so little is really understood about what they can do and how they can change the world. Involving more people in robotics and AI, regardless of their background, can help in addressing global and ethical concerns. We hope to develop classroom learning experiences that will get students from all disciplines interested in robotics and AI. When we bring together a diverse group of individuals this will foster useful, ethical and sustainable methods of AI, now and into the future.

Authors: Breanne Spencer and Cassie Lease
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P2-25: Enhancing quercetin bioavailability and absorption through chemical modification

Quercetin is a phytochemical compound that is an example of a flavonoid, a group of plant-based pigments found in many fruits and vegetables with many medicinal benefits. For this research, we focus on quercetin's anti-neurodegenerative characteristic, an essential component for preventing the development of Alzheimer's Disease. One of the leading causes of Alzheimer's Disease is neurofibrillary tangles resulting from an abnormal Tau protein accumulation in the neurons. According to the GSK3 hypothesis, overactive GSK3 will cause hyperphosphorylation of Tau proteins, thus resulting in memory impairment. Quercetin is a viable compound in combating this hyperphosphorylation, as it increases PTPRD (Protein Tyrosine Phosphate Receptor) dephosphorylation activity towards GSK3. However, quercetin is shown to have a low bioavailability and is not easily absorbed into the human body when orally consumed. This research aims to increase the amount of quercetin absorbed into the cellular membrane by synthetically modifying the natural product. These quercetin derivatives will include glycosylation of the C-ring and bromination in the A-ring. Glycosylation is a common method to increase passage through the blood-brain barrier due to the glucose transporters, thus allowing an attached quercetin passage.

Author: Trevor Bao
Faculty Advisor: Kevin Schultz **Goucher College**

P2-26: Standard Curve Analysis for Quantification of PFAS in the Susquehanna River and the Conodoguinet Creek

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals used in the production of non-stick and stain-, heat-, and water-resistant products and coatings. These products/coatings include food packaging, fire-fighting foam, clothing, cookware, and adhesives. Although beneficial in those products, PFAS are known as forever chemicals, meaning they do not break down in the environment. This leads to soil and water source contamination, bioaccumulation in fish and wildlife, and potential health effects. Since

information regarding PFAS levels of fish in smaller waterways is not as prevalent, this study aims to determine these levels in fish tissue samples to eventually evaluate levels in Pennsylvania's smaller waterways. To begin this process, we have prepared calibration solutions for three of the thousands of PFAS chemicals: PFOS (Perfluorooctanesulfonic acid), PFBA (Perfluorobutanoic acid), and 6:2 FTS (6:2 Fluorotelomer sulfonic acid). These calibration solutions will allow us to construct calibration curves for the GC/MS and NMR (both of which will be used for analysis) to determine what these instruments' limits of detection are, as well as have a means to quantify the PFAS levels within eel muscle tissue samples. Ultimately, this study's findings will provide knowledge regarding PFAS levels in the Susquehanna River and the Conodoguinet Creek.

Author: Rachael Filip
Faculty Advisor: Dr. William Ames **Juniata College**

P2-27: Influence of Varying Bromate Concentrations on Wave Activity in the BZ Reaction

Oscillations occur in many physical, chemical, and biological processes, from pendulum clocks and violin cords to heartbeat and the shifting of tectonic plates during earthquakes. One example of an oscillating chemical process is the Belousov-Zhabotinsky (BZ) reaction. The BZ reaction consists of bromate, bromide, organic substrate, sulfuric acid, and a metal catalyst (usually ferroin (iron), ruthenium, cerium, manganese, etc.) that undergoing continuous reduction and oxidation, causing repetitive color changes. For a ferroin-catalyzed BZ reaction, a red color for the reduced state and a blue color for the oxidized state are observed. This experiment investigated the effects of altering the bromate concentration in the BZ solution's wave activity. Images of reactions at varying bromate concentrations were analyzed using MATLAB to determine the velocities, wavelengths, and periods of the chemical waves generated in unstirred BZ solution. It was found that increasing bromate concentrations resulted in an increase in wave velocities and a decrease in wavelengths and periods.

