WELCOME

Regional Science Consortium
19th Annual Research Symposium
November 8-10, 2023
Tom Ridge Environmental Center
at Presque Isle State Park

Welcome… to the celebration of our 19th Annual Regional Science Consortium Research Symposium! Every year I look forward to the Symposium, and this year was no different. I am excited to report that the next three days will include 39 Oral Presentations and 53 Poster Presentations. The purpose of our Symposium is to provide a venue to present scientific research by our RSC researchers. The Symposium is the one time each year that the scientists and students in this region come together, 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. We have 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 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 (*refreshments provided*). Please join us Thursday evening from 6:00 – 8:00, immediately following the presentations, for our Social which will include refreshments along with the Salmon Frank Band! All are welcome to attend.

I would like to thank all of the participants of the Symposium this year. I would like to thank the researchers, professors, and especially the 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 of the TREC for the preparations. I would especially like to thank Jennifer Salem, Sean Dalton, Sarah Magyan, and Hailey Dahl for their support of this event and the RSC. ***Thank you all!***

I hope you all enjoy Symposium 2023!
Please mark your calendar for next year's Regional Science Consortium Research Symposium on November 6 – 8, 2024.

Cheers!
Jeanette

Jeanette Schnars, Ph.D.
Executive Director
Regional Science Consortium

SCHEDULE OF TALKS

Regional Science Consortium
19th Annual Research Symposium
November 8-10, 2023
Tom Ridge Environmental Center
at Presque Isle State Park

WEDNESDAY, NOVEMBER 8, 2023

10:00 – 12:00 **REGISTRATION OPENS**
Register, upload presentations

12:00 – 12:10 **Welcome**
Jeanette Schnars, Ph.D., Executive Director, RSC

Presentations

Session Chair: *Jen Salem, RSC Plant Lab Manager*

12:10 – 12:30 **A Census of the Bat Population of Gannon University, Erie, PA**
Kira Armstrong*+, Della Mamani*+, and Dr. Steve Ropski
Biology Department, Gannon University, Erie, PA. 16541

12:30 – 12:50 **Habitat Suitability Mapping Using Logistic Regression Analysis of Long-term Bioacoustic Bat Survey Dataset in the Cassadaga Creek Watershed (USA)**
Jonathan P. Townsend[a,b]*+, Jared Aldstadt[a]
(a) Department of Geography, University at Buffalo, 116 Wilkeson Quadrangle, Buffalo, NY 14261, USA;
(b) Landscape-based Environmental System Analysis & Modeling Laboratory (LESAM), University at Buffalo, 142 Wilkeson Quadrangle, Buffalo, NY 14261, USA

12:50 – 1:10 **A Study of Bird/Building Collisions During Migration Seasons in the City of Erie**
Jewel Gonzalez[1]*+, Macy Hepditch[1]*+, Dr. Steve Ropski[1], and Dr. Sarah Sargent[2],
Biology Department, Gannon University[1] and Erie Bird Observatory[2], Erie, PA 16541

1:10 – 1:30 **Thar She Glows: Patterns of Biofluorescence in Snakes**
Holden Cooper*+, Lynne Beaty
School of Science, Penn State Erie - The Behrend College, Erie, PA 16563

1:30 – 1:50 **Impact of Sexual Cannibalism on Male Fitness in *Tenodera sinensis***
Wilczynski SA*+, Crossett R, Roster CP, Mathewson A, Brown WD, Ferguson SB

1:50 – 2:05 **BREAK**

Session Chair: *Sean Dalton, RSC Lab and Field Manager*

2:05 – 2:25 **Cactus Roots Harbor an Endophytic Growth Promoting Pseudomonas Species**
Isabella Foriska*+, Collin Olson, Rajinikanth Mohan
Dept. of Biology, Mercyhurst University, Erie, PA

2:25 – 2:45 **Thermophilic Bacillus Species Are Predominant Isolates from Plant Compost**
Kara Hill*+, Catherine Segada, Arna Dhar, Jason Rettger, Michael Foulk, Rajinikanth Mohan
Department of Biology, Mercyhurst University, Erie, PA 16546

2:45 – 3:05 **Preponderance of Milk Spoilage Bacteria in Raw Milk**
Aneesh Gadamsetty, Harjaap Kathuria*+, Kara Hill, Alena Kremer, Rohan Cherukuri, Jason Rettger, Adrian Rosas Ornelas, Kiersten Brown, Isabella Foriska, Nicole Hetzer, Rajinikanth Mohan
Department of Biology, Mercyhurst University, Erie, PA 16546

3:05 – 3:25 **Exploring Superoxide Dismutase in Defense Against Oxidative Stress in *Bacillus* spp.**
Jason Rettger*+, Rajinikanth Mohan
Department of Biology, Mercyhurst University, Erie, PA 16546

3:25 – 3:40 **BREAK**

Session Chair: *Sarah Magyan, RSC Aquatic Biologist*

3:40 – 3:50 **Role of PCBs in the alteration of inflammatory markers and genetic changes in breast cancer**
Trinity Prestash*, Nesve Ozsoy, Ashley E. Russell
Penn State Erie, The Behrend College
Speed Talk

3:50 – 4:10 **Giving a Face to the Unknown: Biometrics Applied to the Identification of Human Remains**
Rhiannon Toy[1]*+, Kloey Crist[1]*+, Joe Adserias-Garriga[1], Sara C. Zapico[2]
1: Department of Applied Forensic Sciences, Mercyhurst University
2: Department of Chemistry & Environmental Science, New Jersey Institute of Technology

4:10 – 4:30	**The contribution of scene recovery data in skeletal trauma interpretations** Joe Adserias-Garriga* *Department of Applied Forensic Sciences, Mercyhurst*
4:30 – 6:00	**RSC BOARD MEETING** – RSC Board Members – *Room 112*
6:00 – 8:00	**POSTER SESSION** – All are welcome to attend – *Refreshments provided*

THURSDAY, NOVEMBER 9, 2023

10:00 – 10:40 **REGISTRATION OPENS**
Register, upload presentations

10:40 – 10:50 **Welcome**
Jeanette Schnars, Ph.D., Executive Director, RSC

Presentations

Session Chair: *Jonathan Titus, RSC Past Board Member*

10:50 – 11:10 **Holistic Urban Land Reclamation incorporating Landscape Literacy**
Maris Grundy*, Josh Smith, Priscilla Titus, and Jon Titus
Lyceum at Silo City, 85 Silo City Row, Buffalo, NY 14203

11:10 – 11:30 **Wetland Restoration at Presque Isle State Park – A Never-ending Story**
Holly Best*
PA Department of Conservation and Natural Resources

11:30 – 11:50 **Wetland Restoration and Propagation Updates**
Jen Salem*
Regional Science Consortium

11:50 – 12:10 **Overview of Wetland Vegetation Monitoring on Presque Isle from 2012 through 2023 (Update)**
Robert S. Whyte*
Pennwest University, California, Biology Department, California, PA 15419

12:10 – 1:10 **LUNCH**

Session Chair: *Hailey Dahl, RSC Education and Outreach Manager*

1:10 – 1:30 **Biological Surveys in Restored Primary Wetland Habitats on Presque Isle State Park Erie, PA**
Sarah Magyan*
Regional Science Consortium

1:30 – 1:50 **Seven Years of Marsh Bird Monitoring at Presque Isle State Park: 2023 Update**
Sarah Sargent*, Chris Lundberg and Ron Mumme
Erie Bird Observatory, 301 Peninsula Dr, Ste 14, Erie, PA 16505

1:50 – 2:10 **Aerial Drone Surveys of Shoreline Change and Primary Wetland Habitats on Presque Isle State Park, Erie, PA**
Sean Dalton*
Regional Science Consortium

2:10 – 2:30 **BREAK**

Session Chair: *Holly Best, RSC Executive Board Member*

2:30 – 2:50 **Shifting Into STEELS- An overview of the Presque Isle EE staff's transitioning their lessons to fit the new PA STEELS standards**
Emily Pritchard*
PA Department of Conservation and Natural Resources

2:50 – 3:10 **Enhancing Environmental Education Through Nature: Iroquois Elementary School's Outdoor Classroom**
Hailey Dahl*
Regional Science Consortium

3:10 – 3:30 **Creating a Minor in Environmental Studies**
Derek F. DiMatteo*
Gannon University, Erie, PA

3:30 – 3:50 **The April 8th 2024 Solar Eclipse: Nationwide Research and Erie community Engagement Efforts in the Shadow of the Moon**
David Horne*
Gannon University

3:50 – 4:00 **Natural Refrigeration of Spacecraft Placed in Shadow at the Lagrange Points of Planetary Objects**
Jared Franc*
Penn State Erie – The Behrend College
Speed Talk

4:00 – 4:20 **BREAK**

Session Chair: *Jeanette Schnars, RSC Executive Director*

4:20 – 4:40 **Urban litter contribution to pollution in Great Lakes**
Varun Kasaraneni[1]*; Kristen Heflin[1], Susanah Harris[2]
[1]Department of Environmental Science and Engineering, Gannon University, Erie PA
[2]PA Department of Environmental Protection, Meadville, PA

4:40 – 5:00 **Shell-o, It's Me: Invasive Mysterysnails In Presque Isle State Park**
Lynne Beaty*[1], Adam Simpson[1], and Sam Nutile[1]
[1] School of Science, Penn State Erie – The Behrend College

5:00 – 5:20 **Effects of Selfing and Outcrossing on Transgenerational Responses to Predation Risk**
Haley Altadonna[1]*+ and Lynne Beaty[1]
[1] School of Science, Penn State Erie - The Behrend College, Erie, PA 16563

5:20 – 5:40	**Patterns in the springtime migrations of Eastern newts** Pete Siebler*+ *Allegheny College*
5:40 – 6:00	**How Old is That Turtle? And How Long Can They Live? Preliminary Answers from Graveyard Pond and Misery Bay, Presque Isle State Park, Pennsylvania** Peter V. Lindeman* *Pennsylvania Western University at Edinboro*
6:00 – 8:00	**SOCIAL** – All are welcome to attend – *Refreshments provided*

FRIDAY, NOVEMBER 10, 2023

11:20 – 11:40 **REGISTRATION OPENS**
Register, upload presentations

11:40 – 11:50 **Welcome**
Jeanette Schnars, Ph.D., Executive Director, RSC

Presentations

Session Chair: *Jeanette Schnars, RSC Executive Director*

11:50 – 12:10 **Evaluation of Quantitative Grain Size Analysis Methods for Beach and Dune Sands: A Case Study from the Lake Erie Shoreline in Northwest Pennsylvania**
FINKENBINDER, Matthew S.*, WINTERSTEEN, Erika, and ZAJAC, Jessica.
Wilkes University

12:10 – 12:30 **Concentrations of Heavy Metals in Round Gobies (*Neogobius melanostomus*) Are Predicted by Sediments, But Not Water**
Greg Andraso*, Alex Chelton, Maggie Greenfield, and Russell Minton
Gannon University, Biology Department

12:30 – 12:40 **The Common Sunfish in Presque Isle Bay and Water Quality**
Garrett McClelland*, Affiliates: Dr. Headley, Dr. Dempsey, and Dr. Andraso
Gannon University
Speed Talk

12:40 – 12:50 **Spatial Distribution of Eastern Sand Darter (*Ammocrypta pellucida*) in Western Pennsylvania**
Etienne Pienaar*[1], Jacob Green[2], Dr. Darren M. Wood[1]
1:Grove City College, Grove City, PA 16127,
2:Gomez and Sullivan, 41 Liberty Hill Rd, Henniker, NH
Speed Talk

12:50 – 1:00 **Brook Trout Population Connectivity in Oil Creek Tributaries**
Eli Rybka*
Watershed Conservation Research Center, Allegheny
Speed Talk

1:00 – 1:10 **Establishing a Baseline of Stream Characteristics in Indiana County, PA: Leveraging Community Connections**
Hope Burbank*, Katherine Farnsworth, Cindy Rodgers
Indiana University of Pennsylvania
Speed Talk

1:10 – 1:30 **Evaluating the long-term success of two stream-bank restorations within the French Creek Watershed**

Meredith Barney*, Mark Kirk, Casey Bradshaw-Wilson, Kelly Pearce
Watershed Conservation Research Center, Allegheny College

1:30 – 1:50 **BREAK**

Session Chair: *Hailey Dahl, RSC Education and Outreach Manager*

1:50 – 2:10 **Effects of Repeated Intranasal Administration of Gentamicin on Vestibular Function.**

Zachary Breeden, M.M.S.*+, LeAnn Haddad, M.S., Yusra Mansour, D.O., Ph.D., Randy Kulesza, Ph.D.
Lake Erie College of Osteopathic Medicine

2:10 – 2:30 **Impact of in utero paracetamol exposure on vestibular and auditory function**

Meghan Graeca*+
Lake Erie College of Osteopathic Medicine

2:30 – 2:50 **Genomic surveillance of Sars-CoV-2 variants enhances mitigation strategies and reveals viral evolution in a university campus context: A 2023 update on work in the Gannon University COVID-19 Lab**

Heeter, Madison*, Choy, Boram, Masri, Nour, and Jeanette Schnars, Ph.D.
Gannon University

2:50 – 3:00 **Understanding Key Factors in Managing COVID-19 and Related Pandemics: Implications for Policy Development and Health Care**

Boram Choy*, Madison Heeter, Nour Masri*, and Jeanette L. Schnars, PhD.
Gannon University
Speed Talk

3:00 – 3:30 **BREAK**

3:30 – 4:00 **PRESENTATION OF THE JERRY COVERT STUDENT RESEARCH AWARDS**

Jeanette Schnars, Ph.D., Executive Director, RSC
Jerry Covert, Ph.D., Past Executive Director, RSC
Student Award Presentations
Closing Remarks

ABSTRACTS

Regional Science Consortium
19th Annual Research Symposium
November 8-10, 2023
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ORAL PRESENTATIONS

Wednesday, November 8, 2023

A Census of the Bat Population of Gannon University, Erie, PA

Kira Armstrong*+, Della Mamani*+, and Dr. Steve Ropski
Biology Department, Gannon University, Erie, PA. 16541

For the past 15 summers, a census of the bat population has occurred on the Gannon University campus in Erie, PA. The numbers for the first three years held relatively steady, but the data for the past 9 years indicates a dramatic decline. White Nose Syndrome was first reported in 2006 in a cave in New York. The disease has killed an estimated 7 million bats in the eastern United States since then and has spread throughout Pennsylvania and into northeastern Ohio. This fungal infection has killed 95% of bats in some caves and may result in the listing of three bat species as endangered in Pennsylvania, including the Little Brown Bat (*Myotis lucifugus*), the predominant bat on the Gannon campus. This study will compare yearly data by building, time of year, building side and species composition to determine how White Nose Syndrome has affected the Gannon campus bats. A decrease in numbers may be partially responsible for an increase in West Nile Virus in the area. The results will also be used to place bat houses at appropriate locations to encourage bat presence on campus.

Habitat Suitability Mapping Using Logistic Regression Analysis of Long-term Bioacoustic Bat Survey Dataset in the Cassadaga Creek Watershed (USA)

Jonathan P. Townsend[a,b]*+, Jared Aldstadt[a]
(a) Department of Geography, University at Buffalo, 116 Wilkeson Quadrangle, Buffalo, NY 14261, USA;
(b) Landscape-based Environmental System Analysis & Modeling Laboratory (LESAM), University at Buffalo, 142 Wilkeson Quadrangle, Buffalo, NY 14261, USA

Bat species show global ecological importance, yet their numbers are declining worldwide. Understanding bat-habitat interactions is crucial in terms of developing effective conservation plans. In an effort to model bat habitat suitability in the Cassadaga Creek watershed, long-term bioacoustic bat data (spanning 2009 – 2020) was compiled, georeferenced and statistically analyzed using logistic regression techniques. In total, 1,600 bat occurrence records from five species of bat (559 Eptesicus fuscus, 560 *Lasionycteris noctivagans*, 143 Lasiurus borealis, 260 Lasiurus cinereus, and 78 *Myotis lucifugus*) were paired with pseudo-absence points to study the relationship between bat calling behavior and land cover. All bats but *Myotis lucifugus* had a statistically significant relationship with forested land cover, and all bats had negative interactions with agricultural habitats. Geospatial data was coupled with the statistical output to create maps of habitat suitability and echolocation calling density. This work provides a model that can be employed worldwide to evaluate bat habitat needs or patterns in echolocation behavior. Future research will incorporate a more recently collected dataset that is of greater geographic diversity with a larger number of environmental variables in the species distribution model.

