

WELCOME

*Regional Science Consortium
22nd Annual Research Symposium
November 4-6, 2026
Tom Ridge Environmental Center
at Presque Isle State Park*

Welcome... to the celebration of our 22nd Annual Regional Science Consortium Research Symposium. Each year I look forward to the Symposium, and this year is no different. The RSC has evolved greatly over the last several years, and you will hear all about our new innovative programs as well as our long-term monitoring programs in the presentations. I am looking forward to listening to all of the current student and faculty research in this region and the collaboration among our many members.

Over the next three days, the Symposium will host 32 Oral Presentations, 1 Panel Discussion, and 33 Poster Presentations and Artwork! The goal of our Symposium is to always provide a venue to present scientific research and artwork by our RSC members. The Symposium is the one time each year that the RSC member scientists and students in this region gather together to inform others of their research and also listen to their colleagues' research; thereby creating a great opportunity for collaboration among scientists from all disciplines, which I believe to be the spirit of the Consortium. Our network is growing with the development of a more multi-disciplinary approach. The overlap of science with art has always been apparent in history, and we are looking forward to making that overlap an essential part of the work at the RSC. All of this makes for a great variety of presentations that will interest everyone. Therefore, take the time to listen or view as many presentations as you can... they are most impressive this year.

We encourage everyone to attend our Poster Session on Wednesday evening from 6:00 – 8:00, providing the opportunity to discuss the projects with the poster presenters. All are welcome to attend (*refreshments provided*).

I would like to thank all the Symposium participants this year. I would like to thank the Researchers, Professors, and Students, for their hard work in preparing their PowerPoint and poster presentations. I would also like to thank Holly Best and the PA DCNR staff and the TREC Foundation for the preparations. I would especially like to thank the RSC Team, Jennifer Salem, Sean Dalton, Sarah Magyan, Katy Wolfrom, and Tyler Brooks for their support of this event and all their work at the RSC. ***Thank you!***

I hope you all enjoy Symposium 2026! Please mark your calendar for next year's Regional Science Consortium Research Symposium on November 3 – 5, 2027.

Cheers!

Jeanette

Jeanette Schnars, Ph.D.

Executive Director, Regional Science Consortium

SCHEDULE OF TALKS

*Regional Science Consortium
22nd Annual Research Symposium
November 4-6, 2026
Tom Ridge Environmental Center
at Presque Isle State Park*

WEDNESDAY, NOVEMBER 4, 2026

- | | |
|---------------|---|
| 10:00 – 10:25 | REGISTRATION OPENS
Register, upload presentations |
| 10:00 – 10:25 | REFRESHMENTS |
| 10:25 – 10:30 | WELCOME
Jen Salem, Plant Lab Manager, RSC |

Presentations

Session Chair: Jen Salem, RSC Plant Lab Manager

- | | |
|---------------|---|
| 10:30 – 10:50 | Mercyhurst University - Intelligence Program
Ted Stanich,* Executive Director
<i>Mercyhurst University, Erie, PA</i> |
| 10:50 – 11:10 | Before the Crisis: Extending a One Health Real-Time Research Framework to Environmental Security
Tonya Nichols ¹ * and Ted Stanich ² *
<i>¹Aquatronox, LLC Gulf Breeze, FL; ²Mercyhurst University, Erie, PA</i> |
| 11:10 – 11:30 | Regulatory and Research Recreational Water Quality Sampling at Presque Isle State Park
Sean Dalton*
<i>Regional Science Consortium</i> |
| 11:30 – 11:50 | From Classroom to Community: Embedding Service-Learning in a Core Biology Curriculum
Beth Potter*
<i>Penn State Behrend</i> |
| 11:50 – 12:40 | LUNCH |

Session Chair: Sean Dalton, RSC Lab and Field Manager

- 12:40 – 1:00 **Molecular Identification of PETase Genes and Assessment of PET Plastic Degradation in Marine Bacteria**
Gennavieve Miller*+ and Rajinikanth Mohan
Mercyhurst University, Department of Biology, Erie, PA 16415
- 1:00 – 1:20 **Characterization of cold tolerant bacteria isolated from fourteen beaches along the Atlantic coast**
Sydney Wiegand*+, Rajinikanth Mohan
Mercyhurst University, 501 E 38th St., Erie, PA 16546
- 1:20 – 1:40 **Survey of Farming Practices in Erie, PA**
Allison Tibel*+, Shelby Spiva*+, Rajinikanth Mohan
Mercyhurst University, Department of Biology, Erie, PA 16415
- 1:40 – 2:00 **Endophytic Bacteria in Horsetails from Presque Isle & Letchworth State Parks**
Alexa Bartolomeo*, Ariana Economidou, Rajinikanth Mohan
Mercyhurst University, Department of Biology, Erie, PA 16415
- 2:00 – 2:20 **Comprehensive Analysis of Atmospheric Changes From the 2024 and 2026 Total Solar Eclipse**
David J. Horne, Havyarimana Roger*+, Nicholas B. Conklin
Gannon University
- 2:20 – 2:35 **BREAK**

Session Chair: Dr. Katy Wolfrom, RSC Director of Education

- 2:35 – 2:55 **Core Roles of Forensic Anthropology**
Joe Adserias-Garriga*, DDS. PhD, D-ABFO, DLAF-cert.
Chair, Dpt of Applied Forensic Sciences at Mercyhurst University
- 2:55 – 3:15 **Intentional Dismemberment Patterns in the American Northeast**
Ella Griffith*+,
Master in Forensic and Biological Anthropology, Mercyhurst University
- 3:15 – 3:35 **Beyond the Lab: Developing Continuous Cortisol Monitoring Patch**
Udoko, I.¹*, Udoko, D.²*, Udoko, P.¹, & Ji, X.¹
¹*Gannon University*
²*Pennsylvania State University*
- 4:30 – 6:00 **RSC BOARD MEETING** – RSC Board Members – *Room 112*
- 6:00 – 8:00 **POSTER SESSION & ART EXHIBITION** – All are welcome to attend
(Refreshments provided)

THURSDAY, NOVEMBER 5, 2026

8:30 – 9:20	REGISTRATION OPENS Register, upload presentations
8:30 – 9:20	REFRESHMENTS
9:20 – 9:25	WELCOME Jen Salem, Plant Lab Manager, RSC

Presentations

Session Chair: Jen Salem, RSC Plant Lab Manager

9:25 – 9:45	Erosion in bedrock streams of Erie County, Pennsylvania: Preliminary findings and Walnut Creek's two canyons Nicholas L.G. Schiff* <i>Independent Researcher</i>
9:45 – 10:05	Investigating the Importance of Plant-Microbe Interactions in Lake Erie Bluffs: Coltsfoot as a Model Pioneer Species Natalie Jurkowski*+, Rajinikanth Mohan <i>Mercyhurst University</i>
10:05 – 10:15	BREAK
10:15 – 10:35	Molecular Documentation of Spring Mushrooms in Erie, PA Austin Stamp*+, Maryclare Parker- Stark*+, Rajinikanth Mohan <i>Mercyhurst University, Department of Biology, Erie, PA</i>
10:35 – 10:55	eDNA from PA to ZA: Progress on Gruwell Lab eDNA projects from Lake Erie to South Africa Matthew E. Gruwell Ph.D.* <i>Penn State Erie, The Behrend College</i>
10:55 – 11:05	BREAK

Session Chair: Sean Dalton, RSC Lab and Field Manager

11:05 – 12:05	Discussion Panel - Mercyhurst University Intelligence Studies Bill Brosius, Chair, Department of Intelligence Studies; Ted Stanich, Executive Director, Department of Intelligence Studies; Chris Mansour, Ph.D., Chair, Computing and Information Science
12:05 – 1:00	LUNCH

Session Chair: *Dr. Katy Wolfrom, RSC Director of Education*

- 1:00 – 1:20 **Bank Swallow Stewardship at Presque Isle State Park: A Pilot Project**
Holley Short*
Erie Bird Observatory
- 1:20 – 1:40 **Long-term Patterns in Least Bittern Detections at Presque Isle State Park**
M. Collette Lauzau*, Dr. Sarah Sargent
Erie Bird Observatory
- 1:40 – 2:00 **A Decade of Endangered Piping Plover (*Charadrius melodus*) Success at Presque Isle**
Catherine D. Haffner¹*, Nicole A. Ranalli², Patricia M. Barber¹
¹*Pennsylvania Game Commission, Bureau of Wildlife Management, Wildlife Recovery Division, 2001 Elmerton Avenue, Harrisburg, Pennsylvania 17110*
²*U.S. Fish and Wildlife Service, Pennsylvania Field Office, Ecological Services, 110 Radnor Rd, Suite 101, State College, Pennsylvania 16801*
- 2:00 – 2:20 **BREAK**

Session Chair: *Tyler Brooks, RSC AmeriCorps Member*

- 2:20 – 2:40 **Trophic overlap between invasive round gobies and native benthic darters in a stream biodiversity hotspot**
Mark A. Kirk*, Casey R. Bradshaw-Wilson, and Kelly J. Pearce
Watershed Conservation Research Center
- 2:40 – 3:00 **Developmental and Behavioral Effects of Road Salt Runoff on American Toad Tadpoles**
Dhrisha Iyer*+, Lynne Beaty, Samuel Nutile
Penn State Erie, Behrend
- 3:00 – 3:20 **Developing and Refining a Three-Stage Compartmentalized Logistic Population Model For Wolf Spiders (Lycosidae) of Erie, PA**
Dr. Daniel J. Galiffa*
Associate (Tenured) Professor of Mathematics, Penn State Erie, The Behrend College
- 3:20 – 3:40 **A Summary of Two Years of Pollinator Collecting on Newly Restored Dunes on Beach 8**
Tyler Brooks*
AmeriCorps SMILES Program, Regional Science Consortium

FRIDAY, NOVEMBER 6, 2026

8:00 – 8:30	REGISTRATION OPENS Register, upload presentations
8:00 – 8:30	REFRESHMENTS
8:30 – 8:35	WELCOME Sean Dalton, Field and Lab Manager, RSC

Presentations

Session Chair: *Femi Oloye, Ph.D., University of Pittsburgh at Bradford*

8:35 – 8:55	Wetland Restoration at Presque Isle State Park – A Never-ending Story Holly Best, Ph.D.* <i>Pennsylvania Department of Conservation and Natural Resources</i>
8:55 – 9:15	Restoration Updates Jen Salem* <i>Regional Science Consortium</i>
9:15 – 9:35	Antibiotics in the environment: the unseen effects Mosier*+, F. Oloye, O. Oloye <i>University of Pittsburgh at Bradford</i>
9:35 – 9:55	Evaluating the Toxicity of Plastics in The Environment: A Direct Comparison of BPA, BPS, and BPF J.Troutman*+, F. Oloye, O. Femi-Oloye <i>Department of Physical and Computational Sciences</i> <i>University of Pittsburgh at Bradford</i>
9:55 – 10:10	BREAK

Session Chair: *Oluwabunmi Femi-Oloye, Ph.D., University of Pittsburgh at Bradford*

10:10 – 10:30	Predicted Toxicity of Select Cyanotoxins via In Sillico Computation Connor Cornelius*+ <i>University of Pittsburgh at Bradford</i>
10:30 – 10:50	Pollinator Companion Plant Effects on Tomato Pollination and Fruit Quality Paige Frederickson*+ <i>Biology Program, University of Pittsburgh at Bradford, Bradford, PA</i>
10:50 – 11:10	Using in silico methods to estimate the toxicity of several herbicide safeners A. Owens*+, F. Oloye, O.Oloye <i>University of Pittsburgh at Bradford</i>