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P2-28: Some Controls on the Development of Legacy Islands in the Susquehanna River

Some recently formed islands in the Susquehanna River can be described as strongly influenced by human activity. A small cluster of islands located downstream from the Selinsgrove Railroad Bridge (1871) formed in response to three anthropogenic changes to the environment: 1. an obstacle (the railroad bridge), 2. coal waste legacy sediments, and 3. vegetation removal. These islands are the basis of this study. Aerial photographs and personal accounts help reveal how the islands transitioned from bars to vegetated landforms as large as 0.5 acres and 2.2 m in elevation. These islands can be considered part of a new category of fluvial islands known as "legacy islands".

Here we model the processes that caused these legacy islands to form. The first step involved shoaling of the river substrate by the deposition of gravel. This took place downstream from the bridge. The second step involved a pioneer species like American water-willow, which colonized the gravel. The willow slowed water flow, causing finer sediment to fall out of suspension, and the substrate to aggrade. Fine sediments, and low water levels promoted growth by successive vegetation like silver maple, sycamore, river birch, loosestrife, smart weed, and other forbs and

weeds to colonize and stabilize the bar. This effectively transformed it into an island. One key factor in the growth of the elevation of these islands is the capture of flood debris by multi-trunk trees. This produces debris dams that decrease flow velocity in later flooding events. Debris dams deflect high energy and cause finer sediments to be deposited. The loss of vegetation due to man, as seen from aerial photographs and personal accounts, cause the island to return to a bar-like status.

The legacy island is composed of well-rounded cobbles to gravel that decrease in size downstream along the central axis of the island (30 to 19 mm); sand occurs on the tail end of the island. These sediments are composed of bituminous coal, quartzite, quartz/wacke sandstone, siltstone, brick, glass, and other manmade debris. The sediment cores from the island consist mostly of sand size grains. Much of this sand is composed of quartz, coal and coal waste, such as ferric oxy-hydroxide, magnetic slag, and coke. Minor amounts of the sand is composed of garnets, quartz with magnetite inclusions and muscovite, which may have a Pleistocene origin. X-ray Fluorescence (XRF) analysis of the cored sediments indicates that slight increases in silt correspond to increases in certain metals like Fe_2O_3, Al_2O_3, K_2O, MgO, Pb, Zn, Zr, and Ni. Increases in CaO can be attributed to Corbicula and Pleurocera found between 100 and 150 cm in the core. Initial values of Pb from the island sediments (20 to 74 ppm) are slightly higher than local background levels.

Anthropogenic activities like construction, mining and deforestation can result in the formation and destruction of islands. The newly formed island cluster in this study supports a wide range of wildlife, including mammals, migrating birds and waterfowl, amphibians and reptiles. We need to understand how legacy islands form because they represent new fragments of riparian ecosystem that may require future conservation and restoration. Additionally, the erosion of these floodplain sediments has consequences downstream. They add to the naturally produced sediments that accumulate behind dams, and they may be transported by major floods to lowland ecosystems like the Chesapeake Bay.

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P2-29: The effect of regulating TGFβ signaling during retinal neuron regeneration in zebrafish (Danio rerio)

Responsible for maintaining surrounding neuronal cells and ensuring proper neuronal function, Müller glial (MG) cells are a crucial component of the vertebrate retina. Zebrafish can regenerate damaged retinal neurons from the MG, but mammals cannot. Retinal damage in mammals results in reactive gliosis and retinal scarring that is, in part, positively regulated by TGFβ signaling via activated R-SMADs. For retinal damage in zebrafish, however, glial scarring is negatively regulated by TGFβ corepressors tgif1 and six3b, which play significant roles in promoting the asymmetrical division and proliferation of the MG cells during retinal neuronal regeneration. One TGFβ target gene, ascl1a, promotes neuronal cell fate and also may regulate successful regeneration in the zebrafish retina. Thus, regulating TGFβ signaling is a key component of MG-driven replacement of destroyed retinal neurons in zebrafish. We have studied TGFβ signaling after photoreceptor destruction at 1-, 3-, and 14-days post lesion (dpl) by tracking MG activation, progenitor proliferation, and retinal regeneration, respectively. Preliminary results indicate that increased TGFβ signaling leads to fewer proliferating cells at 3