A Study of Bird/Building Collisions During Migration Seasons in the City of Erie

Jewel Gonzalez[1]*+, Macy Hepditch[1]*+, Dr. Steve Ropski[1], and Dr. Sarah Sargent[2],
Biology Department, Gannon University[1] and Erie Bird Observatory[2], Erie, PA 16541

Collisions with buildings are a major cause of bird deaths during migration. The Erie Bird Observatory is studying this in the city of Erie, Pennsylvania, during both Spring (April/May) and Fall (September/October) migration seasons. Students and faculty at Gannon University walk two separate routes each morning from roughly 6:30-7:30am to look for dead or injured birds. The location, time, and species of each bird is recorded; injured birds are taken to Tamarack Wildlife Rehabilitation Center and dead birds are frozen for future identification. The goal is to identify which buildings have the most incidents and then help them lessen these through modifications. There are also four other routes in the city where identical work is being done.

Thar She Glows: Patterns of Biofluorescence in Snakes

Holden Cooper*+, Lynne Beaty
School of Science, Penn State Erie - The Behrend College, Erie, PA 16563

Biofluorescence has been widely documented in marine life, but few studies have examined this trait in terrestrial vertebrates. In fact, biofluorescence was only recently found to be a widespread trait among snake species. Many adult snakes have been documented to biofluoresce blue in response to UV light; however, how widespread biofluorescence is in response to other wavelengths and across snake taxa is unknown. For our study, we used shed skins and live snakes to observe how patterns of biofluorescence in response to UV, blue, and green light varied between snake species. To do this, we captured and photographed wild snakes in the field and photographed preserved skin sheds lent to us by the Natural History Museum at the Tom Ridge Environmental Center. Snakes and sheds were photographed under diffuse white light to document normal appearance followed by exposure to UV, blue, and green lights with appropriate longpass filters to document fluoresced wavelengths. While still collecting data, we have found that ventral surfaces typically biofluoresce more intensely than dorsal regions for all excitation wavelengths. Research on biofluorescence in terrestrial vertebrates is limited, so our study is a novel contribution demonstrating the prevalence of the trait in an understudied taxon.

Impact of Sexual Cannibalism on Male Fitness in *Tenodera sinensis*

Wilczynski SA*+, Crossett R, Roster CP, Mathewson A, Brown WD, Ferguson SB

Tenodera sinensis (the Chinese mantid) exhibit sexual cannibalism 14% of the time in wild mating pairs (Elgar & Schneider, 2004). Sexual cannibalism occurs when a female consumes a male before, during, or after mating (Elgar, 1992; Maxwell, 1999). This behavior may significantly influence the overall fitness of both the male and the female by providing nutrition (Brown & Barry, 2016) to the female and terminating future mating opportunities for males. Our study assesses the impact of sexual cannibalism on lost mating opportunities for males. To determine the amount of lost mating opportunities we used natural mating frequencies. Greater natural mating frequencies will indicate greater potential costs of sexual cannibalism for males. To assess these frequencies a parentage analysis of egg clutches (ootheca) was done using novel microsatellite markers. We predict that this species is polyandrous based on field observations of the attraction of multiple males to a singular female (Lelito & Brown, 2006; Christensen & Brown, 2018), with females mating with multiple males. Consequently, multiple mating as well as multiple sires, indicates higher natural mating frequencies, intensifying the expected impact on the fitness of males who experience cannibalism after a single mating event compared to those who mate multiple times without facing cannibalism.

Cactus Roots Harbor an Endophytic Growth Promoting Pseudomonas Species

Isabella Foriska*+, Collin Olson, Rajinikanth Mohan
Dept. of Biology, Mercyhurst University, Erie, PA

The prickly pear cactus, *Opuntia* sp., is a xerophytic desert plant which is distributed in various parts of the United States. Previous studies of the *Opuntia* rhizosphere revealed that the roots were colonized

primarily by fungi, with few bacteria being present. In this study, we isolated below-ground microbiota of an Eastern Prickly Pear cactus found in the wild using serial dilution plating and identified them using 16S rRNA sequencing. Of the sixteen culturable bacterial isolates, we found that the four endophytes were exclusively gram negative, with a fluorescent *Pseudomonas* sp. (strain IF1) found as most abundant. The rhizosphere immediately surrounding the roots were colonized by a higher diversity of bacteria, with most of them being gram negative. The bacteria in the surrounding sand were mostly gram positive, including *Bacillus* sp. These results indicate that the cactus roots actively select and colonize specific taxa of bacteria. The bacteria in the three environments were found to be biochemically distinct. Inclusion of the *Pseudomonas* strain IF1 dramatically improved the growth of two different cacti species based on the number of *de novo* padlet sprouts. Thus, wild cacti and endophytic *Pseudomonas* could benefit from a mutualistic interaction.

Thermophilic Bacillus Species Are Predominant Isolates from Plant Compost

Kara Hill*+, Catherine Segada, Arna Dhar, Jason Rettger, Michael Foulk, Rajinikanth Mohan
Department of Biology, Mercyhurst University, Erie, PA 16546

Compost is decomposing organic material that is used worldwide as fertilizers for plant growth. Compost is rich in microbes, but the knowledge of specific compost bacteria that promote plant growth is limited. In this study, we isolated bacteria from compost created from cafeteria food waste at Mercyhurst University. We found that most bacteria were thermophilic Bacillus species, which is not surprising since the final phase of compost formation involves heat generation. Some of these Bacillus species are presumably plant growth promoting. Additionally, we also isolated a Pseudomonas species, which based on phylogenetic analysis could be potentially pathogenic. Thus, bacteria in compost could be a mixture of beneficial and pathogenic bacteria and could work better for some plant species than others. We are also testing the metabolic preferences of the bacteria using biochemical tests. In future, individual isolates will be tested for plant growth promotion to identify probiotic bacteria.

Preponderance of Milk Spoilage Bacteria in Raw Milk

Aneesh Gadamsetty, Harjaap Kathuria*+, Kara Hill, Alena Kremer, Rohan Cherukuri, Jason Rettger, Adrian Rosas Ornelas, Kiersten Brown, Isabella Foriska, Nicole Hetzer, Rajinikanth Mohan
Department of Biology, Mercyhurst University, Erie, PA 16546

The health benefits and disease risks of raw, unpasteurized milk have long been a serious bone of contention. To examine the culturable bacteria in raw milk, bacteria were isolated using serial dilution plating on tryptic soy agar and 9 isolates were identified using 16S rRNA sequencing. Eight of the 10 isolates were bile tolerant gram negative bacilli and the remaining two were the gram positive lactose-utilizing fermenters, *Leuconostoc* and *Lactococcus*. Five of the 8 gram negative bacteria were glucose-fermenting, phosphate-utlizing & citrate-metabolizing *Pseudomonas* species, mostly belonging to the dairy-related *Pseudomonas fragi* group. Some *Pseudomonas* species were UV fluorescent, while some were psychrotolerant and others were able to metabolize the milk protein casein. Two of the gram negative bacteria were nitrate-reducing potential pathogens, *Citrobacter* and *Enterobacter*. Collectively, the bacteria in raw milk appeared to be capable of metabolizing raw milk components even at cold temperatures and the bile tolerance of most strains suggested a potential for enteric growth in raw milk consumers. Unsurprisingly, there was a preponderance of potential milk-spoiling *Pseudomonas* spp. and potential pathogens, consistent with previous studies, reiterating the need to exercise caution in raw milk consumption.

Exploring Superoxide Dismutase in Defense Against Oxidative Stress in *Bacillus* spp.

Jason Rettger*+, Rajinikanth Mohan
Department of Biology, Mercyhurst University, Erie, PA 16546

Reactive oxygen species present cellular life a unique challenge in maintaining homeostasis. Superoxides are free radicals that can radicalize other molecules, leading to damage
in proteins, lipids, and DNA, which can be fatal for organisms at any level of life. The presence of

such reactive species in bacteria are often associated with numerous cellular stresses, in environments such as hyper saline, osmotically hostile, extreme temperature, peroxide and herbicide rich. These environments and their respective impact on the expression of the enzyme superoxide dismutase in *Bacillus subtilis* is a primary goal of this study. *B. subtilis* demonstrates adequate growth under oxidative stresses to observe the expression of superoxide dismutase as a defense mechanism. Using SDS-PAGE, Western Blotting, and genetic analysis via gene knockout, we found the reliance on superoxide dismutase for oxidative stress tolerance in B. subtilis. SOD enzyme activity through an enzyme assay, as well as qPCR to study gene expression will be employed to further understand the role of SOD in these stresses. Understanding the role of superoxide dismutase in bacterial stress defense allows for better understanding of the universally damaging processes associated with reactive oxygen species. Since oxidative stresses have implications on human health, being that they can also affect human biochemistry, a better understanding of the fundamentals of the enzymes are instrumental to address related health issues like cancer, inflammation, and organ injuries.

Role of PCBs in the alteration of inflammatory markers and genetic changes in breast cancer

Trinity Prestash*, Nesve Ozsoy, Ashley E. Russell
Penn State Erie, The Behrend College

Speed Talk

Polychlorinated biphenyls (PCBs) are contaminants in Lake Erie that travel through food webs eventually making their way into game fish consumed by Erie County residents. There is a correlation between PCB exposure and breast cancer, and Erie County women experience significantly higher rates of breast cancer relative to the rest of the country. Prolonged PCB exposure may lead to an activation of inflammation and subsequent changes in genes associated with the onset and metastasis of cancer. Extracellular vesicles (EVs) are small particles released from cells, carrying cargo that contains lipids, proteins, and nucleic acids. EVs that are released from tumorous cells have the potential to pass abnormal traits to another cell via cell-to-cell communication, potentially resulting in cancer metastasis. If PCBs alter expression of RNA or cause inflammatory changes in cells and their released EVs, this could indicate a clear role for the involvement of PCB exposure and breast cancer onset and potential metastasis. NIH3T3 cells were exposed to pharmacologically relevant concentrations of PCBs and the EVs released by these cells were characterized. RT-qPCR will be performed using RNA isolated from the cell lysates and the EVs to assess changes in genes associated with breast cancer. The future scope of the project would be to examine genetic changes in breast cancer specific cells (MCF7 cell line) and also look at changes in the inflammatory pathway as chronic inflammation can also contribute to the onset of cancer.

Giving a Face to the Unknown: Biometrics Applied to the Identification of Human Remains

Rhiannon Toy[1]*+, Kloey Crist[1]*+, Joe Adserias-Garriga[1], Sara C. Zapico[2]
1: Department of Applied Forensic Sciences, Mercyhurst University
2: Department of Chemistry & Environmental Science, New Jersey Institute of Technology

Identifying human remains is one of the main goals of forensic scientists. The first step in the identification process is to reconstruct a biological profile, which consists of estimating a broad description of the individual. This can be accomplished by applying methods of skeletal analysis and forensic phenotyping.

The skeletal analysis includes several metric and non-metric methods that contribute to the assessment of the individual's sex, age, ancestry and stature. Forensic phenotyping uses DNA or other molecular biomarkers to infer the externally visible characteristics of the individual (such as ancestry, eye color, age, etc.).

When the biological profile is created but no antemortem records of potential individuals for this identity are found, other alternative methods are often used such as forensic facial reconstruction.

This research project aims to improve human identification by combining skeletal analysis, forensic facial approximation, and forensic phenotyping.

Our contribution to the project involved both sample collection for DNA analysis and biological profile estimation for four individuals from the Mercyhurst Donated Skeletal Collection.

The contribution of scene recovery data in skeletal trauma interpretations

Joe Adserias-Garriga*
Department of Applied Forensic Sciences, Mercyhurst

In the past, anthropologists were limited to the analysis of dry bones in the laboratory. They seldom participated in the recovery of the remains and the consideration of soft tissue fell outside of their umbrella of expertise. Therefore, their contribution to the cause and manner of death was very limited. This traditional approach started to change when in the 70´s when forensic anthropologists and forensic pathologists created unique collaborations in the Medical Examiner´s Office settings, resulting in a more accurate skeletal trauma analysis and interpretation.

In the 1980´s, archaeological excavation techniques and methods started to become incorporated into the recovery, analysis, and interpretation of outdoor forensic scenes. The focus on documenting and understanding relevant contextual factors of the scene and the concept of archaeologic association provided valuable information to the case.

Nowadays, skeletal trauma analysis is one of the most frequent requests of the forensic anthropological assessment, by Medical Examiners and Coroners offices.

This presentation will focus on the value of incorporating the scene information into the lab analysis of skeletal trauma analysis and interpretations.

Holistic Urban Land Reclamation incorporating Landscape Literacy

Maris Grundy*, Josh Smith, Priscilla Titus and Jon Titus
Lyceum at Silo City, 85 Silo City Row, Buffalo, NY 14203

Rust belt cities such as Buffalo and Erie face many challenges in restoring their post-industrial landscapes due to the industries that were formerly on the site such as very poor soils and dominance by invasive species. Compounding these challenges is a lack of expertise and understanding of urban ecological issues amongst local publics. The Lyceum at Silo City (the Lyceum) is an urban land management nonprofit based at Silo City in Buffalo. Situated amongst 100-year-old grain silos the Lyceum's work encompasses restoration ecology, site-responsive arts, and community-building and education that connects the public with a unique urban landscape. By retrofitting existing structures in a cost-effective pragmatic fashion the Lyceum raises tens of thousands of native plants each year including trees, shrubs, forbs and graminoids. The Lyceum has also fabricated unique facilities for propagating aquatic plants. These plants have significantly improved habitats along Buffalo's waterways and urban parks through collaborations with Tifft Nature Preserve and Riverkeepers amongst others. The Lyceum assists with planting efforts and offers expertise in restoration when needed. In addition, the Lyceum collaborates with local high schools to offer on-site active participatory workshops to inner city youth in horticulture and conservation.

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

Holly Best*
PA 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.

Wetland Restoration and Propagation Updates

Jen Salem*
Regional Science Consortium

Since 2016, the Regional Science Consortium has been growing plants to be used for a NFWF-funded priority wetland restoration project on Presque Isle State Park. Over the years, we have made modifications and implemented new propagation methods to increase our acreage planted and overall plants produced. We have added restoration sites to the original three locations as our plant production capabilities have increased over the years. Our focus has also widened to include long-term seed storage equipment to better store seeds harvested for immediate use in the wetland propagation program and for long-term seed storage. These additions and updates to the Wetland Restoration program on Presque Isle will continuously be modified as the project evolves.

Overview of Wetland Vegetation Monitoring on Presque Isle from 2012 through 2023 (Update)

Robert S. Whyte*
Pennwest University, California, Biology Department, California, PA 15419

The Presque Isle Priority Wetland Restoration project was initiated in 2011 and recently completed phase III (2019-2023). This comprehensive multi-agency effort seeks to treat and restore >1250 acres of coastal

wetland habitat at Presque Isle State Park. The Park, located in northwestern Pennsylvania, is 3,200 acres, which contains several unique ecological communities including numerous emergent wetlands and an open-water lagoon system. The native wetland plant communities have been overrun by invasive species including Phragmites (*Phragmites australis*), Narrow-leaved cattail (*Typha angustifolia*), and Purple loosestrife (*Lythrum salicaria*). In this talk, I provide a general update and overview of the program's monitoring status. I will review the areas monitored, our approach to monitoring, the overall state of the vegetation, and next steps. While significant areas of Phragmites have been removed and controlled, the focus going forward is to monitor the remaining small isolated stands that could rapidly spread under the right environmental conditions. In 2020 we also monitored the inner lagoon to evaluate the submerged plant community. This area has been under recent threat from invasive species to include Eurasian watermilfoil (*Myriophyllum spicatum*) and Starry stonewort (*Nitellopsis obtusa*). We are currently preparing a comprehensive 10 year report of the Presque Isle wetland vegetation, which should be ready in 2023. In 2022 we began a new monitoring phase that will run through 2024 and will focus on an assessment of the planted and restored areas.