11:10 – 11:30	Ecotoxicity and Atmospheric Chemistry of Volatile Aldehydes: Formaldehyde, Acrolein (2-propenal), and Acetaldehyde J Emma C. Whispell*+, Dr. Femi Oloye, and Dr. Bunmi Femi-Oloye <i>University of Pittsburgh at Bradford</i>
11:30 – 11:50	A Closer Look at Water Quality: Determination of Trace Nickel and Copper Concentrations in Tunungwant Creek Water Using Solid Phase Extraction and Atomic Absorption Spectroscopy Peyton Haight*+, Dr. Femi Oloye, and Dr. Bunmi Femi-Oloye <i>University of Pittsburgh at Bradford</i>
11:50 – 12:30	LUNCH

12:30 – 12:45	PRESENTATION OF THE JERRY COVERT STUDENT RESEARCH AWARDS Jen Salem, RSC Plant Lab Manager Sean Dalton, RSC Field and Lab Manager <i>Student Award Presentations</i> <i>Closing Remarks</i>
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ABSTRACTS

*Regional Science Consortium
22nd Annual Research Symposium
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ORAL PRESENTATIONS

WEDNESDAY, NOVEMBER 4, 2026

Before the Crisis: Extending a One Health Real-Time Research Framework to Environmental Security

Tonya Nichols^{1*} and Ted Stanich^{2*}

¹*Aquatronox, LLC Gulf Breeze, FL;* ²*Mercyhurst University, Erie, PA*

Emerging threats rarely begin as clearly defined crises. Signals may first appear in environmental monitoring, water and wastewater, wildlife, animal or plant populations, or other natural and built systems. Individually, these observations may appear unrelated or insufficient to prompt action. Viewed together, however, they may provide important information about an emerging biological or environmental threat. This work builds upon the Real-time Research Framework for Bio-incidents using a One Health Approach, developed through the National Science and Technology Council Health Security Threats Subcommittee to support an integrated research agenda during significant biological incidents. The framework uses sector-based research keys and interdisciplinary integration to identify data gaps, research needs, expertise, and information-sharing requirements across human, animal, plant, and environmental sectors. We explore whether this approach could be extended upstream—from organizing research during an emerging incident to identifying and investigating signals that may precede one. An environmental security lens raises additional questions: What constitutes a meaningful signal? Who collects the relevant information? What connections across sectors may reveal significance that is not apparent within any single discipline? What information is missing, and what research could help distinguish emerging threats from background conditions? This presentation proposes an extension of the framework and considers how representative scenarios could be used to examine environmental signals, cross-sector information gaps, and interdisciplinary research questions at the intersection of One Health, environmental security, and intelligence analysis.

From Classroom to Community: Embedding Service-Learning in a Core Biology Curriculum

Beth Potter*

Penn State Behrend

As biology programs evolve to meet the needs of an increasingly interconnected society, curricula must provide opportunities for students to engage with both scientific content and the communities they serve. To strengthen these connections and introduce students to Penn State Behrend's Open Lab philosophy, a six-week service-learning pilot project was implemented in BIOL 230W, a fourth-semester core course required for all biology majors. Developed in partnership with the Regional Science Consortium's (RSC) Weed Warrior Program, the project connected classroom learning with community-based environmental stewardship. Students participated in presentations by RSC representative Jen Salem, conducted small-group research on invasive plant species found at Presque Isle State Park, and engaged in fieldwork removing invasive species. Pre- and post-assessment surveys were used to evaluate changes in student knowledge, attitudes, and skills related to invasive species management and community engagement.

Results demonstrated a positive impact on student learning and engagement. Nearly 80% (79.7%) of participants reported increased knowledge of invasive plant species and a greater understanding of the importance of the Weed Warrior Program in supporting local conservation efforts. Students also reported gains in teamwork, communication, and their ability to connect biological concepts to real-world environmental challenges. These findings suggest that service-learning can effectively integrate scientific content, community engagement, and professional skill development within the undergraduate biology curriculum. The success of this pilot project provides a strong foundation for expanding Open Lab experiences and strengthening connections between undergraduate scientists and the communities they serve.

Regulatory and Research Recreational Water Quality Sampling at Presque Isle State Park

Sean Dalton*

Regional Science Consortium

During the recreational swimming season between Memorial Day and Labor Day, Presque Isle State Park's beaches can see over 4 million visitors. During this peak time of the year, RSC staff and technicians collect and process beach water samples for various water quality parameters 7 days a week. Analysis is run on parameters ranging from bacteria concentrations in the water to harmful algal bloom toxin levels, all of which is reported to State and County managers to help ensure the public is as informed as possible.

Molecular Identification of PETase Genes and Assessment of PET Plastic Degradation in Marine Bacteria

Gennavieve Miller*+ and Rajinikanth Mohan

Mercyhurst University

Polyethylene terephthalate (PET) is one of the most commonly used polymers in food and beverage packaging. Due to improper plastic waste management, plastic has become a pressing issue for both the environmental and human health. Microorganisms may respond to this stress by adapting an enzyme necessary to degrade the waste. Polyethylene terephthalate hydrolase enzymes (PETase) are used in the degradation of plastics and offer a sustainable solution for recycling PET. However, their prevalence and efficiency are not yet well understood. The objective of this study is to determine how prevalent PET-degrading enzymes are in the marine environment. In this study, we utilized marine bacteria isolated from various beaches along the United States East Coast to investigate the degradation of PET in tryptic soy broth agar (TSA) plates. To promote plastic degradation, we will use minimal media agar supplemented with PET to screen for plastic degradation activity. As a complementary approach, we will also screen the bacteria using primers designed to amplify PETase enzymes that are commonly employed for PET degradation. Through this study, we hope to find if there is enrichment of PETase enzymes in certain bacterial taxa. Understanding the genetic and functional aspects of marine microorganisms in response to plastic pollution may inform future bioremediation strategies and contribute to sustainable approaches to plastic waste.

Characterization of cold tolerant bacteria isolated from fourteen beaches along the Atlantic coast

Sydney Wiegand*+, Rajinikanth Mohan

Mercyhurst University 501 E 38th St., Erie, PA 16546

Bacteria living in marine environments must be able to tolerate certain conditions such as low temperatures and saline environments. There is limited research on the culturable microbes from the ocean, as well as the mechanisms that marine bacteria use to survive. In this study, we cultured bacteria from 14 beaches along the Atlantic coast of the USA and characterized their tolerance mechanisms. Plating undiluted sea water and incubating at 4°C, we found over 50 isolates and found surprisingly similar bacteria in numerous beaches across the coast. Using 16s ribosomal RNA sequencing, we identified *Pseudomonas*, *Pseudoalteromonas*, *Marinobacter*, and *Psychrobacillus* as the most common genera across all of the beaches. The common presence of a certain species of bacteria indicates that the

species may have tolerance mechanisms suitable for the average marine environment. The cold-tolerant isolates were screened on salt to identify dual tolerant species. SDS-PAGE of cold and salt exposed *Psychrobacillus* isolates revealed a ~30kDa differentially expressed protein band identified as ribosomal subunit proteins. This study provides insights into how bacteria can survive in the seemingly stressful environment of the ocean.

Survey of Farming Practices in Erie, PA

Allison Tibel*+, Shelby Spiva*+, Rajinikanth Mohan

Mercyhurst University, Department of Biology, Erie, PA 16415

Modern agriculture poses a burden on environmental and human health, while unpredictable weather patterns and high costs of fossil fuels compound the challenges in agriculture. Consequently, there is increasing awareness among farmers about the need for sustainable practices in agriculture. In this study, we surveyed the farming practices of over 20 agricultural farms in Erie County, PA. We observed, not surprisingly, that sustainable farming practices were more commonly associated with smaller farms. Although none of the farms were certified organic, organic agricultural practices were surprisingly common. Specific sustainable practices found to be common in this study include low tillage, cover crops and organic fertilizers and reduced reliance on chemical fertilizers and synthetic pesticides. Publication of this survey will help local farmers relate to common challenges how the farming community is responding to them.

Endophytic Bacteria in Horsetails from Presque Isle & Letchworth State Parks

Alexa Bartolomeo*, Ariana Economidou, Rajinikanth Mohan

Mercyhurst University, Department of Biology, Erie, PA 16415

Horsetails are ancient plants that belong to the genus *Equisetum*. They are present worldwide and the most common horsetail in North America is the field horsetail, *Equisetum arvense*. Horsetails have physiological adaptations to thrive in diverse environments ranging from deserts, marshes, shallow water and forests to open land. In this study, we isolated endophytic bacteria from stems and leaves of horsetails from two distinct environments: dry sand in Presque Isle (PI) in Pennsylvania and wet shale cliffs at Letchworth State Park (LSW) in New York. We observed that while horsetails obtained from both locations harbored *Pseudomonas* species, they also contained unique rare bacteria including *Cohnella phaseoli* in PI and *Duganella zoogloeoides* in LWS. Bacteria isolated from LWS exhibited distinct adaptations including higher cold tolerance, while PI horsetails appeared to be able to withstand higher temperatures. Interestingly, while the bacteria in PI were able to ferment a variety of sugars, LWS bacteria showed little fermentation capacity. These metabolic and stress adaptations of the bacteria may reflect adaptations in their native environments, and we suggest that the endophytic bacteria may help the host horsetails cope in their respective habitats.

Comprehensive Analysis of Atmospheric Changes From the 2024 and 2026 Total Solar Eclipse

David J. Horne, Havyarimana Roger*+, Nicholas B. Conklin

Gannon University

A rapid reduction in light levels from the sun and the associated changes in local temperature and pressure may result in changes to several atmospheric parameters. While detections of atmospheric changes have been previously reported during total eclipse events, data is limited. This makes the detection of atmospheric effects that can be attributed to the eclipse elusive due to the infrequent nature of total eclipse events and their variation in geographical location. The 2024 total eclipse provided an excellent opportunity to study the atmospheric effects of the eclipse as it moved across a singular continent. Our goal during the 2024 Great North American solar eclipse was to search for evidence of atmospheric changes, measure their effects and the extent of their changes caused by the passage of the moon's shadow during the total eclipse. Additional data from the 2026 Spanish solar eclipse is provided; however, not analyzed to the extent of the 2024's. We discuss the construction and operation of a series of atmospheric science packages comprising of atmospheric sensors and a GPS locator.

These sensor packages were placed at seven geographically separate locations across North America from Texas to New York to record atmospheric conditions along the line of totality as the moon's shadow moved across the continent. We present results showing the effect of the eclipse on *light level*, *wind speed*, *wind direction*, *atmospheric pressure*, and *humidity* and conduct detailed site-to-site comparisons of the atmospheric conditions at each geographic location before during and after totality.

Core Roles of Forensic Anthropology

Joe Adserias-Garriga*, DDS. PhD, D-ABFO, DLAF-cert.

Chair, Dpt of Applied Forensic Sciences at Mercyhurst University

Forensic anthropology plays a critical role in medicolegal investigations by translating biological and environmental information into evidence that may address two fundamental questions: Who is the deceased, and what happened to them? Although forensic anthropology is often associated with the estimation of the biological profile from dry bones, its contribution extends considerably further, encompassing the recovery, personal identification, and interpretation of skeletal trauma and pathology. This presentation examines the two core functions of forensic anthropology: human identification and reconstruction of the events surrounding the death. Identification may rely on the comparative assessment of skeletal and dental anatomy, antemortem trauma, pathological conditions, surgical interventions, dental treatment, and other individualizing characteristics documented during life. By integrating these features with antemortem medical and dental records, and other sources of information, the forensic anthropologist can establish concordance between an unknown set of remains and a potential missing individual. At the same time, skeletal remains preserve evidence of an individual's experiences and the biological processes occurring before, around, and after death. The analysis of skeletal trauma and context can contribute to reconstructing the events surrounding death. Distinguishing the different mechanisms of trauma and their proper interpretation can lead to the reconstruction of the events around the death and therefore assist in establishing the cause and manner of death.