dpl, but surprisingly there is no demonstrable difference across treatments in distribution of activated MG across the retina at 1 dpl or in neuron regeneration at 14 dpl. Ongoing experiments aim to complete data collection at all time points and will provide valuable information on what stage(s) of regeneration are most regulated by TGFβ signaling.

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P2-30: H2B repression domain regulates the cell cycle in the yeast Saccharomyces cerevisiae

The DNA of eukaryotic cells is wrapped around histone proteins to form complexes called the nucleosome core particles which are the basic repeating units of chromatin. Most nucleosomes consist of a pair of canonical histones, H2A and H2B which form a heterodimer and H3 and H4 which form a heterotetramer. Histones are encoded by replication-dependent genes and are expressed during the S phase. Studies have identified a small portion (amino acids 30-37) on the N-terminal domain of histone H2B that regulates global transcription. This domain, termed the H2B Repression (HBR) domain, suppresses approximately 10.8% of the yeast genome. The HBR domain is also a regulator of DNA damage response and repair. Previous studies have indicated that loss of this domain leads to poor growth under standard growth conditions, indicating a defect in a cell's progression through the cell cycle. This hypothesis is supported by the fact that the HBR mutant is sensitive to hydroxyurea – a genotoxic stressor that inhibits the enzyme ribonucleotide reductase halting DNA synthesis. To determine the phase of the cell cycle affected in the HBR mutants we initially looked at bud morphology (a qualitative measure of phases of the yeast cell cycle). These data confirmed it is that cells have defects either entering or exiting the cell cycle, likely in either S phase or mitosis. When treated with hydroxyurea, there was an initial delay in S-phase progression. However, after 90 minutes of treatment, there was not significant difference in distribution of bud morphologies between the HBR mutant and wild type. We hypothesized the cell cycle defect could occur in mitosis. Both wild type and mutant cells were treated with nocodazole, which inhibits the formation of microtubules and arrests the cells at the end of mitosis. Cell cycle progression was assessed using both bud morphology and flow cytometry.

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P2-31: Variable Diapause in Response to Changing Climates

Contemporary global climate change is altering ecosystems at an unprecedented rate. In response species are shifting their ranges, life history traits, behaviors, and species interactions. Here, we use geographic variation in hybridizing field crickets (Gryllus pennsylvanicus and G. firmus) to understand how variable diapause - a period of developmental arrest to withstand seasonal extremes - in response to changing climates. We use both field and laboratory experiments in populations of both species, to (1) characterize diapause and generation time in natural populations and (2) determine how variable diapause is between species and latitudinal populations. We found that populations from northern latitudes of both species have relatively synchronous hatching and adult generation time, but that G. firmus tends to sustain hatching

longer than G. pennsylvanicus. We only recently deployed passive acoustic recorders at two sites (Clearfield, PA and Fort Mott State Park, NJ) to begin to assess data from natural populations. This work has the potential to show how species respond and adapt (or do not, for that matter) to climate change.

Author: Brayden Todd

Faculty Advisor: TJ Firneno **Juniata College**

P2-32: Synthesis and characterization of tetradentate ONN Schiff base complexes

Schiff bases incorporating natural product moieties, e.g. chromenes, are increasingly being studied, owing to their interesting structures and range of biological activities. A salen-type chromene-Schiff base ligand was synthesized by the condensation of an ortho-hydroxy chromene aldehyde with dimethyl phenylenediamine. The corresponding zinc, copper, and nickel complexes were subsequently prepared. Both NMR and IR spectroscopic analysis were used to confirm the formation of the ligand and the metal complexes. To further characterize the metal complexes, X-ray diffraction (XRD) and UV-Vis spectroscopy were performed and gave insight into the bond length, geometry, and electronic properties of the metal complexes. The XRD data showed that the zinc complex was 5-coordinate, as well as slightly distorted square pyramidal, compared to the 4-coordinate copper and nickel complexes that were square planar. In addition, the UV-Vis spectroscopic analysis indicated the similarity of the metal complexes, potentially being metal to ligand charge transfer (MLCT) band, due to the high absorptivity, and a potential red shift in metal complexes caused by the lowering of energy by the differing metals.