Biological Surveys in Restored Primary Wetland Habitats on Presque Isle State Park Erie, PA

Sarah Magyan*
Regional Science Consortium

Invasive plant species can have numerous negative effects if left unopposed in priority wetland habitats for many biological species, ultimately leading to their displacement. The RSC monitors species of native amphibians, fish, mussels, and macroinvertebrates using various methods at 7 priority wetland habitat restoration areas distributed across Presque Isle State Park in Erie County, PA where treatment for invasive plants has been applied since 2009. Surveys were conducted both before and after native replanting efforts by Go Native! Erie. These surveys seek to catalog the change in native biodiversity in these restored habitats.

Seven Years of Marsh Bird Monitoring at Presque Isle State Park: 2023 Update

Sarah Sargent*, Chris Lundberg and Ron Mumme
Erie Bird Observatory, 301 Peninsula Dr, Ste 14, Erie, PA 16505

Starting in 2017, we surveyed for secretive marsh breeding birds using a standardized protocol at approximately 50 points within open marsh habitats at Presque Isle SP. Six of the eight target species have been detected in at least one year. Least Bitterns have been the most abundant but are declining, with Common Gallinules second most abundant, Virginia Rails have become more abundant over the study period. Soras, Pied-billed Grebes and American Coots remain irregular breeders here. King Rails and American Bitterns have not been detected. Habitat surveys were conducted in 2020 and 2022 within the marsh bird survey areas to quantify characteristics of the habitat that are important to the birds.

Aerial Drone Surveys of Shoreline Change and Primary Wetland Habitats on Presque Isle State Park, Erie, PA

Sean Dalton*
Regional Science Consortium

Presque Isle's shoreline and wetlands are dynamic environments subject to rapid change as a result of underlying geologic and biological conditions. These changes have direct impacts on the local economy and ecosystems of Erie, PA and Presque Isle State Park. In response, the RSC has integrated drone surveys into two of its already existing monitoring projects including tracking erosional changes to Presque Isle's lakeside shoreline over time and indexing the health of primary wetland habitat vegetation.

Shifting Into STEELS- An overview of the Presque Isle EE staff's transitioning their lessons to fit the new PA STEELS standards

Emily Pritchard*
PA Department of Conservation and Natural Resources

The Commonwealth of Pennsylvania adopted new integrated academic standards for science education that take effect July 1, 2025. Collectively known as STEELS (Science, Technology & Engineering, Environmental Literacy and Sustainability), the new standards are focused on teaching how to do science rather than memorizing scientific facts. This shift in education style is naturally aligned with Pennsylvania State Park's environmental education programming and therefore the division is spearheading efforts to ensure STEELS is incorporated statewide. Presque Isle State Park's environmental education team has begun the journey of shifting into STEELS by piloting an advanced field trip opportunity for several school-aged groups.

Enhancing Environmental Education Through Nature: Iroquois Elementary School's Outdoor Classroom

Hailey Dahl*
Regional Science Consortium

This presentation explores the innovative utilization and significant benefits of an outdoor classroom in the context of Water, Climate Change, and Environmental Justice. This project is made possible through the Pennsylvania Department of Environmental Protection's Environmental Education grant. This interdisciplinary approach harmonizes the suburban environment with the natural world, fostering connections between students and their local ecosystem. Embracing the Great Lakes Literacy Principle, the project features a Pollinator Garden, Pergola Classroom, Reading Garden, Yoga Garden, Rain Garden, and opportunities for Writing and Art. Aligning with NOAA's Meaningful Watershed Educational Experience (MWEE) standards, the initiative empowers students to engage with real-world water-related issues, understand climate change's local impact, and advocate for environmental justice. The presentation elucidates how this outdoor classroom enhances education, enriches environmental awareness, and promotes well-being. It also highlights the critical role of teacher and student engagement, the importance of grant support, and future funding opportunities. Together, we embark on a journey to create informed and responsible stewards of our environment.

Creating a Minor in Environmental Studies

Derek F. DiMatteo*
Gannon University, Erie, PA

This presentation explains how I developed an interdisciplinary minor in environmental studies for undergraduates at Gannon University. I explain the rationale for the minor, how it is structured to draw upon courses across the disciplines, and its potential for growth. Prior to this minor's creation, Gannon offered a program in Environmental Science and Engineering that was accessible only to science students. Yet environmental issues intersect with virtually every career field, from law to public health to culture industries. Creating this minor would fill a gap in Gannon's curricular offerings. However, its creation needed to overcome three challenges; it would need to: 1) be interdisciplinary, 2) be completable using as many courses from the liberal studies core as possible, and 3) cost no money to establish. If successful, the potential would be a minor that offers humanistic and social science dimensions to a science-oriented field while increasing the university's competitiveness in the higher education marketplace. This presentation is the story of the minor's creation and early implementation.

The April 8th 2024 Solar Eclipse: Nationwide Research and Erie community Engagement Efforts in the Shadow of the Moon

David Horne*
Gannon University

On April 8th 2024 a total solar eclipse will occur across the United States crossing numerous population centers from coast to coast and being visible to potentially 42 million people. totality will occur in Erie PA around 3:16PM, an event that will not be repeated here until the year 2144. In this talk I will outline present a research plan to place a series of weather observation devices designed to record, wind speed, wind direction, atmospheric pressure, humidity, light level and position across the nation from coast to

coast to measure atmospheric changes as the shadow of the moon passes over the area. I will present preliminary results from the October 14th partial/Annular eclipse recorded from both Erie PA and San Antonio TX. I will also detail my ongoing efforts to engage schools and the local community in regard to eclipse science and important safe solar observing practices in preparation for the spectacular total eclipse including dissemination of safe solar observing glasses to area schools and organizations.

Natural Refrigeration of Spacecraft Placed in Shadow at the Lagrange Points of Planetary Objects

Jared Franc*
Penn State Erie – The Behrend College

Speed Talk

There are objects in the Solar System where orbiting spacecraft can remain in perpetual shadow on the side opposite the Sun and near a Lagrange stability point. At these locations, one could place a space observatory – similar to the Webb telescope – without the engineering challenge of masking the Sun. For this project, we will determine which objects in the Solar System have their Lagrange stability points within their umbral shadows, and also calculate how much infrared light a spacecraft would receive from the night-side of a parent object.

Urban litter contribution to pollution in Great Lakes

Varun Kasaraneni[1]*; Kristen Heflin[1], Susanah Harris[2]
[1]*Department of Environmental Science and Engineering, Gannon University, Erie PA*
[2]*PA Department of Environmental Protection, Meadville, PA*

Although Urban litter is reported to be one of the primary sources of litter and plastic pollution in surface and marine waters, very little research is available about the actual levels and factors contribution to urban litter. A comprehensive investigation was conducted to determine the levels of litter entering storm water infrastructure and the factors that influence the levels. Storm samples were collected for eight events over spring, summer, and fall (0.14 in – 1.29 in) seasons from seven locations (2- Commercial, 2-Industrial, 3- Residential). Samples were collected using metal strainer baskets placed in drains prior to storm event and collected within 24hrs after the event. Samples are analyzed for Macro litter (>5mm), Macro plastics (>5mm), and Micro plastics (<5mm). Macro litter is also categorized by type (paper, textile, plastic, metal, glass, wood, construction material and other), further all smoking related items were also quantified separately. Some important conclusions of the study include, low income and Commercial locations had significantly higher Macro litter (3-20 times more) and Macro plastics (6-11 times more) counts. Microplastics counts per 10,000 gallons of runoff range from 42.6 – 58,512.

Shell-o, It's Me: Invasive Mysterysnails In Presque Isle State Park

Lynne Beaty*[1], Adam Simpson[1], and Sam Nutile[1]
[1] *School of Science, Penn State Erie – The Behrend College*

Invasive, nonindigenous species can influence native communities directly via consumption and indirectly through trophic cascades and accidental stowaways (e.g., parasites). Because of their diet variety and obligatory role in trematode life cycles, freshwater snails can significantly affect the communities they invade. Presque Isle State Park is currently home to several invasive, nonindigenous freshwater snail species, including mysterysnails (*Cipangopaludina/Margarya spp*.) which have the potential to impact the coastal ecosystems of Lake Erie negatively. In the Summer of 2023, we performed a robust mark-recapture study of invasive mysterysnails in Presque Isle State Park, generating population size estimates for different locations. The largest population was found in Thompson Bay, followed by Leo's Landing and Lily Pond. The smallest population estimated was in Graveyard Pond; however, we noted an increased mysterysnail presence in the park's lagoons that had not been observed in previous years. In addition, a snail initially tagged in Lily Pond was recaptured in Thompson Bay, suggesting that there may be human-facilitated movement of snails around the park. Future studies will estimate the population size of mysterysnails in the lagoons and use genetic tools to assess the population structure of snails in the park.

Effects of Selfing and Outcrossing on Transgenerational Responses to Predation Risk

Haley Altadonna[1]*+ and Lynne Beaty[1]

[1] *School of Science, Penn State Erie - The Behrend College, Erie, PA 16563*

Phenotypic plasticity – an organism's ability to change traits in response to its environment – can improve an individual's fitness by promoting a phenotype better suited for current environmental conditions. Phenotypic expression can be altered by direct experiences (i.e., within-generation plasticity) or experiences of previous generations (i.e., transgenerational plasticity). Transgenerational plasticity can help offspring overcome environmental stressors, such as predation, by using epigenetic information from their parent(s). Offspring may have varied contributions of epigenetic information, as seen with simultaneous hermaphrodites, which can reproduce via either outcrossing or self-fertilization (i.e., selfing). While predation's influence on transgenerational effects has been described, the relative influence of epigenetic information from one or two parental sources is unknown. This study aimed to determine how transgenerational epigenetic effects of predation risk are influenced by selfing and outcrossing. *Physa acuta*, hermaphroditic freshwater snails, were collected from Penn State Behrend's campus and allowed to mate. The resulting F1 generation was exposed to treatments consisting of all combinations of the absence or presence of predation risk and the absence or presence of a mate, resulting in six F2 generation lineages. Shell landmarking and a behavioral assay were completed to quantify anti-predator responses of the F2 generation. We found that the offspring of outcrossers were larger, and their size was influenced by paternal predation treatment. F2 snails were also less likely to exhibit anti-predator behavior after exposure to predation risk. These findings suggest that outcrossing and selfing influence transgenerational epigenetic effects of predation risk.

Patterns in the springtime migrations of Eastern newts

Pete Siebler*+

Allegheny College

For the past 25 years, researchers at Allegheny College have intensively studied the springtime migration of spotted salamanders (*Ambystoma maculatum*) to breeding ponds at the Bousson Environmental Research Reserve (BERR). While spotted salamanders are by far the most abundant amphibian species, numerous other amphibian species also use these ponds as breeding habitats, which include wood frogs, pickerel frogs, and eastern newts. Furthermore, although the BERR is renowned as a regional biodiversity hotspot for amphibians, we know very little about the migration patterns and population characteristics of these other species. Our objective was to summarize data on migrating eastern newts that were captured in 2019, 2020, and 2023 to see what migration patterns exist. We will evaluate within-year and between-year trends of sex ratio, body size, and arrival time of eastern newts during their springtime migrations. We hypothesize that red-spotted newts will follow similar patterns as spotted salamanders, with smaller newts and male newts arriving earlier in the migration season and larger newts and female newts arriving later in the season. Our study will provide important new insight into an understudied amphibian at an otherwise well-studied amphibian hotspot.

How Old is That Turtle? And How Long Can They Live? Preliminary Answers from Graveyard Pond and Misery Bay, Presque Isle State Park, Pennsylvania

Peter V. Lindeman*

Pennsylvania Western University at Edinboro

As famously long-lived species, turtles naturally elicit curiosity about their longevity. Answering the question of how old larger adult turtles are and how long they may live requires long-term, intensive population sampling. I have sampled the turtle assemblage of Graveyard Pond and Misery Bay at Presque Isle State Park for a quarter century (from 1999 to 2023) and preliminary information on longevity is beginning to emerge. Common map turtles (*Graptemys geographica*) exhibit reliable annual plastral growth rings through age 6 in males and age 10 in females. Several turtles captured with growth rings in the early years of the study have been recaptured in recent years, the oldest being a 29-year-old female. In

addition, turtles marked in the early years that were beyond the age of showing growth rings have also been recaptured recently, with one female being at least 32 and one male being at least 28. Fifty-six common snapping turtles (*Chelydra serpentina*) have been recaptured between 9 and 22 years after their first capture. While none were of known age at first capture, several must exceed 30 years of age based on their probable minimum ages at first capture; extraordinarily slow rates of growth over several years in many of them suggest that they may be older, perhaps considerably so in some cases. Recapture records are insufficient in number as well as in intervals to draw conclusions for painted turtles (*Chrysemys picta*), stinkpots (*Sternotherus odoratus*), spiny softshells (*Apalone spinifera*), and Blanding's turtles (*Emydoidea blandingii*).

Evaluation of Quantitative Grain Size Analysis Methods for Beach and Dune Sands: A Case Study from the Lake Erie Shoreline in Northwest Pennsylvania

FINKENBINDER, Matthew S.*, WINTERSTEEN, Erika, and ZAJAC, Jessica.
Wilkes University

The goal of this project was to measure and analyze the textural properties of sediment samples from the Lake Erie coastal zone in northwest Pennsylvania using visual inspection, sieving, and laser diffraction. Sediment samples were collected from beach and dune environments at Presque Isle State Park and Erie Bluffs State Park in June of 2021. Samples were analyzed using a binocular stereoscope and grain size comparator chart, a R-29 Ro-Tap RX-29 sieve shaker and nested sieves ranging from 32 microns (-5 phi) to 4000 microns at (-2 phi) at ¼ phi intervals, and a Microtrac SYNC laser diffraction system. Percentile grain size values from the sieving and laser diffraction analyses were used to calculate grain statistical parameters including the graphic mean, standard deviation, and skewness. Next, representative beach and dune samples were measured repeatedly (a minimum of 10 times) via laser diffraction to evaluate the degree of measurement reproducibility. Comparison between run percentile grain size values and the calculated grain size statistical parameters are used to assess reproducibility. Lastly, the textural analysis data from select beach and dune samples measured via sieving and laser diffraction was used to evaluate the similarity of results between these methods, both of which require different sediment masses for analysis, and rely on different calculation techniques (mass vs. volume percent), respectively. Results from this project include baseline textural datasets for beach and dune systems along the Lake Erie coastal zone and insights into potential methods biases for sieving vs. laser diffraction quantitative grain size analysis techniques.

Concentrations of Heavy Metals in Round Gobies (*Neogobius melanostomus*) Are Predicted by Sediments, But Not Water

Greg Andraso*, Alex Chelton, Maggie Greenfield, and Russell Minton
Gannon University, Biology Department

The round goby (*Neogobius melanostomus*) is a non-native fish that has received much attention in the Great Lakes. Due to its confinement to the benthos, predation on benthic organisms, and its role as prey to larger fishes, the round goby likely plays an important role in the transfer of contaminants to higher trophic levels. We used ICP-MS to assess concentrations of Ni, As, Cd, Ba, and Pb in liver, muscle, and otoliths of round gobies as well as sediments and water from five sites in Erie County, PA. One-factor ANOVA revealed differences in concentrations of individual heavy metals in soft tissues, otoliths, sediments, and water among sites. Multivariate analyses revealed differences among sites in metal composition of sediments and water. However, differences in sediment composition did not predict differences in water composition among sites. Multivariate analyses also revealed among-site differences in heavy metal composition of round goby tissues, both when all tissues were considered together and when tissues were considered separately. Finally, concentrations of heavy metals in the tissues of round gobies were predicted by metal concentrations in sediments, but not water. Our results support previous work that indicates the round goby plays a relatively new and important role in the transfer of heavy metals from sediments to higher trophic levels in its invaded range.