Intentional Dismemberment Patterns in the American Northeast

Ella Griffith*+

Master in Forensic and Biological Anthropology, Mercyhurst University

This presentation will cover the different methods of dismemberment observed in forensic cases, the affected areas of the body, alongside implements used, in cases examined by the Mercyhurst Forensic Anthropology Laboratory (MFAL). This presentation will provide another reference sample in the comparative study of dismemberment both nationally and internationally. Comprehensive data have been published for New York City (Adams and Rainwater, 2018) and non-comprehensively for the state of Florida (Rubin, 2021), but not yet for a multi-state body. All Mercyhurst case files logged (x) to (y) ($N=x$) were accessed and reviewed for evidence indicative of intentional human dismemberment. Of the cases reviewed in this period, ($N=x$) were evaluated to have involved intentional dismemberment, representing (x) individuals. After identification, the demographic information of the individuals was then taken. All dismemberment data was taken from trauma identified on skeletal remains that were delivered to MFAL for scientific analysis. Both the state of remains and amount of remains were inconsistent and depended on the circumstances of the recovery or the submission of body parts by the offices commissioning anthropological analysis. MFAL cases were then categorized into dismemberment mode following Rainwater (2018) and Rubin and Finlayson (2021) : anatomical disarticulation of the joints; transection of bone via sawing; and/or transection of the bone via chopping. Once mode of dismemberment was determined by the identification of one or more categories, the most commonly affected body regions were quantified. The tool types were then identified through trauma markers indicative of saw, sharp-force, and chopping implements and how they compared across dismemberment modes. The documentation of dismemberment patterns from different areas of the United States not only assist law enforcement and forensic anthropologists to respond to investigative demands involving

Beyond the Lab: Developing Continuous Cortisol Monitoring Patch

Udoko, I.^{1*}, Udoko, D.^{2*}, Udoko, P.¹, & Ji, X.¹

¹*Gannon University*

²*Pennsylvania State University*

Cortisol is an important hormone involved in the body's response to stress. It plays an essential role in metabolism, immune system function, sleep regulation, and overall health. Current cortisol assessments typically rely on laboratory analysis of blood, saliva, or urine, collected at a limited number of time points, providing momentary measurements rather than continuous measurements, which allow a better understanding of physiological changes. As a result, individuals and healthcare providers often lack access to real-time information about stress and long-term hormonal trends. This presentation presents the early work of the development of a biosensor project. The project includes the design of a wearable cortisol monitoring patch intended to provide a continuous assessment of cortisol fluctuations in real time. The patch is envisioned as a minimally invasive wearable device, capable of collecting physiological data and translating it into useful information about stress, recovery, and overall wellness. By capturing long-term cortisol trends rather than individual measurements, the system aims to provide a clearer picture of an individual's hormonal responses. In addition to continuous monitoring, the project emphasizes ownership of health data allowing individuals to have more control over how their physiological information is stored, accessed and shared, while allowing them to have a better understanding of what their data means. The proposed technology demonstrates a step towards more technologically advanced wearable biosensors combining continuous biochemical monitoring with personalized digital health and data management.

Erosion in bedrock streams of Erie County, Pennsylvania: Preliminary findings and Walnut Creek's two canyons

Nicholas L.G. Schiff*

Independent Researcher

Major tributary streams of Lake Erie in Erie County, Pennsylvania have incised through drift from the Wisconsin glaciation and into the underlying Devonian bedrock. In places they have formed canyons with sets of strath terraces indicating a history of both vertical and lateral erosion. The latter appears to occur mainly by meander migration. Erosion is ongoing in Erie County streams today on both streambeds and along canyon walls, including the possible formation of new terraces, but the most significant modern changes appear to be lateral migration through alluvium. Further study of modern erosion will include selection of sites to monitor and comparisons based on historical records. Walnut Creek, flowing south and west of Erie, has two distinct segments with deep (>30 m) canyons in its upper (centered near 42.06°N, 80.07° W) and middle to lower reaches (42.05°N, 80.20° W). They are separated by a section with a much shallower valley. Compared with the upper canyon, the lower canyon exhibits higher terraces and more pronounced meanders. This two-canyon configuration is difficult to reconcile with the standing hypothesis, which attributes incision on Lake Erie tributaries to base level fall from the higher levels of proglacial lakes, and to bluff retreat. It is more likely that the two canyons have different histories of erosion: while incision in the lower canyon was at least partially due to lowering lake levels, the upper canyon formed as glacial retreat opened steeper paths into the Lake Erie basin.

Investigating the Importance of Plant-Microbe Interactions in Lake Erie Bluffs: Coltsfoot as a Model Pioneer Species

Natalie Jurkowski*+, Rajinikanth Mohan

Mercyhurst University

Bluff ecosystems play an important role in supporting diverse plant communities and maintaining the ecological stability of lakeside environments, yet these habitats are highly vulnerable to erosion caused by harsh environmental conditions. Within these ecosystems, pioneer plant species such as Colt's foot (*Tussilago farfara*) are often among the first plants to colonize disturbed bluff surfaces and may contribute to the early stages of bluff recovery. However, the mechanisms by which these species establish and contribute to the restoration and stabilization of eroded bluffs remain poorly understood. In this study, we sought to investigate the microbial diversity associated with the rhizospheres of Colt's foot and Horsetail and examine how these microbial communities may contribute to the ecological processes underlying bluff revival. Using culture-based isolation techniques and molecular methods including 16S rRNA gene PCR amplification, as well as stress and nutrient testing, we characterized the bacterial communities associated with the rhizospheres of these pioneer species at lakeside bluff sites. These findings contribute to a better understanding of the microbial communities present in recovering bluff ecosystems and provide baseline information for future research investigating how plant-microbe interactions may influence soil development, nutrient cycling, and stabilization of eroded lakeside bluffs.

Molecular Documentation of Spring Mushrooms in Erie, PA

Austin Stamp*+, Maryclare Parker- Stark*+, Rajinikanth Mohan

Mercyhurst University, Department of Biology, Erie, PA

Mushrooms are growing in popularity as a dietary protein source as well as forage delicacies. Mushrooms can be visually identified, but DNA-based genetic tests could be used to confirm their identity. The genetic tests, however, are not standardized and not accessible for general use. In this study, we developed a low-cost genotyping procedure to rapidly identify wild mushrooms. We used this technique to document spring mushrooms (March-May) in Erie, PA and over a two-year period, we found specific

mushrooms emerging consistently in spring in Erie, PA. This study can serve as a baseline for comparison in future studies evaluating changes in patterns of annual mushroom emergence.

eDNA from PA to ZA: Progress on Gruwell Lab eDNA projects from Lake Erie to South Africa

Matthew E. Gruwell Ph.D.*

Penn State Erie, The Behrend College

The focus of the Gruwell Genetics Lab in Behrend's Biology department is using molecular tools to better assess biodiversity, important species and invasive species, both locally and across the planet in Southern Africa. Students in our lab are using the tools of molecular genetics to better understand the natural world in the following ways: 1) exploring the biodiversity of fungus present on campus and in the nearby woods, leading to the discovery of new species, 2) creating DNA libraries of aquatic insects and fish from the Limpopo River drainage in South Africa, Botswana, and Zimbabwe for rapid assessment of species in critical parts of the system, 3) using metabarcoding and qPCR to assess biodiversity in Lake Erie, specifically targeting invasive species, 4) using metabarcoding and qPCR of eDNA to assess biodiversity and invasive species range expansion in river systems of North Eastern South Africa, and 5) using phylogenetics in new species discovery of *Enteromius* fish in Mpumalanga, South Africa. Here I present a review of all the activities we are tackling and continued plans for our work moving forward.

Bank Swallow Stewardship at Presque Isle State Park: A Pilot Project

Holley Short*

Erie Bird Observatory

Bank Swallows (*Riparia riparia*) nest in colonies at popular public beaches at Presque Isle State Park. This small swallow species is unique in that they use their small feet and wings to dig out burrows into steep banks and dunes. They seek out habitats near water in order to find these nesting habitats and foraging habitats to capture small insects on the wing. Because documented colonies at Presque Isle are located at highly-visited beaches, there is a high risk of disturbance by beach-goers to nesting colonies, including the collapse of burrows from habitat disturbance. Erie Bird Observatory created a pilot project with the support of the Department of Natural Resources (DCNR) to establish a stewardship program that provides education about nesting Bank Swallows to beach-goers at these beaches.

Long-term Patterns in Least Bittern Detections at Presque Isle State Park

M. Collette Lauzau*, Dr. Sarah Sargent

Erie Bird Observatory

Invasive vegetation can alter wetland vegetation structure and composition, with effects on marsh birds varying among species. Presque Isle State Park is an important coastal wetland on Lake Erie where wetland restoration and invasive vegetation management have occurred for more than a decade. Least bittern (*Ixobrychus exilis*) is a secretive marsh bird that depends on wetlands for breeding and foraging and is listed as state-endangered in Pennsylvania. This study evaluated long-term patterns in least bittern detections at Presque Isle State Park. Least bittern detections showed an overall downward trend. The spatial distribution of detections also changed over time in a portion of the park. Available vegetation data was examined to evaluate if changes in invasive vegetation could be determined to be the cause of shifts in least bittern detections. Limited availability and inconsistent quality of vegetation data prevented evaluation of the relationship between vegetation and least bittern detections. Ground vegetation surveys, unmanned aerial vehicle imagery, and remotely sensed imagery were evaluated for their potential to support future monitoring efforts. This study provides information on long-term patterns in least bittern detections and identifies considerations for improving vegetation monitoring and evaluating habitat conditions at the park.

A Decade of Endangered Piping Plover (*Charadrius melodus*) Success at Presque Isle

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The Great Lakes piping plover (*Charadrius melodus*) is protected as an endangered species under the U.S. Endangered Species Act and Pennsylvania Game and Wildlife Code yet was absent from Pennsylvania for over 60 years. This small shorebird is a Great Lakes dune and swale ecosystem obligate and umbrella species for associated plants and other wildlife; Presque Isle State Park (PISP) is the only nesting habitat in the state. Increased recreational pressure in the mid-1900s caused extirpation and vegetation encroachment in preferred habitat limited recolonization. In 2006, the Pennsylvania Game Commission (PGC) led a piping plover recovery assessment at PISP and initiated a multipronged approach with local partners to enhance recovery potential including habitat management by PISP, regular monitoring by Erie Bird Observatory, and swift nest protection by PGC. Benefitting from state-based and range wide recovery efforts, piping plovers returned to Pennsylvania as nesting birds in 2017. The Pennsylvania Piping Plover and Common Tern Recovery Partnership is celebrating 10 years of success with 23 breeding pairs hosted and 57 young fledged since their return.

Trophic overlap between invasive round gobies and native benthic darters in a stream biodiversity hotspot

Mark A. Kirk*, Casey R. Bradshaw-Wilson, and Kelly J. Pearce

Watershed Conservation Research Center

Invasive species pose a global risk to native biodiversity, and their impacts and rates of spread are predicted to increase under future environmental change. While a great deal of research has been done studying what functional traits define a successful invader, less research has been done regarding what defines how susceptible an ecosystem is to biological invasions. The round goby (*Neogobius melanostomus*) invaded the French Creek watershed of Pennsylvania in 2014, which harbors a renowned level of aquatic biodiversity. Yet round gobies have exhibited a very weak range expansion with minimal impact to native diversity over the last decade. Using a rich darter community as our model (11 different *Etheostoma* and *Percina* spp.), we tested for trophic niche overlap using stable isotopes analysis. We quantified isotopic niches of the 11 species using isotopes of nitrogen ($\delta^{15}\text{N}$), carbon ($\delta^{13}\text{C}$), and sulfur ($\delta^{34}\text{S}$). Using $\delta^{15}\text{N}$ to infer trophic position, we observed round gobies occupying a novel trophic position that sat lower than nearly all other darter species, as only one native darter showed evidence of trophic overlap (logperch; *Percina caprodes*). Using $\delta^{13}\text{C}$ to infer underlying basal resource use, we observed that fish origin could be differentiated between LeBeouf Creek (refugia for gobies) and French Creek (refugia for darters); providing evidence of isotopic niche shifts for some species. When the isotopic niche data are combined with our long-term diet studies, we can build a picture of the complexity of the French Creek food web. Our results have important implications for understanding how food webs in highly diverse communities can be affected by invasive species.