Author: Ethan Roe, Tysean Johnson, Sylvia Stanell, Matthew Crawford, Chloe Lyle, Colin D. McMillen, William G. Dougherty Jr., and Geneive E. Henry

Faculty Advisor: Dr. Geneive E. Henry **Susquehanna University**

P2-33: Larval Fish Habitat Ecology

Given their importance in fish life cycles, little is known about the larval stage of freshwater fish in the Juniata Basin. This study attempts to illuminate one of the most important aspects of fish ecology, their habitat. By making use of light traps, larval fish were sampled from 5 different site types: lentic emergent aquatic plants, lentic submerged trees, lentic submerged, invasive aquatic plants, lotic submerged trees, and lotic emergent aquatic plants. While the study is still in progress, thus far it has been found that fish of the family Clupeidae prefer woody, lotic sites; that in lentic bodies of water, larvae of the family Percidae perfer emergent plants; and that larvae of the families Centrarchidae and Cyprinidae are generalist, much like their adult forms. Additionally, lentic sites demonstrate much more larval fish diversity at the family level than lotic sites do. If these findings continue to be supported by further data, understanding fish larvae habitat relationships could be a new tool in fisheries management to promote better habitat usage and restoration techniques.

Author: Brett Russotto

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P2-34: Synthesis of Furan-Based Terarylene for Photochromic Drug Delivery

The objective of this project is to construct a dithienylethene (DTE) molecular complex capable of light-triggered drug release, facilitating targeted delivery for the selective eradication of cancerous cells. The DTE presented is a terarylene that contains a 2,3-disubstituted thiophene core. The synthesis involves a Pd-catalyzed Suzuki coupling reaction allowing for a concise and convergent process. The terylene should exhibit photochromic properties, enabling examination of its ring opening and ring closing capabilities via light irradiation The thiophene sulfurs can be oxidized to form the S-oxide or S,S-dioxide which changes the photochemical properties and reactivity. We will examine these changes using UV/Vis spectrophotometry and NMR spectroscopy.

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Faculty Advisor: Kevin Schultz **Goucher College**

P2-35: Behavioral Changes of Convict Cichlid Parental Pairs During Offspring Development in Response to a Predator

In our research project, we observed behavioral changes during offspring development in the biparental convict cichlid (Amatitlania nigrofasciata). We set up pairs in experimental tanks and recorded pair behavior when presented with a heterospecific predator to examine levels of parental aggression and pair coordination throughout the stages of offspring development. We predicted aggression towards the predator would increase as the offspring developed because the free-swimming fry might be more susceptible to predation and also because parental defense in convict cichlids overlaps with territorial defense behavior. We predicted that the pair coordination would also increase over time because as offspring age the pairs will be more successful if they are able to act as a cohesive unit while defending their young.

Authors: Mariah N. Dixon and Hailey G. Perez

Faculty Advisor: Dr. Natalie A. van Breukelen **Goucher College**

P2-36: METTL3 is required for Germline Function During Drosophila Spermatogenesis

The addition of a methyl group to the N6 position of adenosine (m6A), regulates several aspects of RNA metabolism. The evolutionarily conserved enzyme that adds the m6A modification METTL3, plays a crucial role in numerous biological processes such as spermatogenesis. Our current work focused on Drosophila spermatogenesis suggests METTL3 and subsequently m6A is crucial for germline development. Germline specific knockdowns using the GAL4/UAS system were used to investigate the function of METTL3 during spermatogenesis. We find that germline knockdown of METTL3 results in spermatid bundle disassociation evident by phalloidin actin staining. This disassociation phenotype is coupled with a loss of actin waste bags, a phenotype associated with failed late-stage progression through spermatogenesis. Additionally, we find germline knockdowns lack mature sperm in seminal vesicles. Overall, our findings suggest METTL3 is required for germline development. Additionally, our work may provide further insight into METTL3's and subsequently m6A role in metazoan reproduction. **Authors: Rohan Harris and Jazmyn Moodie**