The Common Sunfish in Presque Isle Bay and Water Quality

Garrett McClelland*, Affiliates: Dr. Headley, Dr. Dempsey, and Dr. Andraso
Gannon University

Speed Talk

Over the summer I have been going out on Gannon's Research boat. I have been doing this with the professors at Gannon University who have been collecting data for the last six years. I will be doing the

speed talk based on the last five years of data collected. I will be discussing then years 2017 through 2022 with the of months included being June through November. When we go and collect data, we get many different types of water quality information such as light penetration, temperature, plankton quantities, and ph are just a few. Then we proceed to do a bottom of the bay fish trawl going across the bay for 10 minutes. After we bring the fish in and measuring the length and numbers of fish caught. I will be discussing the relationship between the common sunfish in Presque Isle and the effect water quality has on these fish. Being a math major at Gannon will be giving connections between the common sunfish and water quality with statistics. I will be very eager to present my findings at the Regional Science Consortium this November thank you.

Spatial Distribution of Eastern Sand Darter (*Ammocrypta pellucida*) in Western Pennsylvania

Etienne Pienaar*[1], Jacob Green[2], Dr. Darren M. Wood[1]
1:Grove City College, Grove City, PA 16127,
2:Gomez and Sullivan, 41 Liberty Hill Rd, Henniker, NH

Speed Talk

The Eastern sand darter, *Ammocrypta pellucida*, is a Pennsylvania state endangered freshwater sand specialist which has undergone substantial decline in its native range within the last century due to habitat loss mostly caused by siltation and chemical pollution. Although physical reports exist within the French Creek watershed, distribution of individuals is largely limited to the French Creek mainstem and some tributaries. This study sought to predict the distribution of the Eastern sand darter in the French Creek watershed using spatial modeling. A MaxEnt model was constructed with the known locations of physical detections, as well as slope, flow accumulation, surficial geology, and land cover classes to determine areas most consistent with Eastern sand darter habitat. The MaxEnt model predicted Eastern sand darter habitat range larger than the range of current known physical detections. Maximum predictive cell values per HUC 12 watershed ranged between 0.04 and 0.966, with nine out of 35 HUC 12 watersheds showing maximum predictive values over 0.4. Five out of the nine watersheds with values over 0.4 were outside the current known range of the Eastern sand darter. The spatial model demonstrates the importance of conserving the remaining watersheds inhabited by Eastern sand darters in Pennsylvania and demonstrates the importance of increasing sampling to further document the distribution of the Eastern sand darter in French Creek.

Brook Trout Population Connectivity in Oil Creek Tributaries

Eli Rybka*
Watershed Conservation Research Center, Allegheny

Speed Talk

This is an ongoing study with the goal of evaluating population connectivity of Brook Trout and Brown Trout throughout streams and tributaries that drain into the middle reaches of Oil Creek, Pennsylvania. A major factor impacting trout populations throughout the watershed are the quality of stream crossing structures. Poorly constructed and maintained culverts can be barriers to movement that isolate populations of Brook Trout, though problematic culverts can also serve to prevent non-native brown trout from colonizing Brook Trout habitat. Other barriers, such as the presence of large beaver impoundments and wetlands, have different implications for each species, as prior studies have found that Brook Trout are able to navigate through beaver altered watersheds significantly better than Brown Trout. We use a combination of electrofishing data and stream crossing surveys to determine the extent of Brook Trout population connectivity through these barriers and whether Brown Trout are also able to cross into these same streams. Stream crossing surveys were completed using protocols established by the North Atlantic Aquatic Connectivity Collaborative (NAACC). Given that two of these problematic stream crossings are already planned for replacement in 2024, this study seeks to identify if other culverts with poor passability that could be considered for removal or improvement to help restore brook trout population connectivity.

Evaluating the long-term success of two stream-bank restorations within the French Creek Watershed

Meredith Barney*, Mark Kirk, Casey Bradshaw-Wilson, Kelly Pearce
Watershed Conservation Research Center, Allegheny College

Streambank restorations are often implemented as responses to anthropogenic stressors that alter instream habitat and impair biotic integrity. However, the long-term benefits of these restoration projects are often understudied. The Watershed Conservation and Research Center (WCRC) at Allegheny College, in conjunction with local community partners, have performed two restorations at locations struggling with issues of erosion, sedimentation, and streambank stability. These restorations occurred in lower Woodcock Creek, a tributary to French Creek, in Crawford County, PA. The first site was located on the mainstem of Woodcock, and the other in a small tributary to the creek. Pre- and post- restoration data were collected at these sites, which included biotic assessments of fish and macroinvertebrates, as well as abiotic measurements of hydrology, substrate, and sedimentation, and water quality samples were collected and tested bi-weekly. The streambank restorations are expected to elicit long-term improvements in biotic integrity, water quality, and habitat heterogeneity, as well as increased recruitment of sensitive species. Changes caused by the restorations will be evaluated and presented in order to quantify restoration success and overall stream health. Both sites will continue to be monitored in a long-term multi-year study, and the data will be essential in planning future restorations and evaluating the overall health of the French Creek Watershed.

Effects of Repeated Intranasal Administration of Gentamicin on Vestibular Function.

Zachary Breeden, M.M.S.*+, LeAnn Haddad, M.S., Yusra Mansour, D.O., Ph.D., Randy Kulesza, Ph.D.
Lake Erie College of Osteopathic Medicine

Gentamicin is an aminoglycoside antibiotic that exhibits bactericidal activity against gram-negative bacteria. Numerous studies have evaluated gentamicin parenterally, including systemic, topical, ophthalmic and intracochlear routes. Adverse effects of gentamicin include rash, inflammation, drowsiness, weakness, fatigue, and ototoxicity. However, gentamicin is most commonly administered intranasally intraoperatively or via irrigation, but no studies have examined the toxic effects of gentamicin administered via this route in an animal model. Accordingly, we hypothesized that intranasal administration of gentamicin will result in ototoxicity and impaired vestibular function. We investigated this hypothesis in Sprague-Dawley rats that received intranasal irrigation with gentamicin or saline from postnatal day (P) 21-31. We examined vestibular function by assessing performance on balance beam navigation tasks on P39 and recording vestibular evoked myogenic potentials (VEMPs) on P40 in response to 5 msec 10 kHz pure tones at 90 dB. There was no difference between control or exposed animals in the time it took to navigate the balance beam under routine conditions. However, after a vestibular challenge, exposed animals took significantly longer to navigate the beam. Gentamicin-exposed animals also had abnormal VEMPs. Specifically, exposed animals had significantly longer onset latencies, longer N1 latencies and overall longer duration evoked responses. Together, these findings suggest that intranasal administration of gentamicin results in impaired vestibular function that extends to descending vestibular projections to the spinal centers.

Impact of in utero paracetamol exposure on vestibular and auditory function

Meghan Graeca*+
Lake Erie College of Osteopathic Medicine

Paracetamol (PAR) is an analgesic and antipyretic medication regarded as the safest over-the-counter pain and fever relief option for use during pregnancy. PAR and its metabolites are known to reach the developing fetus and neonate through direct placental transfer and excretion in breast milk. However, recent epidemiologic evidence suggests that PAR exposure can increase the risk of neurodevelopmental conditions, including autism spectrum disorder (ASD), a disorder associated with social, communicative, and behavioral difficulties, and attention deficit hyperactivity disorder (ADHD). There is recent evidence

that in utero exposure to PAR results in behavioral abnormalities. Because auditory and vestibular disfunction is a common feature in human subjects with ASD and animal models of ASD, we hypothesized that animals exposed to PAR will have impaired hearing and balance. We investigated this hypothesis using a battery of behavioral, neurophysiological, and anatomical methods. After timed-mating, Sprague-Dawley dams were gavaged daily with water or PAR (350 mg/kg) from gestational day 6 until parturition. PAR-exposed rat pups exhibited decreased rotarod testing time, increased time for negative geotaxis, and increased time for righting reflex. The PAR-exposed pups also displayed delayed ear opening compared to control. PAR-exposed animals had longer latency vestibular evoked myogenic potentials and auditory brainstem responses, but these were exacerbated near hearing threshold. Together, these findings suggest that in utero PAR exposure affects development of the inner ear and/or brainstem.

Genomic surveillance of Sars-CoV-2 variants enhances mitigation strategies and reveals viral evolution in a university campus context: A 2023 update on work in the Gannon University COVID-19 Lab

Heeter, Madison*, Choy, Boram, Masri, Nour, and Jeanette Schnars, Ph.D.
Gannon University

Upon its discovery in December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has been responsible for millions of deaths globally having since been declared a worldwide pandemic by the World Health Organization (WHO). Similar to other RNA viruses, SARS-CoV-2 has an enhanced ability to consistently mutate, resulting in the proliferation of several variants of concern (VOCs) as classified by the WHO. The increased transmissibility, virulence, and decreased effectiveness of public health measures attributed to VOCs highlight the importance of genomic surveillance of SARSCoV-2 in tracing the spread of mutants and elucidating the emergence of novel variants. Gannon University, located in Erie, PA. has undertaken surveillance for SARS-CoV-2 VOCs utilizing RT-qPCR and Next Generation Sequencing (NGS) to continually monitor their prevalence in those infected within the campus population and the Erie community. The experiment results provide insight to viral evolution within distinct populations, and illustrate the potential for localized genomic surveillance to reduce the burden of a public health crisis in similar industries and in the general population. As a result of the efforts on campus and within the community, the lab has shifted some additional focus toward testing Lake Erie freshwater samples for presence or absence of traces of SARS-CoV-2 in the water, which may help in indicating human fecal waste in tributaries and beaches.

Understanding Key Factors in Managing COVID-19 and Related Pandemics: Implications for Policy Development and Health Care

Boram Choy*, Madison Heeter, Nour Masri*, and Jeanette L. Schnars, PhD.
Gannon University

Speed Talk

The COVID-19 pandemic has posed unprecedented challenges to healthcare systems and policymakers worldwide. In managing the pandemic, several factors need to be considered, including the duration of COVID-19 positivity in individuals, the decline in testing rates, and the duration and severity of symptoms. This presentation highlights the importance of understanding these factors in developing effective strategies to control the spread of the virus and provide appropriate care. The presentation emphasizes the need for continued research and data collection to inform decision-making and policy development in the ongoing fight against COVID-19.

ABSTRACTS

Regional Science Consortium
19th Annual Research Symposium
November 8-10, 2023
Tom Ridge Environmental Center
at Presque Isle State Park

POSTER PRESENTATIONS

POSTER SESSION: Wednesday, November 8, 2023, 6pm—8pm

1. The Evolution of Forensic Odontology

Rhiannon Toy[1]*+, Aurora Vana[1], Joe Adserias-Garriga[1]
1: Department of Applied Forensic Sciences, Mercyhurst University

In forensics, there are three main ways to identify a person: DNA, fingerprints, and odontology. These identification means are highly reliable and widely used in forensic investigations. DNA analysis involves comparing genetic material to establish a person's unique biological profile. Fingerprint analysis matches the distinct patterns on a person's fingertips. Dental identification relies on comparing antemortem vs. postmortem dental records to establish a person's identity, which can be particularly useful in cases where other traditional methods may not be feasible, such as in mass disasters or cases of severe decomposition. Forensic odontology includes different areas of expertise that include dental age estimation, personal identification, disaster victim identification, bitemark examination, human abuse and neglect, and civil litigation.

This paper focuses on the role of forensic odontology as a scientific means of personal identification. Due to the distinctive characteristics of a person's dentition, individual tooth morphology and restorations serve a purpose in human identification. Therefore, forensic odontology applies principles and techniques concerning oral and maxillofacial structures to the legal or judicial systems.

A literature review on the role of dentistry in forensic investigations reveals how what began as a way for a Roman empress to identify a rival's head evolved into one of the most effective methods for identifying the deceased today.

2. The Use and Evolution of Forensic Odontology in Disaster Victim Identification Operations

Rhiannon Toy[1], Aurora Vana[1]*+, Joe Adserias-Garriga[1]
1: Department of Applied Forensic Sciences, Mercyhurst University

In forensics, odontology, also known as forensic dentistry, is used in multiple ways. This includes identification of human remains, age estimation, abuse and neglect cases, and patterned injuries. When it comes to identification, odontology is often used in Disaster Victim Identification (DVI) operations. DVI operations refers to the management and identification of human remains that are found in mass disasters or incidents. These include natural disasters, such as earthquakes or hurricanes, and man-made disasters, such as explosions, terrorism, and transportation accidents. Mass casualties will typically result in a DVI operation in order to ensure that all remains are identified in a timely manner.

The first official use of forensic odontology in DVI is considered to have been at the Bazar de la Charite fire in 1897. This fire resulted in the deaths of 126 people who attended the annual charity. A dentist in Paris at the time, Dr. Oscar Amoedo, determined that dental records would be useful in either identifying or excluding victims as no visual identifications could be made due to the charred state of the remains. Since 1897, there have been many more DVI operations, as well as improvements to the field.

Improvements include portable x-radiographs and Computer-Assisted Dental Identification Software. A literature review on the role of forensic odontology in DVI reveals how well this science has improved and its importance in identification today.

3. Post-mortem Interpretations of the Pink Teeth Phenomenon

Dakota Bell, B.S.*+; Shelby Feirstein, B.A.; Joe Adserias-Garriga, DDS, PhD, D-ABFO
Dept of Applied Forensic Sciences, Mercyhurst University

In certain forensic cases, teeth may show a postmortem pink staining, which is referred as the "Pink Teeth Phenomenon".

In the past, the Pink Teeth Phenomenon was thought to be correlated with an individual's cause of death, particularly in instances of asphyxia (i.e. drowning, hanging, or strangulation). However, recent studies have found no significant correlation between these variables, and it's attributed to a postmortem change in the body due to decomposition.

Multiple studies state that the Pink Teeth Phenomenon is mainly seen in the anterior teeth and more often in younger individuals compared to older individuals. The current and most agreed upon mechanism behind this phenomenon is the lysis of erythrocytes and the dispersion of hemoglobin derivatives through dentin tubules that enter the tooth's dentin. This library of research also suggests that there is a delay between time of death and the onset of pink coloration around the cemento-enamel junction (CEJ).

More research is needed to determine what series of mechanisms cause this phenomenon, including depositional environment, orientation of the body at death, and if certain areas of the dentition are more prone to presenting this phenomenon.

This presentation aims to present an accurate understanding of the current literature discussing the Pink Teeth Phenomenon (PTP) and learn where future research may lead.

4. Assessing the Viability of DNA Yields from Taphonomically-Altered Bone

Shelby Feirstein, B.A.*+ (M.S. Candidate, Mercyhurst University), Joe Adserias-Garriga, DDS., Ph.D, D-ABFO (Mercyhurst University), Luis Cabo-Perez, M.S. (Mercyhurst University), Sara C. Zapico, Ph.D., ABC-MB (New Jersey Institute of Technology)

Learning Objective: Attendees of this presentation will gain a better understanding of how DNA preserves in scenarios in which human remains have been exposed to thermal alteration or common corrosive chemicals in household products. This is especially important in cases where other means of identification are not applicable.

Impact Statement: This presentation will impact the forensic community by sharing preliminary findings on the efficiency of DNA analysis on taphonomically-altered bone in regard to identifying human remains exposed to fire or common household chemicals.

DNA is more resistant to degradation in hard tissues due to the protective effects conferred by the surrounding inorganic matrices of bones and tooth tissue.3 United States laboratories currently favor femora, teeth, and temporal bones as preferred samples for DNA isolation and analysis. However, the recommended elements are not always available for sampling and subsequent genetic profiling. The latest studies suggest that elements, such as phalanges, metacarpals, and metatarsals, render similar, if not better, DNA yields.1 These smaller bones offer ease and efficiency to the whole process and are not used in the biological profile in anthropological analyses unlike the cranium and long bones.

Circumstances, such as fatal fires, mass disasters, and exposure to corrosive substances, where the condition of the remains complicates their identification, may obscure a victim's identity and hamper the possibility of DNA recovery and characterization. Thermal alteration, sodium hydroxide (NaOH), and hydrochloric acid (HCI) are known to change both the structural integrity and composition of skeletal elements, affecting the quality and/or quantity of DNA available for extraction.