Developmental and Behavioral Effects of Road Salt Runoff on American Toad Tadpoles

Dhrisha Iyer*+, Lynne Beaty, Samuel Nutile

Penn State Erie, Behrend

Each winter, runoff from road salt accumulates in fragile aquatic ecosystems with the potential to offset the natural balance of these environments. Amphibians are frequently among the first to exhibit possible effects, as their highly permeable skin makes them acutely vulnerable to aquatic pollution. This study aimed to find the effects, both in growth and development, and in predator-avoidance behavior, of such pollution on American toad (*Anaxyrus americanus*) tadpoles. Over the course of nine weeks, 90 experimental tadpoles were split randomly into groups of five, assigned to tanks with varied concentrations of dissolved road salt, and observed for physical growth, time to metamorphosis, and

predator avoidance behavior. While predator avoidance behavior remained relatively constant among experimental groups, median concentration tanks showed an increase in average growth/week and a decrease in average time to metamorphosis. This data conveys that tadpoles raised in road salt concentrations of 312.5-625 mg/L were growing noticeably faster than their lower (0-156.25 mg/L) or higher (1250 mg/L) counterparts. While these results did not align with the experiment's original hypothesis, suggesting stunted growth as a result of pollution, the data still raises concerns about the larger population and ecosystem level effects of road salt runoff. Ecosystems are finely tuned to align birth and development rates with the availability of certain nutrients and food sources, and any discrepancy in this timing can accumulate towards an imbalance in the food web and, largely, ecosystem collapse.

Developing and Refining a Three-Stage Compartmentalized Logistic Population Model For Wolf Spiders (Lycosidae) of Erie, PA

Dr. Daniel J. Galiffa*

Associate (Tenured) Professor of Mathematics, Penn State Erie, The Behrend College

In this talk, we address how a three-stage compartmentalized model for Lycosidae spiders, which are often colloquially called “Wolf Spiders,” was constructed and analyzed. This model is based on biological insights regarding the natural history and ecological the spiders, as well as field novel observations. These in turn necessitated dividing the life stages of these spiders into three essential components; ‘spiderlings,’ where the first instar Wolf Spiders live on the mother’s opisthosoma (abdomen), an immature phase called the ‘dispersing phase,’ and final phase where the spiders become sexually mature. We discuss that we were able to prove that our model is mathematically viable and demonstrate its biological feasibility via showing numerical simulations of actual populations. We supplement our discussion by also presenting our supplemental model, which takes into account cannibalism amongst the spiders, leading to an analogous results. Lastly, we cover natural extensions of our models, including an application to tarantula populations.

A Summary of Two Years of Pollinator Collecting on Newly Restored Dunes on Beach 8

Tyler Brooks*

AmeriCorps SMILES Program; Regional Science Consortium

The restoration of a sand dune represents a unique opportunity to study the flora and fauna that colonize entirely new geographic structures. Sand dunes represent a unique habitat for plants, with some species specializing on these sand dunes. Presque Isle, likewise, is home to numerous habitats not replicated elsewhere in the state. This unique habitat in a unique location offers a home to potentially unique species to thrive. Plants are among the first to colonize the dunes, with species such as *Maianthemum stellatum*, *Ptelea trifoliata*, and *Cakile lacustris* specializing on these dunes. In 2025, new dunes were placed on Presque Isle State Park on Beach 6 and Beach 8. Dunes usually develop, as most geographic structures, over years and years, but the sudden placement of a sand dune is an opportunity to see species “sprinting” to colonize these new habitats. As part of a sampling effort by the Regional Science Consortium in 2025 and 2026, we sampled insects as they followed potential host plants on to the new sand dunes using twenty-one blue vane traps.

ORAL PRESENTATIONS

FRIDAY, NOVEMBER 6, 2026

Wetland Restoration at Presque Isle State Park – A Never-ending Story

Holly Best*, Ph.D.

Pennsylvania Department of Conservation and Natural Resources

Since the mid 1980's, the quantity of invasive plants found at Presque Isle State Park has increased substantially. The Park started battling the plants via mechanical means in the 1990's, but it wasn't enough. Fortunately, we were able to collaborate with many non-profit partners to receive a large amount of Great Lakes Restoration Initiative and Sustain our Great Lakes funding to be able to arm ourselves and win some of the battles on the Park to turn things around. This presentation will provide an overview of the work being done at the Park and why Presque Isle State Park is such an important place to preserve. This presentation will be about invasive plants, partnerships, and will provide an update on what we have been able to accomplish.

Restoration Updates

Jen Salem*

Regional Science Consortium

Since 2016, plant propagation has been an integral part of the wetland restoration project on Presque Isle State Park. Over the years, many refinements have been made to this program to improve plant production, quality and plant diversity. In 2024, Rock Sock technology was incorporated into the Regional Science Consortium's restoration efforts, and this year, a Beach 8 dune re-establishment project was added to our existing restoration projects. Learn how these efforts evolved and the direction these projects will take in the future.

Antibiotics in the environment: the unseen effects

Mosier*+, F. Oloye, O. Oloye

University of Pittsburgh at Bradford

Antibiotics are effective at killing the bacteria that causes infections in humans, but once they are excreted or disposed of, far less is known or understood of what they do to the environment they end up in. This study used insilico QSAR modeling (EPA's TEST software) to evaluate three widely used antibiotics; amoxicillin, ciprofloxacin, and erythromycin along with their major metabolites. Amoxicillin showed relatively low toxicity with a bioconcentration factor (BCF) of 1.48, which further decreased once broken down into amoxicilloic acid and amoxicillin piperazine-2,5-dione. For amoxicillin the LC50 (48h) for *Daphnia* was found to be 47.5 mg/L, the LC50 (96h) for Fathead minnow was 1.51 mg/L and the oral rat LD50 was evaluated at 5,231 mg/kg, overall showing the low toxicity of amoxicillin. Ciprofloxacin was evaluated to be the most toxic with a BCF of 10.95 and when broken down into the four primary metabolites, ciprofloxacin only increases in toxicity as a BCF of 13.82 was found for the metabolite N-acetylciprofloxacin. Ciprofloxacin was evaluated to have an LC50 (48h) 2.84 mg/L, an LC50 (96h) for fathead minnow around 0.19 mg/L and an LD50 oral rat at 4,344 mg/kg making ciprofloxacin the most toxic of the antibiotics evaluated. Erythromycin was evaluated in the same tests and very little predictable data was found, after looking into the literature it can be seen that this is due to the fact that erythromycin has the biggest effect on cyanobacteria which is not something insilico QSAR modeling can run, yielding little data and prompting further research.

Evaluating the Toxicity of Plastics in The Environment: A Direct Comparison of BPA, BPS, and BPF

J.Troutman*+, F. Oloye, O. Femi-Oloye

Department of Physical and Computational Sciences

University of Pittsburgh at Bradford

As the human population increases there is a demand for plastic products that are produced by corporations. These plastics are not disposed of properly and eventually end up in the environment creating plastic pollution. Understanding the components of plastic and their toxicity helps identify the harm to organisms and the environment. Compounds such as Bisphenol A (BPA), Bisphenol S, and Bisphenol F are used in the formation of plastic which persists in the environment. The toxicity of these plastic compounds was evaluated in this experiment to determine the toxicity in the environment. The experiment was conducted using the online T.E.S.T application created by the United States Environmental Protection Agency. For Bisphenol A the LC50 (96 hr) for Fathead minnow was 4.65 mg/L, LC50 (48 hr) for *Daphna magna* 11.42 mg/L, and Oral rat LD50 was 3247.32 mg/kg. For Bisphenol S the LC50 (96 hr) for Fathead minnow was predicted to be 17.12 mg/L, LC50 for *Daphnia magna* 7.75 mg/L, and Oral rat LC50 of 4554.43 mg/kg. Bisphenol F had a LC50 (96 hr) of 4.29 mg/L for Fathead minnow, LC50 (48 hr) of 3.64 mg/L for *Daphnia magna*, Oral rat LC50 of 4949.63 mg/kg, overall shows that Bisphenol F is the most toxic compound evaluated.

Predicted Toxicity of Select Cyanotoxins via In Sillico Computation

Connor Cornelius*+

University of Pittsburgh at Bradford

The outlined experiment procedure was conceptualized with algae blooms in mind. Often blue-green algae containing cyanobacteria cause these blooms. Cyanobacteria are known to produce many different toxins – a few being cylindrospermospin, guanitoxin, and microcystin. These toxins within algal blooms have the potential to cause toxic effects in wildlife and primary consumers essential to ecosystems such as water fleas. The EPA TEST database utilized in silico computation via various factors including consensus and group contribution to determine toxicity of the compounds. SwissDock will be used to assess and examine interactions with proteins regarding each toxicant. What was found was relatively high neurotoxicity in guanitoxin that affects *Daphnia magna* at low doses and indicates potential mutagenic effects via group contribution methods. Other, more unreliable characteristics, were derived for cylindrospermospin and mycrocystin in which LD50 was similarly determined via the Nearest Neighbor method which also predicted developmental toxicity and the lack of predicted mutagenic effects for the toxicants. Results show the potential for future research aspects in the examination of cyanotoxins within the environment to get more reliable experimental values.

Pollinator Companion Plant Effects on Tomato Pollination and Fruit Quality

Paige Frederickson*+

Biology Program, University of Pittsburgh at Bradford, Bradford, PA

Diminished populations of native pollinators pose a considerable threat to agricultural productivity in both small-scale garden settings and commercial farm settings. This study explored how placing a pollinator companion plant (*Potentilla fruticosa*) near tomatoes (*Solanum lycopersicum*) affected tomato fruit set, weight, seed set, and sugar content. Tomatoes require buzz pollination due to their poricidal anthers and are ineffectively pollinated by the European honey bee (*Apis mellifera*), making tomatoes an ideal model to explore native bee-crop interactions. No significant difference was found in the fruit set or fruit diameter when comparing tomato plants placed near *Potentilla* to tomato plants without the companion plant, but sample sizes were small, and further research is needed to better assess the benefits that companion pollinator plants may provide tomatoes and other crops. This preliminary study demonstrates opportunities for creative approaches to undergraduate research projects that connect pollination ecology, especially with respect to native bees, to gardening.

Using in silico methods to estimate the toxicity of several herbicide safeners

A. Owens*+, F. Oloye, O. Oloye

University of Pittsburgh at Bradford

Herbicide safeners are a common class of chemicals, used in union with herbicide when forming a commercial herbicide solution. They counteract the herbicide in certain plants to allow for more selective toxicity, protecting crops. Generally, these compounds are considered inert, however a growing pool of research suggests they may have some effects on animals, especially during development. Using Toxicity Estimation Software Tool (TEST), Swiss ADME, Estimation Program Interface (EPI suite) and SwissDock, potential toxicity of three common herbicide safeners, mefenpyr-diethyl, isoxadifen-ethyl and fenchlorazole-ethyl were estimated. This type of out-of-lab testing, called in silico testing, is a growing way to screen potential chemicals to see if further investigation is warranted. EPI suite was used to estimate the potential mobility of the compounds. SwissDock and Swiss ADME were used to estimate how likely the chemicals would bond with enzymes like CYP450. TEST estimated that all three safeners were developmentally toxic, additionally, they were estimated to be moderately toxic to *Mus musculus*, *Daphnia magna*, and fathead minnows. These results indicate the need for additional testing in relation to acute and chronic toxicity, especially developmental toxicity. They also demonstrate the potential of in silico testing as a pre-lab assessment protocol.