Faculty Advisor: Antonio Rockwell **Susquehanna University**

P2-37: Perfluorosulfonic Acids (PFSAs) and Polyethylene Microplastics: Interactions in Soil

Per- and polyfluoroalkyl substances (PFAS) are synthetic chemical compounds used in consumer, industrial, and commercial products. PFAS, commonly named "forever chemicals," are highly resistant to degradation, with some taking hundreds or thousands of years to decay. Furthermore, research has identified associations between PFAS exposure and health effects: organ disease, cancer, and altered immune system function are some examples. Due to their use in many manufacturing applications and their persistent nature, the presence of PFAS in the global environment is increasing. Because these chemicals and the discovery of their detrimental properties are relatively novel, research is ongoing to understand the effects of PFAS, and how to prevent or eliminate PFAS contamination. To contribute to this research, efforts have been made to study the interactions between PFAS, soil, and microplastics, another persistent pollutant. The goal is to identify relationships between PFAS's adsorption to microplastics and soil, and the properties of PFAS, such as its structure, size, and composition. This research specifically studies perfluoroalkyl sulfonic acids (PFSAs) with varying lengths of carbon chains. Using liquid chromatography and mass spectrometry as the main analysis method, trends in adsorption of these PFSAs have been identified. Notably, PFSAs with longer carbon chains tend to have higher rates of adsorption, and introducing polyethylene microplastics to samples of soil drastically increases the rates of adsorption for PFSAs. The implications of these results can lead to further research in fields relating to environmental studies, as understanding how pollutants interact is becoming increasingly necessary in the modern age.

Authors: Gedalia Bloomenstiel and Rebekah Gray

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P2-38: Investigating Skin Permeability through Molecular Dynamics

Skin permeability is a measure of how chemicals penetrate our skin barrier, the upper layer of the epidermis. Knowledge of how permeable our skin is essential to determining safe and effective levels of toxins and topical drugs. Currently the method for testing skin permeability is ex vivo/in vitro experiments which involve using actual skin samples from either humans or animals. Reliable molecule dynamic (MD) simulations offer an additional way to collect information on skin permeates. MD simulations cut down on experimental cost and resources, and reduce human exposure to potentially harmful chemicals. For this research I have been using an accelerated weighted histogram (AWH) method to calculate permeability constants for several different molecules.

Author: Sandy Milby

Faculty Advisor: Dr. William Ames **Juniata College**

P2-39: Enhancing Worm Behavior Analysis through Software Optimization and Machine Learning Model.

Recording behavioral responses of worms poses significant challenges, including potential bias and limited capacity for manual observation. Utilizing computer programs can significantly increase the volume of recordings and enhance accuracy. I investigated various software solutions for worm behavior analysis, and later decided to focus on updating the open-source Tierpsy-Tracker. Methods included updating and optimizing Tierpsy-Tracker to align with our computer systems and ensure accurate results. Additionally, I developed a machine learning

model for segmentation, feature extraction, and visualization of the skeleton data from Tierpsy-Tracker. My workflow allows for efficient and comprehensive analysis of worm behavior, providing reliable and reproducible results. Additionally, I have ensured to create an easy setup and provided thorough documentation for future applicants to facilitate seamless adoption and use.