Furthermore, researchers note that perpetrators may use household corrosive substances and fire as an attempt to destroy the remains based on their availability and apparent effects. Nonetheless, a positive identification can be pulled from both soft and hard tissues in some circumstances.2 Additionally, recent studies have explored whether authentic DNA profiles can be generated from human skeletal elements

exposed to varying stages of fire-induced destruction. Results show that identification from DNA profiles were reliable and reproducible from both well-preserved and semi-burnt bones, whereas blue-gray burnt bone led to sporadic authentic profiles and bones on the verge of full calcination rarely led to reliable results. Black burnt bone consistently contained highly degraded DNA, and in certain cases, there was no remaining nuclear DNA.4,5

The aim of this study is to assess the macroscopic changes on bone exposed to different taphonomic agents and evaluate the possibility of DNA isolation and profiling.

Hand bones, from one donated individual, were exposed to different treatments: controlled fire, sodium hydroxide, and hydrochloric acid. After the appropriate times, respective to each treatment, macroscopic changes were recorded. DNA was extracted using a silica-based method and quantified through a human-specific QPCR methodology, providing degradation and inhibitor ratios. In those samples rendering quantifiable DNA, 0.5 ng of DNA were used to carry out the STR profile. These profiles were compared to the full genetic profiles taken from the control elements.

The results indicate a variable pattern of DNA yields depending on the treatment and duration of exposure. This points to the difficulty of performing analyses on taphonomically-altered bone, demonstrating the importance of finding viable identification methods to avoid delays in achieving a positive identification, and a backlog of cold cases. Future research will seek to expand on these results, assessing other corrosive agents, different concentrations and durations, as well as other skeletal elements.

5. Pathophysiology and management of Lupus Erythematosus

Hannah Peck*+ and Mary Vagula, Ph.D.

Systemic Lupus Erythematosus, more commonly known as Lupus, is an autoimmune disease in which the immune system attacks its own organs, due to a dysregulation of the Type 1 Interferons in an individual's body. This altered regulation causes Type 1 Interferons to be activated by auto nucleic acids, triggering an immune response on one's own body, eventually leading to widespread inflammation and tissue damage. The primary organ systems affected by Lupus are renal and cardiothoracic, with the most common side effects being pericarditis and kidney failure. This disease is estimated to affect at least 5 million people worldwide; however, the effects are disproportionate in regard to ethnicity, due to genetic predisposition as well as access to healthcare. Systemic Lupus Erythematosus (SLE) is difficult to diagnose secondary to the wide array and vagueness of symptoms, which can range from mild to severe. Approximately 1,200 individuals die prematurely each year, as there is no cure for this disease. Individuals with milder symptoms suffer physical, mental, and social handicap when they experience "flare ups" within this disease. This presentation will cover the history of SLE, the molecular mechanism for the trigger of Type 1 Interferons, the onset of symptoms, effects on an individual, diagnostic testing, prevalence, economic impact, treatment, and current research on advancements.

6. Comparison of Essential Oil on Growth Inhibition of *Cutibacterium acnes*

Sabeer Bedi*+

Introduction: *Cutibacterium acnes* is a Gram-positive anaerobic bacterium that contributes to facial acne, post-operative osteomyelitis, and biofilm development. The virulence factors enabling C. acnes to cause these pathologies are bacterial adhesion, biofilm synthesis and enzymatic degradation. Of particular concern is the ability of C. acnes to utilize these virulence factors for contaminating prosthetic joints. Previous studies conducted in our laboratory have discovered that essential plant oils, such as red thyme oil (RTO), cassia bark oil (CBO), and oregano oil (OO), exhibit inhibition of bacterial growth against pathogens such as Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli. This study aims to assess the effect of essential oils on growth inhibition of C. acnes grown anaerobically in vitro. Methods: The zone of inhibition (ZOI) for each oil was determined for C. acnes by utilizing the Kirby-Bauer disk diffusion assay. C. acnes was grown in anaerobic chambers for 72 hours in the presence of a panel of essential oils, and separately with dilutions of RTO, CBO, and OO. The ZOI of each oil was measured and then compared using a Kruskal-Wallis, followed by a Dunn post-hoc test to determine statistical significance.

Results: For the panel of oils tested, RTO, CBO, and OO completely inhibited C. acnes growth. Thus, these three oils were diluted by 50% and displayed a significantly larger ZOI than the other undiluted oils that were tested. Moreover, CBO significantly inhibited the growth of C. acnes compared to RTO and OO.
Conclusion: Results presented here demonstrate that CBO was significantly more effective in inhibiting the growth of C. acnes compared to the other oils examined. These results demonstrate the potential of essential plant oils to inhibit the growth of C. acnes in vitro. A future study should focus on examining other essential oils or combination of oils to determine if they inhibit growth of C. acnes.

7. Microbiome in Petit Manseng Grape Roots

Noah Janes*+, Dr. Mike Campbell
Penn State Behrend

Fungal endophytes are fungi that inhabit the roots of plants and offer some benefits through symbiosis. These endophytes impact plants by producing unique compounds for the plant in exchange for shelter and energy. Understanding the fungi's role in the plant begins by identifying what fungi are present and how that fungal community changes over time. The objective of this study was to determine what fungal genera are present in the microbiome of Petit Manseng grape roots and how that microbiome community changes over time. We sampled roots from 48 randomly selected vines of Petit Manseng from the same vineyard over three separate time points. A subset of roots was plated on MEA media and the resulting fungal isolates had their DNA extracted. PCR was then used to amplify the ITS region and the gene for EF1-α. Amplicons were sequenced using the Sanger method and BLAST analysis to determine the proportion of each genus present across the vineyard in this preliminary dataset. A second set of DNA extractions are being done for the three time points to determine community change over time. These will be amplified using PCR with ITS1 and ITS4 primers and analyzed using Ilumina sequencing. Determining the proportion of each genus present at each time point will be done using R and significant changes in the community between time points will be assessed using a two-way ANOVA. These fungal endophytes may have implications regarding vine health and fruit chemistry for growers and those who sell grape products.

8. Rambutan Fruits Contain Osmotically Adapted Bacteria

Kiersten Brown*+, Kara Hill, Rajinikanth Mohan
Department of Biology, Mercyhurst University, Erie, Pennsylvania

Fruits are consumed worldwide for nutrition and taste. Little is known about microbes that dwell within fruits and may be consumed. We tested the exotic tropical fruit, rambutan (*Nephelium lappaceum*) for the presence of bacteria. We obtained fifteen morphologically distinct isolates of bacteria from the interior of the rambutan fruit using serial dilution plating. We identified the bacteria using 16S rRNA PCR and sequencing and confirmed their identities using gram staining. We performed biochemical tests and found that most isolates showed high osmotic stress tolerance, suggesting a possible bacterial adaptation to the sugary environment inside rambutan fruits. Interestingly, some of the isolated grew well only upon sugar supplementation, indicating that they are osmophiles. The characterization of these bacteria could reveal mechanisms of osmotic stress tolerance in these bacteria as well as bacteria that may be consumed through fruits.

9. Preserving Tradition: Exploring Indigenous Yogurt for Pathogen Prevention

Colin Brown*+, Rajinikanth Mohan
Mercyhurst University

Yogurt, adored by people around the world, is celebrated for its cultural heritage and nutritional benefits. Its history dates back thousands of years, evolving from primitive artisanal practices to today's enormous commercial production. The creamy sweet taste that is so distinctive in commercialized yogurt products is caused by the fermentation of lactose by Lactobacillus and Streptococcus species. Yogurt could potentially be made with any combination of lactose fermenting bacteria, and the extent of using different bacteria

outside of the industrial standards has not been studied. In this experiment, bacteria were isolated from store-bought yogurt and compared to dahi, a traditional fermented milk product originating from India that is of very close resemblance to yogurt. We found that the bacterium responsible for Dahi is *Carnobacterium* which typically seeks to eat dairy, meat, and fish products. The significance of finding *Carnobacterium* in dahi is that this bacterium has no previous history of being found in products such as yogurt. How has this bacterium, passed down generations, kept yogurt safe to eat? This study delves into the bio-preservation potential of indigenous yogurt bacteria through the inspection of metabolic processes to prevent the growth of pathogens. Could this novel bacterium contribute to a new standard of safe dairy products that can be implemented commercially?

10. The growth of *Pseudomonas aeruginosa* in the tumor microenvironment of pancreatic ductal adenocarcinoma

Tiffany Nguyen, M.M.S.*+, Robert Waters, Ph.D., Christopher C. Keller, Ph.D., FNAOME, Nancy Carty, Ph.D., Noelle Thielman, Ph.D.

Intro: Pancreatic ductal adenocarcinoma (PDA) is one of the most devastating cancers due to its poor prognosis and high mortality. A major contributing factor of tumorigenesis is the unique tumor microenvironment (TME) in PDA. Growth factors secreted into the microenvironment have been found to promote tumor progression and metastasis. Recently, the bacterium Pseudomonas aeruginosa has been found in the TME of PDA, but it is unclear how it is able to survive and if it contributes to disease progression.

Methods: PDA cells were grown in media with and without fetal bovine serum, and the supernatant was collected. P. aeruginosa was grown in 3 conditions: Luria Broth or tumor cell media and tumor supernatant, which was taken after PDA cell growth. Absorbance at 570 nm was taken over 24 hours to measure bacterial growth in the various culture conditions.

Results: Bacterial growth in tumor cell media and tumor supernatant showed negligible difference when using media with FBS. Bacteria grown in serum-free media taken from cultures grown with PDA cells demonstrated decreased growth compared to bacteria in serum-free media without PDA cells. Statistical significance was determined using the Mann-Whitney U test.

Discussion: P. aeruginosa showed decreased growth in the presence of secreted factors from PDA cells compared to P. aeruginosa grown in media alone. This data suggests that secreted factors influence bacterial growth. Further studies should be conducted to determine specific factors secreted from PDA cells and how these factors influence bacterial growth.

Conclusion: This study suggests that secreted factors from PDA cells decrease the growth of P. aeruginosa; however, how this research relates clinically needs further exploration. To better study the TME, future investigation should examine the factors secreted by PDA cells and how they influence bacterial growth. These studies may be a step towards understanding TME signaling in the progression of pancreatic cancer.

11. Testing anti-bacterial effects of *Cordyceps militaris*

Chelsea Spatara*+ (Student), John Benjamin (Student), and Dr. Tamrya d'Artenay (Advisor) and Dr. Michael Campbell (Advisor)

Cordyceps militaris is a fungus with a host of beneficial properties, including anti-bacterial features, yet little is known about which bacteria it works against, how powerful it is against these bacteria, and the mechanisms of these anti-bacterial properties. Preliminary research has found that one *C. militaris* (strain 1) has stronger bacterial resistance when compared to two other strains against three bacteria, *E. coli*, *C. freundii*, and *E. aerogenes*. Taking this into consideration, the goals of current and future research is to determine when *C. militaris* is at its most antibiotically active, as well as performing size separation on active fungus molecules to narrow down what size-class of molecules contributes to the antibiotic effects. In doing this, C. militaris antibiotic activity will also be compared to that of commonly used antibiotics in animal feed. Although no animals are intended for use in this study, the overall goal of these experiments

are to create a baseline for future research about the presence of *C. militaris* in medicated animal feed, as opposed to commonly used antibiotics.

12. The Synergistic Effect of Essential Plant Oils and their Components on the Growth Inhibition of Staphylococcus aureus and Escherichia coli

Brady Nicosia*+, Noelle Thielman, Ph.D., Nancy Carty, Ph.D., Christopher C. Keller, Ph.D. FNAOME, Robert Waters, Ph.D.

Introduction: *Staphylococcus aureus*, a Gram-positive coccus, and *Escherichia coli*, a Gram-negative bacillus, are common pathogens, with some strains displaying multi-drug resistance. Previous research in our laboratories has shown that red thyme oil (RTO), cinnamon cassia oil (CCO), and their major constituents, thymol (THY) and cinnamaldehyde (CA), respectively, inhibit bacterial growth when acting alone. Therefore, we postulated that combinations of these oils and/or their constituents would result in more effective bacterial killing in vitro.
Methods: Disc diffusion assays were performed using RTO/CCO and THY/CA combinations to determine their effects on *S. aureus* and *E. coli* growth inhibition. Bacteria were cultured on Mueller Hinton agar in the presence of the essential oils or constituent components alone, and separately in combinations. The zone of inhibition was measured after 24 hours. Statistical significance was determined by Kruskal-Wallis followed by a Dunn post-hoc test.
Results: Both RTO and CCO alone inhibited the growth of *S. aureus* and *E. coli*, however the RTO/CCO combination had an antagonistic effect on both *S. aureus* and *E. coli* growth inhibition. Both THY and CA inhibited the growth of *S. aureus* and *E. coli*, however, the THY/CA combination was also antagonistic for growth inhibition for both bacteria. It was determined that there was no synergistic effect of these oils or constituent combinations against *S. aureus* and *E. coli*.
Conclusion: The results suggest that essential oils and their major constitutive components display in vitro growth inhibition against *S. aureus* and *E. coli*, combinations of these oils, and their constituents may inhibit the active effects of each other. Future studies should investigate if other essential oil and/or constituent combinations can display a synergistic effect, which could offer novel treatments for multi-drug resistant bacterial infections.

13. Identification of Downy Mildew Strains Resistant to Strobilurin and CAA Fungicides

Ivy Laffan*+ (Penn State Behrend), Nyla Zorbas*+ (Penn State Behrend); Michael Campbell (Penn State Behrend, Lake Erie Regional Grape Research and Extension Center); Jessica Clippinger (Lake Erie Regional Grape Research and Extension Center), Bryan Hed (Lake Erie Regional Grape Research and Extension Center)

Downy mildew (*Plasmopara viticola*) is a fungal pathogen that threatens the grape and wine industry in Northeast, PA. The fungus targets leaf tissue and grape clusters and, when left untreated, can cause necrosis of the vine. Strobilurin and CAA fungicides are commonly used to combat downy mildew, but overuse over several decades has led to increased occurrence of resistance. The objective of this experiment was to detect the presence of quinone outside inhibitor (QoI) resistance caused by mutation G143A and carboxylic acid amide (CAA) resistance caused by mutation G1105S on local downy mildew strains. To do this, infected leaf samples were collected, sterilized, and inoculated with one of four different fungicides: Ridomil, Reliant, Abound (associated with QoI), or Revus (associated with CAA). Spore suspensions were collected by washing fungal lesions with sterile water. DNA was then extracted from the spore isolates and amplified via polymerase chain reaction (PCR). A total of 36 samples were tested for QoI resistance, with forward primers CytbQForMut and CytbQForWT assessed separately in conjunction with a shared reverse primer CytbQRev. ITS primers were then used to barcode 10 fungal isolates and confirm identification. CAA resistance has been tested on 12 samples with forward primer Cesa3OF and reverse primer Cesa3OR with no results. This is an ongoing project and DNA sequencing will be required moving forward for further analysis.

14. Effects of cortisol on the expression of iron transport proteins and extracellular vesicles

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Penn State Erie, The Behrend College

During pregnancy, the placenta is responsible for commutation between mother and fetus, such as delivering oxygen and nutrients. Iron is a vital micronutrient delivered to the fetus through the placenta and is essential in the development and synthesis of red blood cells, muscles, and the brain. High levels of the stress hormone cortisol are induced by chronic stress disorders, such as PTSD. Negative fetal outcomes have been correlated with abnormal levels of either iron or cortisol. The objective of our research is to observe how elevated levels of cortisol has on iron transporters transferrin receptor 1 and ferroportin in placental cells. To test this, we used CCK8 and LDH assays to assess cell viability and death after exposure to varying concentrations of cortisol. Then, we cultured BeWo cells and exposed them to medium and high cortisol concentrations and used western blot to assess changes in the expression of the iron transport proteins. We are also looking into the potential role that extracellular vesicles (EVs) have within iron transport during pregnancy. EVs are membrane bound particles released by cells and are responsible for delivering molecular cargo from donor to receiver and facilitate communication between the cells. We are trying to determine if the iron transport proteins are in the EVS and if cortisol affects EVs' expression. The results of the experiments will aid in improving our understanding of the effects that chronic stress has on fetal iron levels.