Ecotoxicity and Atmospheric Chemistry of Volatile Aldehydes: Formaldehyde, Acrolein (2-propenal), and Acetaldehyde

J Emma C. Whispell*+, Dr. Femi Oloye, and Dr. Bunmi Femi-Oloye

University of Pittsburgh at Bradford

Formaldehyde, acrolein, and acetaldehyde are short-chain volatile aldehydes produced by combustion, industrial processes, and natural physiological or photochemical activity. Each causes injury through a distinct mechanism: acrolein is a potent electrophile that kills aquatic organisms at microgram-per-liter levels; formaldehyde causes respiratory distress in aquatic species and phytotoxicity in plants; and acetaldehyde is a systemic and developmental toxin linked to transplacental transfer, rodent teratogenesis, and respiratory harm. Using T.E.S.T software's consensus method, several toxicity endpoints were modeled. For IGC50 (*Tetrahymena* growth inhibition), formaldehyde and acetaldehyde lacked experimental data but had predicted values of 480.60 mg/L and 1982.19 mg/L, respectively; acrolein had experimental and predicted values of 0.72 and 50.13 mg/L. For LC50 (fathead minnow, 96hr), formaldehyde's predicted value was 222.02 mg/L (no experimental data); acrolein's experimental and predicted values were 0.027 and 8.87 mg/L; acetaldehydes were 36.99 and 221.03 mg/L. For LC50DM (*Daphnia magna*, 48hr), formaldehyde's predicted value was 162.49 mg/L; acrolein's experimental and predicted values were 0.057 and 36.06 mg/L; acetaldehydes were 12,417.80 and 474.72 mg/L. For LD50 (oral rat), acrolein and acetaldehyde had experimental values (25.99 and 660.76 mg/kg) with predicted values of 64.96 and 800.86 mg/kg; formaldehyde's predicted value, 143.40 mg/kg, was derived using the nearest-neighbor method. For the Ames mutagenicity test, formaldehyde's predicted value was 0.36; acrolein's experimental and predicted values were 1 and 0.51; acetaldehydes were 0 and 0.11. Overall, formaldehyde and acetaldehyde were classified as mutagenicity-negative, while acrolein was mutagenicity-positive. Lower LC50/LD50 values indicate greater toxicity, with acrolein consistently the most toxic of the three.

A Closer Look at Water Quality: Determination of Trace Nickel and Copper Concentrations in Tunungwant Creek Water Using Solid Phase Extraction and Atomic Absorption Spectroscopy

Peyton Haight*+, Dr. Femi Oloye, and Dr. Bunmi Femi-Oloye

University of Pittsburgh at Bradford

The presence of trace metals in natural water systems is an important environmental concern because elevated concentrations can negatively impact aquatic ecosystems and potentially affect human health. Among these metals, copper ions (Cu^{2+}) and nickel ions (Ni^{2+}) are commonly introduced into surface waters through natural weathering processes as well as anthropogenic activities such as industrial

operations, mining, metal processing, and urban runoff. Monitoring the concentrations of these metals in local waterways is essential for assessing water quality and identifying potential sources of contamination. Contamination is a huge problem because water with too high Ni^{2+} and Cu^{2+} levels can cause liver and respiratory issues in humans and greatly harm aquatic wildlife. In this experiment, water from the Tunungwant Creek in Bradford, Pennsylvania, was tested for nickel and copper. This was completed using solid phase extraction (SPE) to collect all of the Ni^{2+} and Cu^{2+} from of the water. Then, Atomic Absorption Spectroscopy (AAS) was used to find the true amount of Ni^{2+} and Cu^{2+} in the water. It is expected and hypothesized in this experiment that small amounts of both metals will be found because of the amount of runoff of nearby industries within 15-20 miles away from the test site that do produce runoff. The expected concentrations of Ni^{2+} and Cu^{2+} should be below the established water quality standard for release into water, although further testing is currently being done to confirm this. The results will also be compared with EPA values for the amount that nearby industries report. This comparison will test if the results of nickel and copper levels gathered in this experiment, match the reported Ni^{2+} and Cu^{2+} levels the local industries report.

ABSTRACTS

*Regional Science Consortium
22nd Annual Research Symposium
November 4-6, 2026
Tom Ridge Environmental Center
At Presque Isle State Park*

POSTER PRESENTATIONS

POSTER SESSION: Wednesday, November 4, 2026, 6pm—8pm

1. Comparison of Qualitative and Quantitative Methods of Rib Seriation

Caleb Conatser*+

University of Tennessee Knoxville, Mercyhurst University

Correctly ordering the ribs of the skeleton is critical for certain assessments in forensic anthropology such as age estimation and trauma analysis. Practitioners use several rib seriation methods; this preliminary project compares the consistency of qualitative and quantitative methods in rib seriation methods in a modern population. Two qualitative and two quantitative approaches were compared: the Mann and Dudar qualitative methods for seriation and two quantitative measurements: superior costotransverse crest height (SCTCH) and articular facet of the tubercle to angle length (AFTAL). Both left and right ribs of twenty male donors of the UTK Donated Skeletal collection were analyzed; 10 of which had a sample age of 35 to 54 years and the other 10 had a sample age of 55 to 82 years. The preliminary results show that age and side of the body do not play a statistically significant role in the rate of agreement between methods. Analysis indicates that the four different methods of seriation agree on rib order with varied amount of time required for each method. Ribs 3-6 were most consistent with ribs 7-10 slightly varied. A single measurement, AFTAL, had the highest agreement and required the least time. In addition, it has potential use even if the full series of ribs is not available.

2. Craniofacial Evolution: Structural Decoupling of the Mammalian Jaw–Ear

Meléndez Olivera, Paulina Melendez.*+

Graduate Student of Forensic & Biological Anthropology, Mercyhurst University

Craniofacial evolution in mammals includes a profound reorganization of ancestral jaw and auditory elements, culminating in the functional specialization of structures associated with mastication and hearing. The mammalian jaw–ear transition raises fundamental questions concerning how this anatomical separation emerged through morphological, developmental, and biomechanical transformation. This paper proposes structural decoupling as a conceptual framework for interpreting the evolutionary separation and functional reassignment of ancestral jaw elements into the mammalian auditory apparatus. By integrating comparative anatomy, developmental biology, embryology, and biomechanics, the study will examine structural and functional changes associated with the transition across representative mammalian lineages. Attention will be given to the relationship between developmental continuity and functional divergence, and to whether these patterns provide diagnostic evidence for structural decoupling as a distinct framework for interpreting craniofacial evolutionary transformation. This preliminary synthesis aims. To establish a foundation for evaluating structural decoupling alongside existing evolutionary and developmental explanations of the mammalian jaw–ear transition.

3. Short-Term Effect of Epinephrine on Cancer Cell Growth

Eva Sledge*+, Dr. He Liu, Dr. Prasad Dalvi

Gannon University, Biology Department

Cancer cells alter their behavior and signaling pathways in response to stress. Interleukin-6 (IL-6) is a cytokine that regulates immune system-related activity and has been implicated in cellular proliferation, survival, and tumor progression. In this study, we examined IL-6 expression using quantitative RT-PCR in cancer cells treated with stress hormones cortisol and epinephrine. Two cell lines were used: WPMY-1, derived from prostate cancer, and SKN-1, derived from brain cancer. The results provide insight into how short-term stress signals influence cancer cell behavior and signaling pathways.

4. A Review of the Implications and Relationship of Glucagon-like Peptide-1 and Binge Eating Disorder

Emily Prather*+

Gannon University

Glucagon-like Peptide-1 more commonly known as GLP-1s are drugs used to treat diabetes, cardiovascular diseases, and assist with weight loss. Binge eating disorder also referred to as BED is a broad term used to describe those who consume large amounts of food at a time with little to no control. This study explored the understudied relationship between Glucagon-like Peptide-1 and Binge Eating Disorder; among adults with current or prior binge eating disorder who are prescribed GLP 1 receptor agonists, how do they perceive changes in binge episodes, eating-related distress, and overall quality of life. This study will be conducted by phone interviews and survey-based questions focusing on the behavior change among patients diagnosed with BED before and after being prescribed a GLP-1. It is anticipated that there will be a strong relationship between Glucagon-like Peptide-1 and Binge Eating Disorder, particularly through reduced binge episodes and or less intense episodes. If these findings are supported, they may help provide a useful insight into how patients with BED could utilize GLP-1 to assist them in managing their episodes in the future.

5. Holy Water as an Indicator of Dermatological Microbial Transmission: Sequencing Bacterial DNA from Church Water

Timothy Haklar*+ and Liu Cao, Ph.D.

Environmental Science and Engineering

Gannon University, Erie, PA

Communal church holy water fonts present a unique public health concern as they represent pathways for the dermatological transmission of bacteria. Preliminary testing from November 2025 of five different Erie County (PA) Catholic Churches identified at least 1263 species of bacteria present. Many species belonged to the pseudomonadales order, including *A. johnsonii* and *P. oryzihabitans*, both of which can cause infection in rare cases. *E. coli*, a fecal indicator, was detected in 5 out of 23 plated samples and *Pseudomonas* was found in 18 out of 23 plates. As initial testing indicated the presence of potentially-pathogenic bacteria, sites will be resampled to see whether *A. johnsonii* and *P. oryzihabitans* are again found present in the water. Additionally, this study will evaluate the microbial composition of communal holy water fonts to determine the extent to which dermatological contact influences holy water microbiome makeup and water quality. Twenty-three fonts from the aforementioned churches will be sampled and compared to fresh tap water controls taken on site for various water quality parameters. These parameters include temperature, pH, dissolved oxygen, conductivity, total organic carbon, and nitrate concentration. Bacteria will be plated following the appropriate methods for *E. coli*/total CFUs, the *Pseudomonas* genera, and heterotrophic producing bacteria. Using the Quick-DNA Fecal/Soil Microbe Miniprep Kit, bacterial DNA will be extracted and then sequenced using 16s rRNA sequencing. Taxonomic analysis will be performed on the Qiime 2 bioinformatics platform.

6. Evaluating Fluoride Toxicity to Harmful and Commensal Oral Bacteria Species

Jack Mucha^{1*+}, Beth Potter¹, Samuel Nutile¹

¹*School of Science, Pennsylvania State University – The Behrend College, Erie, PA 16510*

Human longevity has doubled over the past century, mainly due to advancements in medical technology and human health. An important aspect of human health is oral hygiene. Good oral hygiene consists of brushing teeth with fluoride-based toothpaste, but the fluoride concentration required to balance harmful and commensal bacteria is poorly documented. The goal for this experiment was to determine the optimal fluoride concentration for harmful bacteria growth restriction, while preserving commensal bacteria populations. Commensal bacteria, *Streptococcus salivarius*, and harmful bacteria, *S. mutans*, were exposed to varying fluoride concentrations and the Kirby Bauer Disk Diffusion Growth Inhibition assay was used to document growth inhibition in each species. From repeated tests, inhibitory concentration 50 (IC₅₀) values, or the fluoride concentration expected to inhibit bacterial growth by 50%, will be determined for both species. IC₅₀ values are expected to be found using fluoride concentrations between 1000-1500 ppm based on popular toothpaste brand fluoride concentrations. Results from inhibition tests will be presented at the Symposium in November. These findings will help consumers choose the most optimal toothpaste for oral hygiene which will lead to better overall health and longevity.