Author: Mahade Mishuk

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P2-40: Geophysical Techniques for Locating Buried Foundations at Gustavus Adolphus Hall at Susquehanna University

An investigation to determine the effectiveness and accuracy of geophysical techniques such as Ground Penetrating Radar (GPR) and Electrical Resistivity Tomography (ERT) together to explore buried foundations. This study was conducted on the former site of Gustavus Adolphus (GA) Hall at Susquehanna University, in Selinsgrove PA. GA was constructed in 1895 and burned down in 1964. GA's location was used as an experimental site. Multiple surveys were performed onsite including a large GPR survey, with a 32x37 m2 grid where the survey lines were spaced by 50 cm, was conducted to ascertain the locations of any remaining buried foundations of the site. Two small GPR surveys, one with 400MHZ and the second with 900 MHZ, in addition to an ERT survey all performed on the same 7x14 m2 grid area, were then implemented to further visualize the area of the foundation that was depicted in the large survey grid. The study also focused on comparing these geophysical techniques with one another or the combination of them. Using both 2D and 3D models a section of GA structure was made visible. The model shows a long wall extending east-west in addition to a large anomaly south of the building which is believed to represent the stairs of GA. This anomaly was also shown on the ERT model as a high resistivity area.

Authors: Seth Corcelius and Ahmed Lachhab

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P2-41: Picky pests: A study of the relationship between genetics and herbivory

Herbivory is an important ecological interaction that affects plant growth and reproduction. Herbivory can affect ecology as broadly as ecosystem dynamics and as narrowly as herbivore preferences. It is affected by many things such as plant type, availability of resources, climate, and much more. Even plants of the same species will not be genetically identical, so herbivory varies from plant to plant within the same species. This study aims to observe which genetic or environmental factors attract herbivores at different frequencies. To assess this, a series of experiments were conducted on Solidago sempervirens (seaside goldenrod) with samples collected both from the field at the Chesapeake Bay Environmental Center and a common garden at Goucher College. Samples were collected from two locations to compare different types of herbivory, such as bites and sap-sucking bugs. Sampling in the field consisted of measuring plant height, taking leaf samples, and a few other environmental samples. The common garden sampling focused on counting bugs and bites on plants. This combined with genetic information from each sample allowed us to conclude which factors have a greater attracting force to herbivores. We hypothesized that some genotypes are eaten at a higher rate than others. We found that genetic diversity in the common garden affected herbivory,

while in the field, diversity was more complex to follow and did not result in significant differences. Our results suggest that while genetic variation may affect herbivory under controlled conditions, it may be a less important factor in determining how much plants are eaten in the field.

Authors: Tanise Thorton-Fillyaw and Lily L'Oiseau
Faculty Advisor: Dr. Akana Noto **Goucher College**

P2-43: Synthesis and Molecular Structure Analysis of Tetradentate ONNO Schiff Base Copper (II) Complexes

There is much interest in studying Schiff bases owing to their ease of synthesis, ability to coordinate transition metal ions, and numerous pharmacological properties. Three salen-type Schiff bases were synthesized by the condensation of 5-hydroxy-2,2-dimethyl-2H-chromene-6-carbaldehyde with three diamines: 4,5-dimethyl-1,2-phenylenediamine, ethylenediamine, and 2,2-dimethyl-1-3-propanediamine. The corresponding copper (II) complexes were prepared and characterized by X-ray diffraction analysis, in combination with FT-IR and UV-Vis spectroscopy. The X-ray diffraction analysis indicated a similar coordination pattern for all three copper complexes with the copper ion bound to two oxygen and nitrogen atoms. The complexes have a slightly distorted square planar geometry, with [O-M-N] bond angles less than 180°. IR spectroscopy revealed the presence of the expected imine (C=N) group for both the ligands and their corresponding copper complexes. The UV-Vis spectra showed a slight to moderate red shift in copper complexes compared to starting material ligands, possibly due to the d-electron charge transfer bands from metal to ligand.