15. Oligodendrocyte derived extracellular vesicle release are altered by endoplasmic reticulum stress

Saranraj Govindaraj*+, Ethan Evalt*+, Madison Jones, Nesve Ozsoy, Ashley Russell
Penn State Erie, The Behrend College

Oligodendrocytes are glial cells that are a part of the central nervous system (CNS) whose function is to form myelin sheaths around axons to provide insulation and facilitation in electrical signaling. These sheaths are composed of proteins and lipids which are synthesized and transported by the endoplasmic reticulum (ER) of the oligodendrocyte. Disruptions in ER protein synthesis can cause ER stress, leading to the activation of the unfolded protein response. Oligodendrocytes are dependent on protein production and are sensitive to the harmful effects of ER stress. Prior studies have reported that ER stress can alter the release and composition of extracellular vesicles (EVs) in some cell types. However, the impact of ER stress on oligodendrocytes has not previously been reported. This study aims to determine the effects of ER stress on oligodendrocyte EV release and composition. Human oligodendroglioma were treated with tunicamycin to induce ER stress. Cell death and viability assays (LDH and CCK8, respectively) were conducted to determine that the optimal concentration to be 10 ug/mL. To confirm successful induction of ER stress, western blotting was performed, revealing a significant upregulation of ATF6, RL90/PDI, and BIP in tunicamycin treated cells, relative to control. We had also verified successful isolation of EVs by observing for EV markers CD63, CD9, and CD81 in the EV fraction, and their absence in the protein fraction. We are currently investigating how ER stress may modulate EV cargo by assessing protein and microRNA profiles, and how these EVs may impact the functionality of naïve cells exposed to them.

16. Effects of repeated intranasal administration of gentamicin on click and tone auditory brainstem responses

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Gentamicin is a bactericidal aminoglycoside antibiotic that broadly targets Gram-negative microbes. Animal studies have shown that systemic administration of gentamicin is ototoxic and results in sensorineural hearing loss due to the destruction of hair cells in the outer cochlea. However, gentamicin is typically administered intranasally in human subjects, but no animal studies have examined the ototoxicity of gentamicin administered via this route. Therefore, we hypothesized that intranasal delivery

of gentamicin will result in similar ototoxicity and impaired auditory function. We investigated this hypothesis in Sprague-Dawley rats that received intranasal injections of gentamicin or saline from postnatal day (P) 21-31. We examined auditory function by assessing auditory brainstem responses in response to clicks and pure tone stimuli (4. 8, 16, 24 and 32 kHz) on P41. We found significant changes in auditory function in gentamicin-exposed animals. Specifically, gentamicin-exposed animals had significantly higher thresholds in response to 8, 16, 24 and 32 kHz tones. There was no difference in ABR thresholds or response latencies to clicks at 90 dB. However, we found significantly longer wave and interwave latencies in response to clicks at 20 dB above threshold. Together, these findings suggest that intranasal administration of gentamicin results in impaired auditory function. These effects are most likely from toxic action of gentamicin on neurons and/or hair cells in the cochlea.

17. MTHFR Genetic Variant

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Methylenetetrahydrofolate reductase (MTHFR) is a gene that codes for MTHFR protein production. MTHFR protein aids the body in processing folate, a natural, water-soluble form of Vitamin B9 that is found naturally in several food types. People who carry a genetic variant of this gene are unable to convert folate to its active form, which is used within the body for important processes, such as DNA and RNA production, healthy red blood cell production, and protein metabolism. Folate plays an important role in breaking down the amino acid, homocysteine. People who have the genetic variant for MTHFR may experience low levels of folate and high levels of homocysteine, which can exert harmful effects. The MTHFR gene is located on Chromosome 1 and has two common forms of the mutation – C677T and A1298C. Those who are homozygous for one of these variants are more likely to experience health problems. There are more people in the United States that have one or two copies of the most common MTHFR variant than people who do not have an MTHFR variant. It is estimated that about 30-40% of the American population may have a mutation located at C677T on the MTHFR gene. It was found that the A1298C variant was present in 7-14% of North Americans, European, and Australian populations. This is an educational poster that examines the MTHFR gene and variants, the correlation between folate and homocysteine levels, symptoms caused by the MTHFR variants, related health conditions, MTHFR variants and pregnancy, and manageability.

18. Effects of Polybrominated Diphenyl Ethers on the Autism Causing Genes in Human Umbilical Vein Endothelial Cells

Courtney Solensky*+ and Mary Vagula Ph.D.
Gannon University

Autism Spectrum Disorder (ASD) is a condition that affects the development of the neurological system in humans. The affected individuals have difficulty with social, communicative, and emotional behaviors and repetition with certain behaviors and tendencies. The disorder is not found to have a "cure" or direct genetic "cause," but it has been found that there are many different genes that are thought to play a significant role in the development of the disease. The effects on the following genes are found to play a role in the development and increase in prevalence of ASD: AVPR1a, DISC1, DYX1C1, ITGB3, SLC6A4, RELN, RPL10, and SHANK3. Since many environmental factors also contribute to many human diseases and conditions, it is important to investigate what factors are leading to and causing ASD. I plan to investigate if polybrominated diphenyl ethers (PBDEs) affect these genes and lead to the development of ASD. PBDEs are a category of halogenated compounds that serve as flame retardants in consumer goods ranging from electronics to textiles. Exposure to PBDEs during pregnancy can cause damage to the development of the neurological systems, reproductive systems, thyroids, immune system, and liver, making them highly dangerous. Human umbilical vein endothelial cells (HUVECs) are taken from the endothelium of the veins in the umbilical cord and will be used for this study. In this poster authors present the signs, symptoms, and molecular mechanisms and current research involved in ASD and the authors indicate that this is an ongoing work in its infancy.

19. Congenital and Age-Related Ocular Anomalies

Courtney Solensky*+ and Mary Vagula Ph.D.
Gannon University

My name is Courtney Solensky, and I am a senior at Gannon University, graduating in the Spring of 2024. As an aspiring orthoptist, I have taken up this research study to prepare myself for my future career. In this presentation, I will share my research on some *Congenital and Age-Related Ocular Anomalies*. Congenital Ocular Anomalies are any eye malformations that occur during embryonic development and are present once the baby comes out of their mother's womb. Amongst other diagnosed congenital disorders, ocular anomalies overall are responsible for about 2.4% of those affected with a disorder. These anomalies put the affected person at much higher risk of developing other ocular dysfunctions that are age-related later in their lifetime. The congenital anomalies that are discussed in this study include blepharoptosis (ptosis), eyelid retraction, entropion, ectropion, cryptophtalmos, aniridia, anophthalmia, and coloboma. The age-related anomalies that are concentrated in this study include macular degeneration, cataracts, diabetic retinopathy, and glaucoma. These four anomalies are found to be the most common age-related eye diseases and are only going to increase in prevalence as the years go on. This research was conducted to bring awareness of the prevalence and effects of all these anomalies, as well as to advise about how genetic testing can be used to detect them early in the fetus before the child is born.

20. An Evaluation of Hamstring Training Methods

Josh Walters*+
Advisor: Todd Backes PhD

Hamstring injuries are common in high-intensity running and jumping sports like soccer and track & field. These injuries typically occur when the hamstring muscles are under high amounts of eccentric load, such as right before one's foot contacts the ground while running. The bicep femoris and semitendinosus are the most commonly injured hamstring muscles and are more heavily recruited than the semimembranosus while running. To combat these injuries, different types of hamstring exercises have been implemented to strengthen the hamstring muscles and mitigate the risk of injury. Typically, machine hamstring curls are used as a hamstring strengthening exercise by concentrically loading the muscle. This gives adaptations that make the hamstring muscles perform better at more curled leg positions, which is not ideal for the lengthening demands that are placed on the hamstring muscles while running. To give the muscles a more specific training stimulus to running sports, training eccentric Nordic hamstring curls could be a viable option. By training the hamstring muscles eccentrically, there can be increases in force production of the leg when straighter or at lower joint angles. Training eccentric Nordic curls can give muscular adaptations that could mitigate the risk of injury and also increase running performance. To test the effects of training these two different types of hamstring exercises, the two different hamstring exercises were trained by two training groups. The adaptations of training these two exercises were interpreted by measuring force production, hamstring flexibility, and hamstring muscle activation to better understand how these exercises affected hamstring functionality after training. By training eccentric Nordic hamstring curls, subjects could produce more force at more lengthened positions giving them more protection from hamstring strain injuries than if they were training a concentric hamstring exercise. Training concentric machine hamstring curls caused the subject's force production curve to be shifted to the right showing that the exercise could possibly be detrimental to hamstring functionality by making the muscle weaker at more lengthened positions. It was also found that subjects training eccentric Nordic curls had greater increases in activation of the bicep femoris hamstring muscles after training than the machine hamstring curl group. The group training eccentric machine hamstring curls had greater increases in semitendinosus hamstring muscle activation, which shows that the two exercises had differing muscular adaptations after training.

21. Cytoarchitecture of the superior olivary complex of the domestic cat (*Felis catus*)

Abigail Steinbeck*+, Dr. Randy J. Kulesza, Dr. Joan S Baizer
LECOM (AS, RK), University of Buffalo (JB)

The superior olivary complex (SOC) is a collection of nuclei in the lateral hindbrain of mammals that plays essential roles in hearing. The SOC includes nuclei that function in sound source localization, encoding temporal features of sound and descending modulation of the cochlea.
The mammalian SOC includes two principle nuclei, the medial and lateral superior olives (MSO, and LSO respectively) as well as a number of periolivary nuclei (medial, ventral and lateral nuclei of the trapezoid body; MNTB, VNTB, LNTB) and the superior paraolivary nucleus (SPON). Although there has been some research done on the functional organization of the SOC in cats, there has not been much reported on the cellular morphology and total number of neurons in each of the SOC nuclei. This study aims to give more insight into the cellular morphology of the SOC of cats in comparison with other mammalian species. We pursued this aim using morphological techniques in Nissl-stained sections from four cats. Compared to our previous results from several mammalian species, the MNTB and LNTB had more neurons in cats compared to humans, dogs, rodents, and chimpanzees. The LSO of cats was found to have the highest number of neurons within the SOC and had a higher number of neurons than the LSO of humans, chimpanzees, and rodents. The MSO was found to have a smaller number of neurons than all other species besides rodents. Overall, these results suggest that the SOC in cats is arranged in a way that is significantly different from humans, suggesting adaptation of these nuclei to the ability of this species to hear a very large range of frequencies.

22. Longitudinal Carriage Rate of *Borrelia burgdorferi* in *Ixodes scapularis* on Presque Isle State Park

Jacob Rudie M.S.*+, Robert Waters, Ph.D., Noelle Thielman, Ph.D., Nancy Carty, Ph.D., Christopher C. Keller, Ph.D., FNAOME
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Objective: Surveillance of ticks on Presque Isle State Park (PISP) previously identified large numbers of *Ixodes scapularis* (black-legged or deer ticks) that carry Borrelia burgdorferi. Our lab has collected and analyzed ticks from PISP for over a decade and this study aimed to examine the longitudinal carriage rate of *B. burgdorferi* in adult *I. scapularis* ticks collected on PISP from 2006 to 2023.
Materials and Methods: Adult *I. scapularis* ticks collected from PISP in 2017, 2019, and 2023 were preserved in 95% ethanol before DNA isolation by phenol/chloroform extraction. PCR reactions were conducted on individual tick DNA samples with 16S-1 and 16S-2 primers for the I. scapularis 16S mitochondrial rRNA gene and ld2/tec1 primers for *B. burgdorferi*. PCR products were visualized on agarose gels by electrophoresis and ethidium bromide staining. Data gathered from previous years was used to analyze the carriage rate overtime.
Results: The average carriage rate of 46.4% over the span of 2006 to 2023. The carriage rate of B. burgdorferi displayed yearly variability ranging from 16% in 2012 to 75% in 2018. The number of ticks each year varied markedly ranging from a high of 583 ticks in 2014 to as few as 20 ticks in 2019.
Conclusions: Results presented here show that *I. scapularis* ticks found on PISP harbor significant amounts of *B. burgdorferi* each year. The relatively high carriage rate of *B. burgdorferi* on PISP means that park visitors, park employees, and local physicians should continue to be aware of the risk of Lyme disease.

23. Carriage rate of Borrelia burgdorferi in larval Ixodes scapularis ticks inhabiting Presque Isle State Park

Elise Oswald, MMS*+, Robert Waters, PhD, Noelle R. Thielman, PhD, Nancy Carty, PhD, and Christopher C. Keller, PhD, FNAOME
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Introduction: Lyme disease is caused by *Borrelia burgdorferi*, a spirochete bacterium transmitted by *Ixodes scapularis*. Past research revealed that *B. burgdorferi* does not undergo transovarial transmission

(ToT)1. Presque Isle State Park (PISP) in Erie, PA, has shown a carriage rate of 35-50% among adult *I. scapularis* ticks. Given this high rate, this study explores if *B. burgdorferi* can undergo ToT in an endemic area such as PISP. To determine this, the carriage rate of *B. burgdorferi* in larval *I. scapularis* ticks is assessed.
Materials and Methods: Questing *I. scapularis* ticks were collected from PISP during May and June of 2023. Larval *I. scapularis* ticks were crushed and lysed, followed with DNA extraction. DNA extracts were amplified by PCR, targeting the 16S ribosomal genomic DNA of I. scapularis and later targeting the 16S ribosomal genomic DNA of *B. burgdorferi*. The PCR products were analyzed on agarose gels by electrophoresis.
Results: A total of 258 tick were collected at PISP. Out of these, 95 (36.8%) were identified as larval I. scapularis. All larval ticks were found to carry the 16S ribosomal genomic DNA associated with I. scapularis (77/77). The carriage rate of *B. burgdorferi* in larvae *I. scapularis* ticks was determined to be 53.2% (41/77).
Conclusions: It is widely accepted that *B. burgdorferi* does not undergo ToT. The present study demonstrates that larval *I. scapularis* ticks can carry *B. burgdorferi* and shows the possibility of *B. burgdorferi* undergoing ToT. Future studies should further investigate this possibility and seek to replicate these results.

24. The Impact of Lake Stratification on the Microbial Community of Lake Pleasant, Erie, PA.

Christian Lange*+
Dr. Matthew Gacura (Gannon University, Dept. of Biology)
Dr. Christopher Dempsey (Gannon University, Dept. of Biology)
Dr. Gary Vanderlaan (Gannon University, Dept. of Biology)

Lake Pleasant is a eutrophic lake located in Union City, Pennsylvania. It is one of only a few examples of naturally occurring glacial lakes in northwestern Pennsylvania. Because of its depth and surroundings, this lake stratifies during the summer months of the year. Lake stratification refers to a distinct separation of the lake into three layers due to temperature changes. This separation can potentially lead to differences in nutrient concentration, oxygen levels and microbial communities within each layer of the lake. The goal of our project was to quantify the different environmental conditions found in each layer of the lake and to determine how this influenced the bacteria community at specific depths in the water column.
Water from Lake Pleasant was sampled from three depths (0, 5, and 12 meters) on September 5, 2023. During sampling, environmental characteristics, such as temperature, pH, dissolved oxygen, and specific conductivity were measured. After sampling, ammonia, phosphate, and dissolved organic carbon concentrations were quantified. At the same time, DNA was also extracted from samples and sent out for Illumina sequencing of the bacterial 16s rRNA gene. We found that each layer of lake tended to have distinct environmental conditions. Barcoding indicated that the surface waters of lake were dominated by various aerobic bacteria and cyanobacteria. While the bottom waters tended to be dominated by various anaerobic groups involved in the cycling of sulfur and nitrogen. Analyses are ongoing to determine how environmental characteristics of each layer influence bacterial community diversity and community aggregated functional traits.