7. Microbial Communities Responses to Acidic and Metal-Rich Conditions in Acid Mine Drainage

Ethan Buchleitner^{*+}

Environmental Science and Engineering

Gannon University, Erie, PA

The risk that polluted waterways pose for human and ecological health has been the subject of much concern since the earliest of civilizations. Despite this, the industrial revolution and the advent of ore mining have significantly increased the abundance of toxic heavy metals in streams and rivers, causing severe health risks and endangering ecosystem well-being. Much of these pollutants enter waterways as runoff from abandoned or discontinued mines, otherwise known as Acid-Mine Drainage (AMD). While various treatment methods are currently being implemented to reduce the risks of AMD, bioremediation using microorganisms may offer an effective and sustainable approach for AMD remediation. Many bacteria have adapted resistance to heavy metals and sequester them for use as metabolites. These uptake processes have the potential to ameliorate the harm done by overly abundant heavy metal concentrations in waterways, while simultaneously avoiding any side effects of chemical or industrial treatment processes. Using samples taken from polluted waterways, this experiment will identify the bacterial groups that demonstrate resistance to copper and effectively metabolizes it for internal functions. Thereafter, various metrics will be recorded such as pH, conductivity, bacterial concentrations, and copper concentrations. Subsequent observations will reveal the most prominent bacterial groups in the sample that possess the highest resistance to copper, and the bacteria will be used to observe changes in copper concentrations before and after its exposure to said family of microbes. The purpose of this project is to identify bacterial groups that that may effectively remediate AMD in an environmentally safe and sustainable manner.

8. Assessing Heavy Metal and Metal Contamination in Erie PA, Stream Sediments and its relationship to industrial land use.

Jake Zimmerman^{*+} and Mattia Parrini^{*+}

Environmental Science and Engineering

Gannon University, Erie, PA

Heavy metal contamination in local lakes and streams is an environmental concern, especially around legacy industrial sites in Erie, Pennsylvania. Over time, toxic heavy metals released from these industrial sites may accumulate in sediments and surface waters of local waterways that discharge into Lake Erie. The goal of this study is to investigate the current status of potentially accumulated heavy metals in sediments near four abandoned industrial sites in the Erie area. This project will be conducted under the following hypothesis: heavy metals deposited in sediments as a result of historical releases, erosion, and

runoff from legacy contamination sites may be present at concentrations high enough to pose risks to human and ecosystem health. To evaluate this hypothesis, sediment samples will be collected from multiple Erie-area tributaries, including sites influenced by current or historical industrial activities, and analyzed for common pollutants and heavy metals such as cadmium, arsenic, copper, lead, and nickel. The results will be analyzed and compared with relevant regulatory and screening thresholds, such as PA soil cleanup standards and EPA soil screening levels for common heavy metals. This project aims to investigate the presence and concentrations of toxic heavy metals in sediments and assess whether the results provide evidence of potential historical contamination and ongoing risks to nearby surface water bodies. The information obtained from this study will help improve understanding of the current status of contamination associated with historical industrial development and identify potential contamination sources near residential areas that may have implications for human and ecosystem health.

9. Impact of the Defunct Erie Coke Site: Soil Analysis and Health Survey

Tristan Chang*+, Rajinikanth Mohan

Mercyhurst University

For nearly a century, the Erie Coke plant on the shores of Lake Erie operated as a steel manufacturing and coking facility, but while in operations, the plant was also the source of hazardous soil, air, and water pollutants for the surrounding community. Decades of unresolved contamination, including exceeding emission limits, wastewater dumping into the municipal sewer system, and improper dumping of hazardous along the Erie bluff eventually led to the plant's loss of their operating permit and eventual shutdown in 2019. Now that the plant has been shuttered, we explored possible lingering effects of the toxic compounds- primarily polycyclic aromatic hydrocarbons (PAH) at various land and water sites near the Erie Coke plant using Gas Chromatography- Mass Spectrometry. We found that the significantly high levels of chemicals-including benzo-e compounds, chrysene, fluoranthene, naphthalene, phenanthrene and pyrene- were found in the immediate vicinity of the plant. Some contamination was detected in the land areas nearby in 2021 but not thereafter suggesting that the toxic pollutant prevalence may have diminished with time. Excessive exposure to harmful polycyclic aromatic hydrocarbons (PAH) can lead to chronic coughing, wheezing, and increased cancer risk, especially in children. In our survey of local residents, we found anecdotal evidence of pollution distress while the Coke plant was operational. All over, we highlight that although Erie Coke has ceased operations, its environmental and public health footprint may persist in the surrounding community.

10. An Exploration of Current Lead Contamination in Homes in the City of Erie

Libby Kibler*+, Hwidong Kim, Ph.D., P.E

Environmental Science and Engineering

Gannon University, Erie, PA

The city of Erie has been ranked 27th in the nation for lead paint exposure, and 72% of the housing stock was built before lead paint was outlawed in 1978. Lead-based paint hazards in children's homes are the main source of lead poisoning in Pennsylvania. To address this imminent public health threat in Erie, lead contaminated homes will be visited and identified through the use of a handheld X-Ray Fluorescence machine. The XRF machine emits high-energy X-rays into the paint-coated surface, and the unique fluorescent energy of lead atoms is reflected and sensed by the handheld if lead is present. The presence of paint chips, peeling paint, and number of lead-contaminated structures will be quantified to determine the severity of contamination of the homes, and identify risks posed to the residents. Geographic Information Systems will be utilized to create maps of current lead contamination levels and examine demographic trends, as low-income neighborhoods and racial minorities are disproportionately poisoned. This project aims to aid the community and the City of Erie to identify and alleviate the public health crisis of lead poisoning.

11. Assimilation of Polychlorinated Biphenyls through Diet

Lauren True^{1*+}, Samuel Nutile

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Polychlorinated biphenyls (PCBs) were widely used in industrial materials in the 1900s but were banned in the 1970s due to their carcinogenic effects. However, PCBs still exist in high concentrations in the environment and are known to bioaccumulate in aquatic food chains. Despite significant research on PCB accumulation in fish, relatively little information exists on the assimilation of specific PCB congeners within fish tissue. Therefore, this study aims to determine the assimilation efficiency of PCBs in fathead minnows (*Pimephales promelas*) and goldfish (*Carassius auratus*) when exposed through diet. Sixty fish of each species were fed one of two concentrations of PCB spiked fish food, 43 ng/g to mimic expected Lake Erie concentrations of today and 117 ng/g to mimic Lake Erie concentrations in the 1970s. After feeding, the fish were euthanized and the PCBs were extracted from the tissue and analyzed with gas chromatograph with a mass spectrum detector. PCB analysis is still ongoing and will be presented in November. It is expected that the higher PCB concentrations in the food will result in greater bioaccumulation, while PCB congeners that are more hydrophobic will assimilate to a higher degree than more hydrophilic congeners. However, extremely hydrophobic PCB congeners (> PCB 187) will have reduced assimilation compared to more mid-range hydrophobic congeners (PCB 101 – 156). With this study, we can determine how PCB congeners are assimilated by fish and better predict the extent to which PCBs will move through the food web, including into human consumers.

12. Monitoring the Nutrient Conditions in Edinboro Lake

Alicia Muniz^{*+}, Katie Slimon^{*+}, Dr. Eric Straffin

Pennwest-Edinboro

Edinboro Lake is a natural kettle lake situated in Northwestern Pennsylvania, which is experiencing excessive nutrient input, resulting in poor water quality and eutrophic conditions. The lake supports the local economy through year-round recreational activities including boating, swimming, and fishing. However, excess phosphorous, especially during warmer summer temperatures, allows the growth of harmful bacteria and algae that can make the lake toxic for humans and pets. Additionally, excessive plant growth, and later death/decay of that material result in anoxic conditions at the bottom of the lake that result in detrimental impacts to the lake ecosystem. Previous studies on Edinboro Lake focused on monitoring parameters indicative of the lake's trophic state. These studies largely attributed the eutrophic conditions to high phosphorus levels. A plan was proposed in 2009 to help lower phosphorus levels and improve overall water quality; however, the lake remains eutrophic. For this study, several key physical and chemical parameters were monitored at five collection sites throughout the lake. We found generally higher levels of phosphate than earlier studies, and detected trends in phosphate related to temperature and rainfall changes. We also noted an increase in phosphate through July, when strong thermal stratification reached depths of 5m, resulting in oxygen depletion at depth. Phosphorus inputs also vary widely in location and timing around the lake, indicating that more work needs to be done to assess nutrient sources that could better inform mitigation efforts.

13. USGS Small Agricultural Supergage Sites: Conneaut Creek at Dicksonburg, PA (04212895)

Sophia Boquist¹, Nickolas Grim¹, Lindsey Sabo^{1*}, Nicholas Santoro^{1*}

United States Geological Survey

The U.S. Geological Survey (USGS) Pennsylvania Water Science Center recently partnered with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) to establish five "super gage" monitoring stations in small, agriculturally dominated watersheds across Pennsylvania. Sites were selected based on watershed size, land-use characteristics, and stakeholder input. Real time data for continuous streamflow, gage height, and water quality parameters including water temperature, specific conductance, pH, dissolved oxygen, turbidity, and nitrate are transmitted every 15 minutes.

Each site is sampled annually for twelve monthly and ten storm event discrete water quality samples, with storm samples including an additional nutrient component. After 36 discrete samples have been collected,

the continuous and discrete datasets will be used to develop surrogate regression models. These models will support prediction of variations in suspended sediment, total phosphorus, and total nitrogen loads associated with agricultural land management practices and land use changes. All project data are stored in the USGS National Water Information System (NWIS) and are publicly accessible online.

The super gage at Conneaut Creek at Dicksonburg, Pennsylvania (USGS 04212895), is located 4.5 miles southeast of Conneautville and drains a 32 square mile, primarily agricultural watershed that flows into Lake Erie. It is currently the westernmost monitoring site in the project and the only one contributing to the Lake Erie basin. All other sites are in central Pennsylvania and drain to the Chesapeake Bay or the Delaware River Watershed.

14. Seasonal Groundwater of Nitrate and Phosphate Exports from Vineyard Aquifer into the PA Lake Erie Coastal Zone

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Nutrient runoff is most commonly attributed to rainwater exceeding the carrying limit of farmland soil, where fertilizers are frequently administered. Lake Erie specifically has an extensive history of eutrophication due to excessive amounts of nutrient runoff. Due to the dry watershed of the region, most rainwater is taken into the aquifer with very little surficial runoff, leading to the theory that the leaching of nutrients into Lake Erie could be caused by groundwater runoff. Using a vineyard located near the bluffs of Lake Erie, the aim of this research is to analyze the sediment composition and water samples of the aquifer underneath the vineyard to create a model of the movement of nutrients through the groundwater towards Lake Erie. Over the course of the study, it was found that phosphate levels in the water samples were below detection levels, while nitrate levels varied significantly, with a lower range in the springtime and higher range in the summertime, following the fertilizer application schedule for the vineyard. These findings suggest that nutrient runoff through the vineyard aquifer is non-negligible, and there are other sources attributing to the eutrophication of Lake Erie. These findings can be put towards future maintenance in fertilizer application timing and quantity for farmlands bordering the edge of Lake Erie.

15. With Snow Comes Salt: The Effects of Winter Regimens on Soil Fungi Communities

Maryam Makhzomi^{1*}+, Brooke Oldham^{1*}+, Matt Gacura

Gannon University

Winter road salting can introduce chloride and other road-associated materials into adjacent soils, changing soil chemistry and potentially reshaping microbial communities. Fungi contribute to organic matter decomposition and nutrient cycling, and differences in their responses to environmental stress may provide insight into roadside soil conditions. This ongoing study examines how distance from roadways and urban versus rural settings relates to soil fungal community composition and diversity, with particular interest in taxa previously associated with salt or metal tolerance. We hypothesize that communities closest to salted roads will differ from those farther away and that these patterns will be more pronounced at urban sites. In early spring 2025, we collected triplicate A-horizon soil cores at 10-foot intervals extending away from roads at three urban and three rural sites. DNA was extracted from a subsample of each core, and the fungal internal transcribed spacer (ITS) region was sequenced using an Illumina platform to characterize community composition and diversity. We measured soil pH, moisture content, and organic matter content; electrical conductivity measurements are planned. Community profiles are being compared across distances and site types and evaluated alongside measured soil characteristics. Preliminary analyses indicate differences in fungal community composition among roadside samples, suggesting that road-associated conditions may help shape these communities. Further analysis will assess whether the observed patterns track distance, urbanization, and conductivity and will identify taxa that

merit follow-up study for stress tolerance. This work may improve understanding of how winter road management is associated with changes in roadside soil ecosystems.