Authors: Tysean Johnson, Ethan Roe, and Geneive Henry
Faculty Advisor: Geneive Henry **Susquehanna University**

P2-44: The NativePlantApp: A Tool for Driving the Supply and Demand of Native Plant Species to Encourage Sustainable Landscaping

The spread of invasive plant species threatens wildlife, disrupts ecosystems, reduces biodiversity, and harms the natural environment. Yet, for particular factors in the landscape plant marketplace, most plant nurseries continue to overwhelmingly supply non-native or invasive plants. To mitigate this issue, government agencies and non-profit organizations have published resources and tools educating consumers about avoiding invasive plant species and opting for native species, but these materials can be inaccessible and incomplete, and they don't address the underlying challenge of a lack of supply of native plants. These existing efforts are frustrating, in that they encourage and sometimes guilt consumers into making environmentally-friendlier choices that are ultimately beyond their reach. To address these concerns, our team is creating the NativePlantApp, a set of online tools available to both plant consumers and suppliers, allowing consumers to easily compile lists of native plants to design sustainable landscapes suitable to their specific region and allowing plant nurseries to use these lists to anticipate demand and alter their supply to include more native species accordingly. Unlike other existing tools, the NativePlantApp uses a national database published by the U.S. Department of Transportation Federal Highway Administration and bplant.org, allowing individuals to search for native plants adapted for their ecoregion and tailor their search results to their project. Operating at a national scale, the NativePlantApp will inform consumers,

facilitate their eco-conscious choices, and aggregate and amplify their voices of demand for native plants, granting nurseries the confidence and encouragement to adjust their supply.
Authors: Gianna Leone, Jeremy Parke, Laurine Rat, Matt Malloy, and Quintin Ioime
Faculty Advisor: Dr. Norris Muth **Juniata College**

P2-45: Neurodevelopmental Impacts of Organophosphates on Late-Stage Amphibian Larvae
Organophosphates pesticides are specifically made to target the nervous system of insects. Unfortunately, these pesticides can also be found in the habitats of non-target organisms, including amphibians. Much research has been done on acute exposures to organophosphates, however exposures to low and environmentally realistic concentrations of these pesticides are less well studied. In this study, we wanted to get a better understanding of the impacts that organophosphate pesticides have after a prolonged chronic exposure to environmentally realistic concentrations of an organophosphate. To do this, Northern Leopard Frog (Lithobates [Rana] pipiens) tadpoles were exposed to either a vehicle control or to 1 µg/L of the organophosphate malathion for approximately 20 weeks in a blind, controlled laboratory study. We are analyzing the changes to the neurodevelopment by examining brain morphology. By studying brain morphology, we get a better understanding of how these common environmental pollutants impact the nervous system of tadpoles and we are more likely to improve how we apply pesticides. This research could help in the conservation efforts of herpetofauna worldwide.
Authors: Santoshi Mutyala, Delanie Crabtree and Sara McClelland
Faculty Advisor: Sara McClelland **Moravian University**

P2-46: Analyzing Anti-Predator Responses of Tadpoles after Chronic Exposure to Nanoplastics
Production of single-use plastic goods has increased throughout the world since the mid-1950's. Today, over 360 million metric tons are created annually. These plastics never disappear from the environment. Instead, over time, breaking down of plastics leads to different sizes of debris such as microplastics, which are particles < 5 mm, or nanoplastics, which are particles < 1µm. In nature, tadpoles aggregate as a defense mechanism when predators are around. Previous research using a concentration of microplastics on the higher end of what is found in nature, showed that tadpoles exposed to microplastics have a lower cluster rate than tadpoles that are not exposed to microplastics. The aim of this study was to test if exposure to lower concentrations of nanoplastics, likely more commonly found in aquatic habitats, also impact how tadpoles react to predators. We raised tadpoles in two groups: one group was exposed to a low concentration of nanoplastics in the water and the other was not exposed to nanoplastics. Tadpoles were then placed into an experimental tank. After the tadpoles habituated, a crayfish was added to the tank. Using a grid-style system, the cluster rate of the tadpoles will be measured. By comparing tadpole cluster rates, we will be able to better understand how differing concentrations of nanoplastics in the environment can impact predatory responses of tadpoles. This work can have implications on the conservation of tadpoles, as tadpoles may be more likely to succumb to predation if they do not display anti-predator defense behaviors.
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