25. Effect of Zooplankton on the Health of Presque Isle Bay and Lake Pleasant

Jordan Kraus*+, Biology Department, Gannon University

Zooplankton serve an important role in in water conditions along with being a crucial species in the food chain of a body of water. I have collected samples of zooplankton from to glacially formed bodies of water, Presque Isle Bay and Lake Pleasant. in order to compare the species found at both locations and determine the correlation between Zooplankton and the health of Presque Isle Bay and Lake Pleasant. The zooplankton samples were collected in June of 2023. Samples were collected with a 20-cm vertical net that was lowered to the maximum depth before reaching the bottom and pulled to the surface. The samples were then preserved in ethanol. In the lab, the samples were identified by species and counted.

Species and composition of each body of water will be compared to water quality data collected at the same time as the zooplankton.

26. Accumulation of Mercury in Round Goby from the Pennsylvania Waters of Lake Erie and its Tributaries

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The round goby (*Neogobius melanostomus*), an invasive species found in the Great Lakes, is known to accumulate harmful organic and inorganic contaminants like polychlorinated biphenyls (PCBs) and heavy metals. They primarily feed on zebra mussels (*Dreissena polymorpha*) and reside on the lake floor, augmenting exposure to—and uptake of—methyl mercury. Accumulation of mercury has been documented in round goby from the western basin of Lake Erie, but little is known about mercury accumulation in round goby from the central basin. Our objective was to quantify mercury accumulation within the tissues of round goby collected from the Pennsylvania waters of Lake Erie and its tributaries. Round gobies were collected from Lake Erie and its Pennsylvanian tributaries and euthanized. The tissues were then homogenized, and acid digested. Mercury in the tissues of round goby was quantified using an inductively coupled plasma mass spectrometer (ICP-MS). Preliminary findings suggest that round gobies from both Lake Erie and the tributaries accumulate various levels of mercury up to 17.3 ng/g, with round gobies from Lake Erie having higher concentrations of mercury than their tributary counterparts. The results of this study may raise concern for native Pennsylvanian game fish. Many native fish species have adapted to consume round goby, which may lead to the trophic transfer of mercury and ultimately endanger human health when game fish are consumed. Understanding contaminant accumulation and transfer is essential to mitigate the impact of invasive species and safeguard the health of aquatic ecosystems.

27. Food Habits and Pharyngeal Morphology of Round Gobies (*Neogobius melanostomus*) in a Small Invaded Pond

Marcus Agostini*+, Russell Minton, and Greg Andraso
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The round goby (*Neogobius melanostomus*) is a non-native fish that has successfully colonized the Great Lakes. It has received considerable attention in terms of its ecological role and impacts on the ecosystems it has invaded. Round gobies possess molar-like pharyngeal structures that are well-suited to crushing hard-bodied prey such as dreissenid mussels. This study was designed to quantify food habits and pharyngeal morphology of round gobies from the Fairview Gravel Pit, a small pond in western Erie County. Stomach contents were identified to broad taxonomic levels to determine if food habits changed in terms of composition of hard-bodied prey as round gobies increased in length. Shapes of cleared and stained lower pharyngeals were assessed through geometric morphometric analyses of pharyngeal outlines. Insects were the most abundant food items in the stomachs of round gobies, followed by crustaceans and mollusks. Mollusks increased in abundance, crustaceans decreased in abundance, and insects did not change in abundance as round goby body length increased. Geometric morphometric analysis of pharyngeals revealed no significant change in overall pharyngeal shape but suggested relative widening of pharyngeals as gobies grew. The ratio of pharyngeal length to pharyngeal width decreased with increasing body length, confirming a relative widening of pharyngeals as gobies grew. Pharyngeal area increased exponentially with body length with evidence of positive allometric growth. Current work is focused on food habits and pharyngeal morphology of round gobies from additional sites in Erie County.

28. Evaluating round goby's use of Lake Erie's tributaries using otolith elemental analysis

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Non-native, invasive species introduced into native habitats can adversely affect native organisms through competition for resources. Round goby (*Neogobius melanostomus*) were introduced to Lake Erie in 1993 and have since become well established within this habitat. Round goby have recently spread into the tributaries connected to Lake Erie, but little is known about the permanence with which goby utilize these areas. The objective of this study was to use elemental analysis of round goby otoliths, calcified structures located in the brain cavity of fish, to examine how these fish utilize tributaries of Lake Erie in Pennsylvania. Round goby were collected from various locations within Lake Erie and its tributaries, including Fourmile Creek, Sixteenmile Creek, Elk Creek, Walnut Creek, and Trout Run. Otoliths were extracted and acid digested for elemental analysis via an inductively coupled plasma mass spectrometer. Otoliths accumulate elements, such as strontium, barium, zinc, and manganese, in ratios that reflect the waters in which they live. Therefore, comparisons of otolith elemental composition between round goby of different tributaries and locations within Lake Erie can provide evidence of round goby habitat use. Results of otolith elemental analysis suggest that there is limited migration between the Lake Erie and tributary populations of round goby. A better understanding of how round goby utilize Lake Erie's tributaries will provide insight regarding the spread of this species into new habitats, the threats posed to native species living in these areas, and inform management strategies related to controlling round goby within the Lake Erie watershed.

29. Eye-spy: Differences in eyespot size in invasive round gobies using local Erie populations

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The invasive round goby (*Neogobius melanostomus*) was first discovered in Lake Erie in the 1990s. Shortly after their introduction, round goby populations exploded, negatively impacting other aquatic life and causing great concern for the fate of biodiversity in the region. One trait that might contribute to round goby success in its invasive range is its eyespot, a color pattern that mimics the eye of a vertebrate to intimidate predators. To gain insights into how eyespots may contribute to round goby success, we documented variation in round goby eyespot size and determined if this variation differed between round goby populations in the Pennsylvania waters of Lake Erie. Round gobies were collected from select areas in Erie County, and their eyespot size was analyzed from photos. Eyespots were commonly observed at all sampled locations, but they varied in size and frequency depending on where and when they were collected. Eyespots occurred less frequently and were smaller in tributary goby populations than Lake Erie pier populations. In our second year of data collection, we noted an increase in the number of eyespots present in tributary goby populations compared to the first year of data collection. This study helps us to determine what factors may be contributing to the success of invasive round gobies, to distinguish round gobies from native look-alikes, and to learn about the importance of an eyespot as an anti-predator defense.

30. Determining the efficacy of catch methods for Round Goby from Lake Erie's Tributaries

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Round gobies, *Neogobius melanostomus*, are an invasive fish found in Lake Erie and its tributaries, competing for space and food with native species. To reduce expansion, gobies can be captured and removed from invaded waters, but the most effective methods of removal from Lake Erie's tributaries are unknown. Our goal was to determine which of three collection methods, minnow traps, kick seining, or hook-and-line fishing, was the most efficient for capture of round goby within Pennsylvanian Lake Erie tributaries. We sampled four tributaries, Elk Creek, Walnut Creek, Fourmile Creek, and Sixteenmile

Creek, three times over Summer 2023. During each collection, hook-and-line fishing and kick seining were used to actively collect goby, while minnow traps were deployed for passive collection. For each method and location, the catch-per-unit effort (CPUE) was calculated and compared to determine the most efficient collection method. Significantly more round goby were caught using kick-seining compared to minnow traps and hook-and-line fishing, regardless of location or month of collection. Interestingly, the size and body condition of round gobies varied with collection method and location. For example, larger round goby in better condition were caught using hook-and-line sampling from Sixteenmile Creek, while goby collected from Fourmile Creek were smaller and in worse condition than other locations. Controlling the spread of round goby requires using the most efficient means of removal. By documenting the efficiency of different collection methods, this study advances management efforts related to control of round goby populations within Lake Erie's tributaries.

31. Growth Rates and Catch Per Unit Effort of Yellow Perch (*Perca flavescens*) and White Perch (*Morone americana*) in Presque Isle Bay, 2016-2023

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Gannon University began a long-term sampling program in 2016 to better understand Presque Isle Bay (PIB). One objective is to monitor the fish assemblage of the open waters of the bay, including the commercially and recreationally valuable yellow perch (YP, *Perca flavescens*) and the white perch (WP, *Morone americana*), a non-native temperate bass. Monthly trawl data from October 2016 to October 2023 were used to analyze growth rates and catch per unit effort (CPUE) of both species. Individual YP and WP were counted and measured for total length (TL) before being released. Across sampling years, YP reached average TL of 72mm and 121mm by the end of their first and second growing seasons, respectively. In contrast, WP reached average lengths of 82mm and 155mm in their first two growing seasons. Young of year (YOY) of both species appeared in trawls by mid-July or mid-August, YOY YP persisted throughout November, and YOY WP numbers declined sharply in the late season. CPUE of YP was highly variable during the study period and alternated between good and poor years. In contrast, CPUE of white perch declined steadily throughout the study period. The presence of large YP early in the season and YOY YP throughout the fall suggest that PIB is an important spawning and nursery area for the species. In contrast, the near absence of adult WP throughout the season and the apparently short stay of YOY suggest that WP use the bay in a more limited and transient manner.

32. Estimating annual breeding probabilities and superpopulation sizes for spotted salamanders (*Ambystoma maculatum*)

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Amphibians are ideal indicator species of a healthy environment due to their sensitive, permeable skin. Thus, monitoring population sizes of amphibians allows us to determine how anthropogenic factors may impact the environment. Like many habitats, the Penn State Behrend campus and adjacent natural areas have been subjected to habitat fragmentation, especially when the Bayfront Connector and AMIC buildings were constructed. This study used mark-recapture methods to estimate the superpopulation sizes of spotted salamanders (*Ambystoma maculatum*) at five breeding sites on Penn State Behrend's campus and determine the impact of local habitat fragmentation on salamander population sizes. Between 2019-2022, spotted salamanders were collected using minnow traps and individuals were marked with visible implant elastomer to track individual recapture rates. Individual capture histories were then run through Jolly-Seber models to generate population estimates for each breeding site. These estimates from two sites were then compared to historical population estimates from 1996-1999, prior to the construction of the Bayfront Connector and the AMIC building, to determine changes in salamander population sizes over time. Estimates for other sites are novel and serve as starting points for future comparison. According to our estimates, the population of spotted salamanders breeding by the AMIC building and adjacent to the Bayfront Connector have substantially declined over the past 20 years. Estimates of

populations at additional campus sites are relatively small, causing broad concern for salamander conservation on campus.

33. Citizen Science and Service Learning with Pika in Yellowstone National Park

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Since 2014 our Gannon Inspired Faculty-led Travel (GIFT) course to Yellowstone National Park has been monitoring the elevation change and distribution of the American pika (Ochotona princeps). Pikas are small herbivores that live in talus slopes found in mountain ranges of the American West. Since they cannot survive temperatures above 78 °F (25.5 °C), they are considered an indicator species of climate change effects. As the temperatures warm in Yellowstone, pikas have been forced to move higher up these talus slopes. In cooperation with the National Park Service and their Citizen Science project, the class performs a point census in the Hoodoos each year to determine the presence and number of individuals via vocalization and visual sightings as well as searching for food caches called haypiles and for latrine sites. Data is uploaded to the NPS database. In 2022 we added a second survey site at Palisade Falls in the Hyalite Recreation Area south of Bozeman, Montana. Citizen Science projects like this are absolutely essential because the park service does not have the manpower to gather data.

34. Humane Animal Rescue of Pittsburgh Wildlife Center Internship

Kelsi Smith*+, Melanie Gustafson-Ropski, Biology Department, Gannon University, Erie, PA, 16541, and Katie Kefalos, Director of Wildlife Rehabilitation, Humane Animal Rescue of Pittsburgh Wildlife Center, Verona, PA, 15147

In Summer 2022 I explored the veterinary field by interning at the Humane Animal Rescue of Pittsburgh Wildlife Center (HARP WLC), Verona, PA, a nonprofit organization that educates the public about Pennsylvania native wildlife and rehabilitates hurt and orphaned species. The facility has 12 spaces, and I learned proper techniques for cleaning these spaces, caring for different species medically as well as with enriched enclosures, and preparing diets and feeding the very young and the injured. The goal at the end of rehabilitation is to release an animal back to the wild. During the internship, I was able to witness the great deal of hard work and dedication it takes to care of our state's wildlife, and I gained hands-on skills that will benefit my future career as a veterinarian.

35. The Aspiring Mathematicians Program (AMP!)

Jodie Styers*, Patrick Kelly*;
Penn State Erie

The Mathematics and Mathematics Education Departments at Penn State Behrend have an active Robert Noyce Teacher Scholarship Program award from the National Science Foundation (NSF 1852624). One component of the project is the Aspiring Mathematicians Program, or AMP! Our poster will provide details of the various elements of the AMP! experience. A total of 24 high school juniors are recruited each year, with six coming from each of the four high-needs partner districts. We'll describe the specifics of the workshops they attend in their junior and senior years, the extra activities that they get to experience while on campus, the mini-lessons taught by Noyce scholars, and some preliminary results of surveys and pre- and post-assessments.

36. Promoting Knowledge and Understanding of Local Ecosystems Through Education at the Regional Science Consortium

Hailey Dahl*
Regional Science Consortium

The mission of the Regional Science Consortium is to promote and enhance our knowledge and understanding of the Lake Erie and Ohio River Basin ecosystems through research and education. One of the many ways we work towards this mission is through our engagement with member school districts, colleges, and universities. The RSC works with 9 school districts and 14 colleges and universities each

year to provide education on our local ecosystems and research via field trips, lessons, activities, and our annual education events. This presentation will explore some of our most popular education lessons and events such as our NOAA Bay Watershed Education and Training Program, Problem Solving Hack-a-Thon, Forensic Science Escape Room, College and Career Fair, and our STEM Lessons and Activities.

37. Biological Surveys in Restored Primary Wetland Habitats on Presque Isle State Park Erie, PA

Sarah Magyan*
Regional Science Consortium

Invasive plant species can have numerous negative effects if left unopposed in priority wetland habitats for many biological species, ultimately leading to their displacement. The RSC monitors species of native amphibians, fish, mussels, and macroinvertebrates using various methods at 7 priority wetland habitat restoration areas distributed across Presque Isle State Park in Erie County, PA where treatment for invasive plants has been applied since 2009. Surveys were conducted both before and after native replanting efforts by Go Native! Erie. These surveys seek to catalog the change in native biodiversity in these restored habitats.

38. Aerial Drone Surveys of Shoreline Change and Primary Wetland Habitats on Presque Isle State Park, Erie, PA

Sean Dalton*
Regional Science Consortium

Presque Isle's shoreline and wetlands are dynamic environments subject to rapid change as a result of underlying geologic and biological conditions. These changes have direct impacts on the local economy and ecosystems of Erie, PA and Presque Isle State Park. In response, the RSC has integrated drone surveys into two of its already existing monitoring projects including tracking erosional changes to Presque Isle's lakeside shoreline over time and indexing the health of primary wetland habitat vegetation.

39. Wetland Restoration and Propagation Updates

Jen Salem*
Regional Science Consortium

Since 2016, the Regional Science Consortium has been growing plants to be used for a NFWF-funded priority wetland restoration project on Presque Isle State Park. Over the years, we have made modifications and implemented new propagation methods to increase our acreage planted and overall plants produced. We have added restoration sites to the original three locations as our plant production capabilities have increased over the years. Our focus has also widened to include long-term seed storage equipment to better store seeds harvested for immediate use in the wetland propagation program and for long-term seed storage. These additions and updates to the Wetland Restoration program on Presque Isle will continuously be modified as the project evolves.

40. Beech Leaf Disease symptoms in American beech trees are more prevalent among small trees than large trees

Julia Desanto, Rachel Ditzenberger, Luna Hammer*+, Adrienne Hanas, Ian Henry*+, Kylee Hollerich, Natilie Kocherzat, Heather Landis, Deborah Nalesnik*+, Elizabeth Readshaw*+, Eli Rybka, Ethan Scott*+, Pete Siebler, Grace Sorger*+, Jason Spindel, Willow Vowler*+, Anna Westbrook*+, Richard D. Bowden
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Beech leaf disease (BLD) is a relatively new disease that has quickly spread via an introduced nematode (*Litylenchus crenatae*) throughout American beech (*Fagus grandifolia*) populations in the northeastern United States and Canada. American beech is an important wildlife food source and is used for low-value wood products. It is not fully known how BLD affects American beech trees of different sizes. To fill this knowledge gap, we estimated beech tree canopy cover, presence of banded leaves, presence of shrunken leaves, and presence of droopy buds on beech trees at two sites in northwestern Pennsylvania.