16. Response of *Gnomoniopsis castanae* to extracts from host and non-host species.

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Gnomoniopsis castanae is a pathogenic fungi species that causes brown chestnut rot. The pathogen is common in Europe and Oceania and has recently been observed in Michigan and Pennsylvania. In addition to brown chestnut rot *G. castanae* has been reported to cause cankers multiple chestnut species as well as red oak and hazelnut. The objective of this experiment is to utilize qPCR to measure the genetic response of *G. castanae* cultures grown in the presence of extracts isolated from active and dormant tissues of American chestnut, red oak, and Concord grapes. A total of 79 *G. castanae* cultures growing on potato agar were started from a single spore isolate, were replated onto water agar containing extracts from active and dormant stage bark of tissue, and were grown in a 25° C incubator for seven days. After RNA processing, First Strand cDNA synthesis protocols were followed to synthesize cDNA using a ProtoScript® II kit and concentrations recorded using NanoDrop. The mean cDNA concentration, in ng/mL for live chestnut (mean ± SD; 538.93 ± 154.21), dormant chestnut (555.11 ± 143.98), live red oak (388.78 ± 114.78), dormant red oak (435.06 ± 110.96), live Concord grape (409.44 ± 164.13), and dormant Concord grape (479.16 ± 90.10) produced a generous amount of cDNA with satisfactory (nm) 260/280 (1.78-2.58) and 260/230 (2.23-2.28) ratios (table 1). The results show that there is enough cDNA to properly complete qPCR and further the analysis of *G. castanae*.

17. Examining the Viability of *Borrelia burgdorferi* DNA Detection in Decapitated and Desiccated Ticks

Ethan Wallace B.S.*+, Christopher Keller Ph.D., Robert Waters Ph.D.

Lake Erie College of Osteopathic Medicine

Lyme disease, caused by *Borrelia burgdorferi*, is transmitted by Ixodes scapularis ticks. The presence of *B. burgdorferi* can rapidly be determined by PCR amplification of DNA from intact *I. scapularis* ticks preserved under ideal conditions. However, ticks submitted for testing are typically received in suboptimal conditions, including desiccation or decapitation. This study examined the effects of desiccation and decapitation on *B. burgdorferi* DNA detection in *I. scapularis* ticks. *I. scapularis* ticks were collected at Presque Isle State Park via flagging and stored in ethanol. Ticks were decapitated (n=51) or left to desiccate (n=53) for ~96 hours before being crushed via pestle. DNA was obtained by chloroform/phenol extraction from individual ticks and amplified by *I. scapularis*-specific PCR. DNA from positive samples was used to amplify *B. burgdorferi* DNA using a *B. burgdorferi*-specific PCR, later visualized by gel electrophoresis. Tick DNA was visualized in 100% of desiccated ticks (n=53), heads (n=51), and bodies (n=51). *B. burgdorferi* DNA was visualized in 86.79% (46/53) of desiccated ticks and 84.31% (43/51) of bodies. Of the positive bodies, 6.98% (3/43) had corresponding positive heads. No positive heads had a corresponding negative body. Desiccation and decapitation did not affect detection of *I. scapularis* and *B. burgdorferi* DNA using the established protocol. Although heads were mainly negative for *B. burgdorferi* DNA, ticks received by our lab typically are either decapitated or desiccated. These results show that detection of *B. burgdorferi* DNA from ticks stored in unideal conditions does not impact the PCR reaction.

18. Comparing eDNA Detection Methods for Locating Aquatic Invasive Species in Lake Erie of the Laurentian Great Lakes, Across Five Months in Multiple Localities

Amanda Welsbacher*+, Matthew Gruwell

Penn State University, The Behrend College

Fast, reliable detection methods are paramount in the fight against the spread of aquatic invasive species (AIS), and eDNA techniques provide many benefits over traditional sampling methods. AIS are spreading rapidly around the world, reshaping ecosystems, outcompeting native species, and experiencing explosive population growth. Some sources cite the Laurentian Great Lakes as the most heavily invaded freshwater system in the world. The advantages of using eDNA technology for AIS detection include: (1) it is often more sensitive, (2) it can cover much more area, (3) it is less destructive, (4) it does not require trapping of threatened species, and (5) it can be done with considerably less taxonomic training. This study was implemented to test the utility of a commercially available metabarcoding assay against a targeted, qPCR approach for the detection of five AIS in Lake Erie. We sampled eight localities monthly throughout the summer of 2024 using both techniques. Our target AIS were the bloody red shrimp *Hemimysis anomala*, the fishhook waterflea *Cercopagis pengoi*, the water flea *Daphnia lumholtzi*, the gammarid scud *Echinogammarus ischnus*, and the macroalgae *Nitellopsis obtusa*. We found that the targeted, qPCR approach was more successful at AIS detection for our five target organisms than the specific, commercially available metabarcoding assay that was used.

19. Determining the Presence of the Freshwater Jellyfish (*Craspedacusta sowerbii*) at Presque State Park using eDNA

Hannah Fisher*+, Dr. Lynne Beaty, Dr. Matthew Gruwell

Penn State University, The Behrend Campus, Erie, Pennsylvania

The freshwater jellyfish, *Craspedacusta sowerbii*, is one of the most widespread non-native aquatic species, but its numerous inconspicuous life stages make its global distribution difficult to determine. The only easily visible life stage, the hydromedusa stage, occurs sporadically, often only lasting from mid to late summer when surface waters reach optimal temperatures. *C. sowerbii* was sighted for the first time in recent memory at Presque Isle State Park in Erie, Pennsylvania, late summer 2025, but the extent of its invasion is still unknown. The goals of this project were to develop a set of primers for the environmental DNA (eDNA) detection of *C. sowerbii* and to use those primers to conduct real-time quantitative polymerase chain reaction (qPCR) testing at various sites across Presque Isle State Park to determine the distribution of *C. sowerbii*. Utilizing eDNA to detect the distribution of *C. sowerbii* allowed its presence to be confirmed even when hydromedusae were absent. A new method of eDNA collection was created; a square of filter material contained within a small wiffle ball was attached to a fishing line and cast from a pole approximately 10 feet away 15 times in various directions. Samples from fifteen sites on Presque Isle State Park were collected and analyzed from June to August 2026. Results suggest the presence of *C. sowerbii* at all fifteen locations. The primers and data produced by this project can be used to monitor *C. sowerbii* populations as they continue to expand into freshwater regions and improve the accuracy of distribution maps.

20. Finding the Freshwater Jellyfish: Detection, Distribution, and Culturing of *Craspedacusta sowerbii* in Presque Isle State Park

Jesse Johnson*+, Lynne Beaty

Penn State Behrend

Craspedacusta sowerbii (the freshwater jellyfish) is an introduced species recently sighted at Presque Isle State Park in Erie County, PA. Given their complex life cycle and diminutive size, their extent, distribution, and potential ecological effects are unknown. They primarily occur as microscopic polyps and podocysts and infrequently bloom as medusae in late summer. Previous studies have speculated that freshwater jellyfish have the potential to become invasive, but little data exists to support or refute this claim. The goals of this project were to 1) investigate the extent and distribution in Presque Isle State Park; 2) develop field sampling methodology; and 3) develop an effective culture system for future

experiments. Twelve sites were sampled on Presque Isle State Park. Ten rocks were taken from each site each and three artificial sampling devices were deployed at each site and collected after two, three, and four weeks. Rocks and devices were examined under a dissection microscope for polyp presence. No polyps were positively identified, however, there was extensive presence of *Hydra vulgaris*, which suggests that sampling methods are suitable for freshwater jellyfish. Live medusae were captured and various husbandry methods were tested, some sustaining specimens for up to 24 days. The absence of polyps despite medusae presence suggests that polyps occur in unsampled microhabitats and substrates which future sampling should focus on, along with site characteristics and observations of medusae. Understanding freshwater jellyfish distribution and ecosystem interactions will help understand their potential long-term impact on Presque Isle.

21. Year-to-Year Changes in Round Goby Abundance in Lake Erie Tributaries

Samuel Nutile, Lynne Beaty, Syllas Fromyer*+
Penn State Behrend

Invasive species can alter aquatic ecosystems by disrupting native community structure, reducing biodiversity, and impacting ecosystem health. The round goby, *Neogobius melanostomus*, an aggressive benthic invader in the Great Lakes, has established populations in Lake Erie and its tributaries, where its ecological impacts on native fish communities remain poorly understood. Previous studies suggest that round gobies may reduce native species abundance and community health, but limited data have made clear statistical conclusions difficult. Over a ten-week period, this study examined four Lake Erie tributaries: Raccoon Creek, Elk Creek, Walnut Creek, and Cascade Creek. Sampling occurred at two locations per stream, the mouth and 800 meters upstream. Fish assemblages were assessed using kick seining and multi-pass depletion sampling to estimate population sizes. Captured fish were identified, measured, and weighed to support calculations of the Index of Biotic Integrity (IBI) and comparisons with round goby abundance. Preliminary comparisons of June records between 2025 and 2026 showed round gobies at Raccoon Creek where none had been recorded in the previous season, and a larger proportion of round gobies in the catch at Elk Creek's upstream site. These patterns suggested site-specific changes in goby distribution and fish community composition, although their effects on native community health remained unresolved. This study provides a foundation for continued analysis and long-term monitoring.

22. Evaluating Personality Differences of Round Goby (*Neogobius melanostomus*) in Elk Creek

Nastassja Hall*+, Sam Nutile, Lynne Beaty
Penn State Behrend

The round goby (*Neogobius melanostomus*) is an invasive fish species that has become widespread throughout Lake Erie, where it competes with native species and negatively affects vulnerable species. Although round goby are known for their aggressive nature, it remains unclear whether populations that differ in their invasion history also differ in personality traits. This study investigated behavioral variation between two round goby populations in Elk Creek: an established population near the creek mouth and an invasion-front population located upstream. Fish were collected using a kick seine and subjected to a series of behavioral assays designed to quantify aggression, exploration, activity, and boldness. Behavioral data were used to evaluate whether personality traits differed between established and recently established populations. Understanding behavioral variation across invasion stages may provide insight into invasion dynamics and inform management strategies for controlling round goby populations.

23. Evaluating Round Goby (*Neogobius melanostomus*) Gills as Sites of Parasitic Development for Native Freshwater Mussel Larvae in Erie, Pennsylvania

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Native freshwater mussels rely on a parasitic larval stage (glochidia) that must attach to the gills of a suitable aquatic host, most often fish, to complete development. In the Lake Erie watershed, the invasive round goby (*Neogobius melanostomus*) is one of the most abundant benthic fish species that frequently

encounters and feeds upon native mussels, often negatively impacting mussel populations. This close association between goby and mussels, however, may result in a reversal of predation with glochidia using round goby as a host during development. Therefore, this study investigated the ability of round goby to support glochidia attachment and successful development of native mussels. Gobies were collected from locations within Lake Erie and its Pennsylvania tributaries, and examined for glochidia. Metrics will include larval attachment, encystment duration, survival, and metamorphosis rates, as well as attempts to identify the species of attached glochidia. Results will be presented at the Research Symposium in November, but preliminary analysis suggests no mussel glochidia were found on the gills of invasive round goby. Evaluating the ability of round goby to serve as hosts for native mussel glochidia informs the wider influence invasive species have on non-native habitats, and how they may disrupt native populations in ways outside of direct competition or predation.

24. Parasite Abundance in Native and Invasive Species of Lake Erie

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Parasites are ubiquitous. Yet, aside from a few heavily studied systems, parasite species composition, relative abundance, and ecological impacts are poorly understood. The mysteries of parasites are further clouded by aquatic invasive species (AIS). In many ecosystems, including the Pennsylvania waters of Lake Erie, it is unclear if—and how much—AIS impact native host-parasite dynamics or if they have caused the concurrent introduction of non-native parasites. Knowing what parasites are present in common AIS and if those parasites are being transferred to other economically important species, i.e., popular game fishes and species that may be targeted for aquaculture, is important for overall ecosystem health and ensuring sustainable fisheries and future aquaculture activities. This project aims to fill this knowledge gap through field surveys designed to document the presence and species composition of parasites in common AIS and sport fishes, including those commonly caught recreationally and potential targets for Great Lakes aquaculture cultivation. Common AIS and native species were obtained and parasites located in the head, internal organs, and musculature were isolated and identified. While parasite identification is ongoing and will be presented in November, far fewer parasites are generally found within AIS compared to native species. A better understanding of parasite populations among AIS and native species can help produce maps of parasite distribution and abundance to better predict their impact on the Lake Erie ecosystem and fishery.

25. The importance of nest position during provisioning events changes with chick age in Purple Martins, a cavity-nesting songbird

Riley Duffy^{*+}, Sabina Khatiwoda^{*+}, Elizabeth M. George

Gannon University, Department of Biology

Parental care in animals has many advantages, such as a significant increase in offspring survival rates. However, it can also bring about parent-offspring conflict. Although each offspring wants as many resources as possible, the parents must often strategically allocate resources amongst multiple offspring and for themselves. Previous work suggests that songbird nestlings influence parental food allocation in various ways, including mouth coloration, begging intensity, and spatial position within a nest. However, results are mixed as to how these factors affecting parental feeding choices change with nestling age, and if they affect both parental sexes equally. Here, we investigate those questions in the Purple Martin (*Progne subis*), a swallow species that breeds in manmade colony nestboxes. We chose to focus on chick spatial positioning as a potential strategy, given its presumed importance in cavity nests with one entrance. We analyzed video footage recorded within nests in the Tom Ridge Environmental Center's colony from 2023-2026 (one nest per year). We sampled one hour of video per day, from day 10 post-hatch until the chicks fledged, to record parental sex and chick nest position for over 300 feeding events in total. Although analyses are ongoing, preliminary results indicate that the importance of spatial position during feeding events changes with chick age, such that parents almost exclusively provision the chick

closest to the entrance at older ages. This could suggest that parents use other criteria to determine who to feed when chicks are young, and that competition among chicks becoming increasingly important with age.

26. Fungal Diversity on the Penn State Behrend Campus

Elise Kelly*+, Matthew Gruwell

Penn State Behrend

Biodiversity is an excellent marker of environmental conditions, as robust environments are able to support a diverse number of species. Fungal diversity is indicative of multiple environmental factors such as nutrient composition, moisture levels, and air quality. Representations of biodiversity, like field guides and catalogs, simultaneously promote the beauty and importance of biodiversity, while contributing findings to scientific databases. The goal of this research is to create a Fungal Diversity catalog of the Penn State Behrend campus, including Wintergreen Gorge, to describe the fungal community and its role in the environment. This will be executed by collecting fungal samples, extracting, amplifying, and sequencing the DNA, and classifying each fungal species. While referencing data during this research, it is clear that fungal databases are insufficient. This project is focused on submitting each fungus' morphology, location, possible ecological interactions, and molecular and phylogenetic data on a variety of fungal species. The current rate at which fungal species are being discovered estimates a timeline of over 650 years to describe every fungal species. To prevent species from going extinct before they are discovered, exploratory research, like this project, is imperative. The finding of a novel species within the first five months of this project advocates the value of this research. The novel species is in the genus *Albertiniella*, characterized by microscopic fungi which parasitize the shelf fungus *Ganoderma applanatum*. This occurrence not only describes a novel species to the genus, but it is also the first recorded locality of *Albertiniella* in the Americas.\

27. Optimization of Low-Cost Substrate Formula and Heat Treatment for the Cultivation of *Pleurotus ostreatus*

Allison Acey*+, Matthew D. Gacura, PhD, Davide Piovesan

Gannon University

Pennsylvania's mushroom industry contributes approximately \$1.2 billion annually to the state's economy. Oyster mushrooms (*Pleurotus ostreatus*) are a nutritious crop that can be cultivated on relatively simple substrates, making them promising for small-scale food production in urban communities with limited access to fresh foods. However, equipment and substrate costs, along with microbial contamination, can impede local cultivation. This study evaluates whether a custom-built pasteurizer and inexpensive mixed-wood heating pellets can support oyster mushroom production as alternatives to autoclaving and conventional hardwood substrate. Twelve substrate bags will be assigned to two heat treatments before inoculation: six will be autoclaved at 121 °C for 40 minutes, and six will be pasteurized at 65 °C for three hours. Bags will contain either mixed-wood heating pellets or conventional hardwood as the wood component, allowing comparison of substrate type across heat treatments. During cultivation, we will record mushroom yield, bag mass changes, and visible contamination. We will monitor for *Trichoderma* mold, a common competitor in mushroom culture, and screen the surfaces of harvested fruiting bodies for the foodborne bacterium *Bacillus cereus*. Treatment combinations will be compared to assess the effects of heating methods and substrate choice on mushroom yield and microbial contamination. Preliminary testing indicates that the custom pasteurizer operates as intended and may reduce *Trichoderma* contamination in treated substrate. The full experiment will determine whether pasteurization and lower-cost pellets produce acceptable yields without increased contamination. Findings may help make small-scale oyster mushroom cultivation more accessible to urban growers and community food projects.

28. Development and Impact Testing of Mycelium-Based Materials

Juliana J. Syracuse*+, Matthew D. Gacura, PhD, Davide Piovesan

Gannon University

Petroleum-derived foams are widely used as lightweight materials in construction and protective applications, prompting interest in alternatives made from renewable resources. Mycelium-based composites can be grown on lignocellulosic residues, potentially diverting waste while forming lightweight materials. As white-rot fungi colonize a substrate, networks of hyphae bind its particles into a cohesive structure. Their physical properties depend on substrate composition and cultivation conditions, making formulation important for comparison. This study will evaluate the impact performance of sheets grown with *Pleurotus ostreatus* and compare them with three commercial foams: polyurethane, ethylene-vinyl acetate, and high-density closed-cell polyethylene. Potato dextrose agar plates were inoculated with *P. ostreatus* and incubated at 28 °C to establish cultures. Rye berries will be included in all substrate formulations. Nine sheets will be prepared, with three replicates each of hemp, sawdust, and a cotton–sawdust mixture. After inoculation with *P. ostreatus*, sheets will be grown for two weeks and dried before testing. Air-rifle projectile tests and drop-weight impact tests will be used to compare the mycelium composites with the commercial foams. We will record sheet mass, projectile puncture depth, rebound after impact, and visible damage as measures of material performance. By comparing the three substrate formulations, we aim to determine whether substrate choice influences the strength and resilience of the resulting sheets. The foam comparisons will show how these experimental composites perform under the selected impact conditions. This work will provide a preliminary basis for assessing mycelium composites as alternatives to petroleum-derived foam in applications where impact response matters.

29. Decoding Tarantula Silk: Using FTIR Spectroscopy to Link β -Sheet Content with Mechanical Performance Across Species and Ages

Saundra Munsick*+

Penn State Erie, The Behrend College, Schreyer Honors College

Spider silk from orb-weavers has been widely studied for its exceptional mechanical properties, but tarantula (*Theraphosidae*) silk remains understudied. Tarantulas use silk for burrowing and defense, and their silk is much weaker (~0.15 GPa) than araneomorph dragline silk (~1.1 GPa). This study investigates whether β -sheet content in tarantula silk correlates with mechanical properties and whether spectral differences reveal phylogenetic or age-related patterns. Silk was collected from tarantulas representing multiple species, including *Grammostola rosea*, *Lasiodora parahybana*, and *Aphonopelma chalcodes*. Attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy was used to collect absorbance spectra. A background spectrum of the clean ATR crystal was collected and corrected on the FTIR, after which silk spectra were acquired. Spectra were exported to MATLAB for normalization and removal of non-negative values, then imported into Fityk for peak integration. Integrated peaks were returned to MATLAB for peak identification and calculation of β -sheet content, focusing on the Amide I band (1620–1630 cm^{-1}). These findings demonstrate ATR-FTIR as a non-destructive method for estimating silk mechanical performance and suggest applications for phylogenetic classification and biomimetic material design.

30. Hyperfine Interactions in Quantum Systems

Rana Jelinek*+, Blair R. Tuttle

Penn State Behrend

Hyperfine (hf) interactions are the shifts in the energy levels of atoms caused by interactions between the magnetic moments of the electron clouds and a magnetically active nucleus. They are important in figuring out which atoms are involved in molecules and defects in solids. Often these defects can affect the magnetic and electronic properties of semiconductors. The hf interactions were calculated using the density functional theory (DFT) tool, Vienna Ab initio Simulation Package (VASP), which can calculate the quantum properties of complex systems. I created the HFparser.py code to parse the VASP output file, OUTCAR, which can contain hundreds of atomic hf interaction values. Therefore, the large hyperfine

values can be sifted out and organized into separate files. My code finds the atoms of the large hf values and outputs the atom numbers and hyperfine tensor values into a new file. Additionally, it can find and output all hf values and averages for a single atom and output isotropic hyperfine values. I used VASP and my code to find the important hf values for different systems including molecules (eg SiH₃) and defects in semiconductors. One focus of my research has been on silicon bond defects in bulk amorphous silicon. Amorphous silicon is an important material in thin film solar cells, although the efficiency is limited by silicon bond defects. My calculations are used to understand the atomic properties of hf active silicon defects in amorphous silicon.

31. Theory of defects in crystalline silicon

Garrett Carnes*+, Blair R. Tuttle

Penn State Behrend

Defect formation energies measure the energetic cost of creating defects in a crystal and can indicate which defects are most likely to form. Understanding these energies is important because defects can introduce electronic states that alter conductivity and affect the performance of semiconductor materials. Silicon is of particular interest due to its widespread use in photovoltaic and electronic applications. This work investigates the formation energies of several intrinsic and extrinsic point defects in silicon using first-principles density functional theory with the Vienna Ab initio Simulation Package (VASP). The intrinsic defect studied is a single vacancy whereas extrinsic defects investigated involve the vacancy interacting with an oxygen or nitrogen atom. Formation energies were calculated including variable charge states. An existing code was improved to incorporate extrinsic defects into the formation energy analysis. The resulting workflow, known as the Behrend Defect Analyzer, prepares input files for VASP calculations and performs post calculation analysis of the results, providing a systematic approach for studying both intrinsic and extrinsic point defects in silicon. My results are compared with previous theory and experiments.

32. Simulating Predator and Prey Interactions Using Ordinary Differential Equations

Gavin Iocona*+, Dr. Daniel Galiffa

Penn State Behrend

With this poster, we will discuss how we have extended the classical Lotka-Volterra system of differential equations to simulate how a population of predators interacts with several populations of prey species. This poster aims to showcase how mathematics can be applied to biology as a tool to give insight into how populations of different species directly affect one another. We will further address how our model is dependent upon several parameters that are determined by real species attributes, such as growth rate, natural death rate, and predation rate. Furthermore, our model shows how predator and prey populations can coexist or have one (or more) prey populations go extinct, depending on the aforementioned parameters. The poster will display several of our population dynamics simulations to demonstrate the behavior of our model given specific values.

ABSTRACTS

*Regional Science Consortium
22nd Annual Research Symposium
November 4-6, 2026
Tom Ridge Environmental Center
At Presque Isle State Park*

ART EXHIBITION

ART EXHIBITION: Wednesday, November 4, 2026, 6pm—8pm

Exuviae

Dr. Daniel J. Galiffa*

Associate (Tenured) Professor of Mathematics

Penn State Erie, The Behrend College

Media: Mixed Media

Dimensions: 12"X14"

Description: Exuviae are the remains of an exoskeleton and related structures that remain after ecdysozoans (here, tarantulas) have molted. Several have been collected and displayed for various species, charting their life process, and also yielding a metaphoric look into the passing of time.