We examined trees of four different size classes (based on diameter (in.) at breast height (1.35 m): <4, 4-12, 12-25, >25). BLD infected all four size classes at both sites, with >96% of all trees having BLD. Symptoms among tree size classes were generally similar at both sample sites. Overall, BLD is most severely affecting the smallest trees. If seedlings fail to mature, and if mature trees decline, then forest composition throughout the range of beech will change, which will affect ecosystem processes, wildlife, the forest industry, and forest landowners.
Keywords: Litylenchus crenatae; Fagus grandifolia; Invasive; Northwestern Pennsylvania; Forest Ecosystems

41. Declining Growth in a Red Pine Growth Plantation: Management Recommendations

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Allegheny College, Meadville, PA

The Allegheny College Bousson Environmental Research Reserve has an approximately 100-yr-old plantation of red pine (Pinus resinosa) that appears to be in growth decline. The understory is devoid of red pine seedlings, but contains a number of hardwood seedlings. Red pine is a tree species that native to the upper Great Lakes area, but not to northwestern Pennsylvania, and is likely to fare poorly in a warming climate. To provide management recommendations for this approximately seven-acre stand, we measured red pine growth, and assessed if deer browsing of young hardwood seedlings would be a threat to regeneration of this forest. We selected random plots and obtained increment growth cores to determine growth over the past 30 years, and measured deer browsing on hardwood seedlings. The rate of both the biomass and diameter growth has slowed, indicating that this stand is in decline. We also found that 98% of tree seedlings had been browsed, and 84% had their terminal buds were browsed, which would hinder regeneration of this stand. An economic analysis of the site indicated that if red pines were harvested, the college could realize a net income of approximately $11,000. Presently, Allegheny College has no plans for forest harvesting. Changes in the current management plan will require further discussion within the Allegheny community.

42. What controls soil organic matter in a Temperate Forest? Three decades in the DIRT

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Jackie Digiacomo*+, Allegheny College, PA
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Forest managers are increasingly pushed by policy planners to increase forest carbon sequestration, especially in soils, which contain 75% of forest carbon. However, forest soil scientists still struggle to understand long-term controls on soil carbon sources and stability. We used the Detrital Input/Removal Treatment experiment established in a Pennsylvania hardwood forest to estimate root and leaf litter inputs to the soil organic matter (SOM) pool. Inputs are estimated by excluding roots, leaves (litter), or both, or by doubling annual leaf litter inputs. After 30 years, %SOM in mineral soil differed only at the 0-10cm depth ($p=0.108$), with No-Litter and No-Inputs treatments showing 26% and 29% decreases, respectively. No-Roots treatments were 9% less than Control treatments. Total SOM differed by treatment ($p=0.088$). The Double -Litter treatment was 24% greater than the Control; No-Litter and No-Inputs treatments were 16 and 21% lower, respectively, than the Control. The No-Roots treatment was not different from the Control. Overall, the pattern of these results are similar to those found previously at the 20-year sampling period. The small difference in the No-Roots treatment indicates that roots do not contribute strongly to total soil carbon. In contrast, cessation of leaf litter drastically reduces SOM, indicating the importance of litter in maintaining forest soil C. The Double-Litter results show that increases in forest

productivity, as might occur through forest management, has potential to increase soil C in mature forests, however doubling forest litter inputs to soils is not realistic.

43. Carbon Sequestration of the Mercyhurst University Tiny Forest

Catherine Segada*+ and Dr. Christopher Dolanc
Mercyhurst University

Urban Nature can be defined as green space that is held within an urban setting. Due to the recent worldwide scientific interest in Urban Nature, more specifically, Miyawaki Forests (Tiny Forests), it is important to determine how much carbon they can sequester. The Mercyhurst University Tiny Forest, planted in the Winter of 2021, is 20 x 11 m and originally hosted 640 trees. We asked, how much carbon can the Mercyhurst University Tiny Forest sequester compared to the amount of carbon emitted from a university dormitory? In June-August of 2023, tree diameter and heights were measured on all 580 living trees at the Tiny Forest. We used i-Tree Planting software to calculate carbon (C) sequestered using current dbh and projected C sequestered at 50, 75, and 99 years using predicted dbh. The Mercyhurst Tiny Forest sequestered 10,987.1 kg of carbon at 3 years, and is projected to sequester 2,204,932.6 kg of carbon at 50 years, 2,658,987.6 kg of carbon at 75 years, and 2,008,632.8 kg of carbon at 99 years. In comparison, Mercyhurst's largest dorm, Warde Hall, emits 300,000 kg of CO^2e annually. It would take 8 years for Warde Hall to emit the same amount of carbon that it will take the Tiny Forest 50 years to sequester. If carbon neutrality is the goal, our findings highlight the importance of increasing tree abundance, density, and carbon sequestration efforts on college campuses.

44. Sustainable management of plants growing in indoor drip hydroponics system

Brayden Miller*+, Ian Sitzler*+, Abigail Vidovich*+, and Hwidong Kim Ph.D. (Faculty Advisor)

Planting in indoor hydroponics under weather-controlled conditions is less restricted by various environmental conditions such as weather and length of sunlight, those techniques are one of the most promising solutions for resolving food deserts in Northwestern Pennsylvania. One of the most challenging issues with indoor farming systems, however, is a lack of carbon dioxide within indoor space that plants critically use as a major carbon source. Thus, in this project a sustainable management practice for hydroponics is to be developed by supplying carbon dioxide (CO2) and to assess the effects of CO2 on vegetable growth. To achieve these goals, a lab scale greenhouse equipped with a drip emitting hydroponic system will be constructed and vegetable growths in control (no CO2 supply) and the experimental (CO2 supply) environments will be investigated. The ultimate goal of this project in the long term is to develop one of the most sustainable systems by supplying CO2 employing composting and/or anaerobic digesters that are operated using the waste produced from plant cultivation. Compost and anaerobically digested leachate produced from composting anaerobic digesters can be used as a fertilizer, and methane generated from the anaerobic digester can be used as fuel for heating the plant-growing chamber during the colder winter months when outdoor farming is not feasible.

45. Quacking the Case on Duckweed's Ability to Mitigate Toxicity of Urea-Based Deicers

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The widespread use of deicing agents, particularly chloride-based formulations, poses a known threat to aquatic ecosystems, necessitating the exploration of environmentally friendly alternatives. Urea-based deicers have emerged as one such alternative, offering potential benefits. However, a critical concern with urea-based deicers is the breakdown of urea into ammonium in water, which can be toxic to aquatic invertebrates. Traditional toxicity assessments may not accurately reflect real-world scenarios where aquatic plants, such as duckweed, play a role in mitigating this toxicity. To better understand the real-world toxicity of urea-based deicers, we determined the lethal concentration 50 (LC50; i.e., the concentration at which 50% of the exposed population was expected to perish) of a urea-based deicer in

the presence and absence of aquatic vegetation. To do this, we conducted 96-hour toxicity tests with 2nd instar *Chironomus dilutus*, exposing them to varying concentrations of a urea-based deicer in the presence and absence of duckweed. Our preliminary results suggest that the presence of duckweed significantly reduced the toxicity of the urea-based deicer, with LC50 values approximately one order of magnitude higher when duckweed was present. This suggests that, in natural environments with abundant aquatic vegetation, urea-based deicers may not pose a substantial threat to aquatic invertebrates, given the ability of these plants to help mitigate the ammonium produced. These findings have implications for understanding the ecological consequences of using urea-based deicers and emphasize the potential role of aquatic plants in safeguarding aquatic ecosystems against the adverse effects of deicing agents.

46. Developing an Anaerobic Digestion System to Break Down Food Waste and Contain Resultant Gases

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Majors: (1) Environmental Engineering, (2) Mechanical Engineering
Advisor: Hwidong Kim, Ph.D., P.E.

Food waste is a common problem that plagues countries all across the world. The EPA estimates that about 24% of the municipal solid waste in U.S. landfills is wasted food. The decomposition of food waste releases not only potent greenhouse gases like carbon dioxide and methane, but other gases causing toxic and unpleasant odors such as hydrogen sulfide and volatile fatty acids. If the end-products of food waste decomposition could be contained, it would keep these greenhouse gases from directly entering the atmosphere. The resulting methane could also be used as a renewable source of natural gas. To solve this problem, an anaerobic digestor will be designed which will provide a closed environment for methanogenic bacteria to break down added food waste. Ideal conditions will be maintained in the digestion chamber to ensure the bacteria are performing properly. The resulting gaseous products will be collected in another sealed container which keeps them from entering the atmosphere, and the remaining solid waste be smaller in volume. If the anaerobic digestor functions as designed, it can be scaled up for larger applications like high volume cafeterias. The resulting methane could be purified to a specific standard be inserted into natural gas pipelines.

47. Repurposing Local Business Waste into Sustainable Fungal-Based Biomaterials for Green Industry

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Davide Piovesan (Gannon University, Dept. of Biomedical Engineering)

The environmental crisis and global economic instability highlight the importance of green industry, renewable materials, and cost-effective fungal-based biomaterials that can also provide a continuous food surplus for low-income communities. This project aims to repurpose waste generated by local Erie businesses into growth substrates for fungi. *Pleurotus ostreatus* (oyster mushroom) is a widely accessible white-rot mushroom, that can decay wood and other recalcitrant substrates. The fungal biomass cultivated in their growth is resilient and versatile composite brick-like material, that can be sold for construction or insulation purposes.

P. ostreatus was the initial fungi selected to inoculate materials for the creation of bricks. This species of fungi is a fast colonizer of substrates enriched in ligno-cellulose, which allow for the rapid production of material. Several waste products from local businesses near Gannon University in Erie, PA were autoclave-sterilized and inoculated to find the best for robust biomaterial growth. The fungi were cultivated on these substrates, in varying combinations, at room temperature for 1 to 2 months to maximize biomass. Afterward, the fungal bricks were deactivated by heat drying resulting in the creation of biomaterials. Future work includes optimization of growth conditions for *P. ostreatus* and testing of material preservation techniques.

48. Litter Boom Trash Collection in Presque Isle Bay

Kendall McGarity*+, Santiago Torres*+, Jeanette Schnars

This is an on-going research project to determine the effectiveness of capturing marine debris from an outflow pipe and the litter's impact on water quality. Two litter booms were placed in Presque Isle Bay in Wolverine Marine on the campus of Lakeshore Towing Services Inc. (34 State Street, Erie, PA 15607). Litter was collected 1-2 times per week from June 19 – October 6, 2023. Floating litter was collected using long-handled nets and placed in 5-gallon buckets. The litter was taken to the Regional Science Consortium lab where it was dried, weighed, and categorized. Starting September 22, litter was also collected outside of the booms to track items that were not being captured by the boom or items that floated in from the marina. Water samples were collected and processed for E. coli and Enterococcus using U.S. EPA standard methods 1600 and 1603. The processing included vacuum filtration and plating techniques within 6 hours of water collection. Weather and meteorological conditions were recorded on each sampling date for each location. The importance of this study is to determine the effectiveness of the litter booms in collecting and removing the litter from entering the bay. This mechanism of litter removal reduces the risk of litter being mistaken as food by fish, shorebirds, and other wildlife, and serving as a substrate for bacteria to grow.

49. Utilizing Computational Fluid Dynamics (CFD) to Simulate Microplastic Removal from Storm Sewers

Lindsay Steis*+, Jake Schwerer, Santiago Torres*+
Advisor: Dr. Varun Kasaraneni

Microplastics (MPs) making their way into water is largely becoming one of the greatest environmental concerns globally. MPs can bioaccumulate in aquatic species and lead to biomagnification through the food chain. This can include the human ingestion of MPs through consumption of fish or through drinking water. MP pollution can cause detrimental impacts on entire ecosystem populations and can cause digestive, reproductive, and respiratory systems health risks in humans. There are few existing solutions that reduce MP concentrations in water which makes it challenging to reduce the larger impact that MP pose. Sewer system capturing devices are one way that can help alleviate the impact of MP. There are existing storm sewers that are optimal for oil and grease removal, sediment, and larger floatables. However, there are not any widely existing sewer collection systems that address MPs. This project aims to engineer a hydrodynamic storm sewer separator and collection system using a computational fluid dynamic (CFD) simulation to filter microplastics and mitigate plastic pollution migration downstream. In order to design the system to optimize MP collection, a base design will be selected from existing sewer systems and then altered through adding baffles, screens, and making modifications specific to MPs. A CAD software will be used to design the sewer system which will be implemented into Flow 3D Hydro which will act to simulate the water and MP flow. Utilizing models to understand the transport and fate of MPs is essential to quantify risk that MPs present.

50. HydroCool: Revolutionizing Water Cooling with Efficient and Cost-Effective Treatment

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Water is used as a coolant during the heat transfer processes of a plastic injection mold. Although the water used is typically filtered, sediments within the coolant water may cause scaling on the machinery. If the cooling water is acidic, metal corrosion may occur, causing a metal increase within the water. Additionally, sediments may be found in the cooling water depending on the source of the water. Because filter options and chemical treatment options already exist as potential solutions to this problem, the goal of this senior design project is to design an effective and economical treatment process for water that is used as a coolant. We are attempting to implement a design for a more efficient water coolant

treatment, to reduce water scaling. This may be done either by chemical treatment, implementing a physical filter, or both.
By gathering coolant water samples from local plastic injection molding companies, laboratory experiments can be conducted, and an efficient treatment process may be determined. The minimal total dissolved solids (TDS) or sediment levels within the treated water will be measured. Based on these results, the best treatment method will be proposed.

51. Simulation Analysis of Takt Time for Mining Truck Wheels

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The process takt time for a product is a driving factor and should be considered when elevating the efficiency of making a product. Wheels for mining trucks are a recurring product of a number of manufacturers, such as the Wabtec Corporation. The takt time for this process can vary by each cycle or batch. The purpose of this study is to identify the takt time through simulation analysis and determine where changes within the process can be made to decrease the takt time in the system. FlexSim is used to develop a simulation model of the operations area and perform a simulation analysis, so that the product goes through the stations, and the time for completion at each station is found. This also accounts for rework time taken if a wheel does not pass the testing station. A reduction in the takt time is aimed through the simulation analysis, whether that is moving around areas or implementing different processes.

52. Current Trends and Challenges in Drone Schedule Design

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Drones have a number of advantages. However, they have limitations in terms of flying time and weight carrying capacity. Effective drone schedules may assist with overcoming such limitations. Drone scheduling is associated with optimization of drone flight paths and may include other features (e.g., determination of arrival time at each node, utilization of drones, battery capacity considerations, battery recharging considerations). There is a lack of a systematic literature survey that provides a holistic overview of the drone scheduling problem, existing tendencies, main research limitations, and future research needs. To address this issue, this study conducts an extensive survey of the scientific literature that assessed drone scheduling. The collected studies are grouped into different categories, including general drone scheduling, drone scheduling for delivery of goods, drone scheduling for monitoring, and drone scheduling with recharge considerations. A detailed review of the collected studies is presented for each of the categories. Moreover, to assist the relevant stakeholders with an effective drone schedule design, representative mathematical models are provided for each category of studies, accompanied by a summary of findings, existing gaps in the state-of-the-art, and future research needs.

53. Traffic Flow Management Simulation Analysis of the Peach and State Street Intersection

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Traffic congestion at intersections is a common urban challenge that leads to wasted time, increased fuel consumption, and environmental pollution. To address this issue, this study aims to analyze and optimize traffic flow at the intersection of Peach and State streets by focusing on the control of traffic lights. The objective of this study is to reduce congestion, travel time, and improve overall traffic fluidity. In this study, a simulation model is developed to replicate real-world traffic conditions at the Peach and State Street intersection. The simulation incorporates factors, such as traffic volume, queue lengths, and traffic light control strategies. The findings of this study provide valuable insights into improving traffic management at intersections, contributing to more efficient and sustainable urban transportation systems.