Rochester Academy of Science
50th Annual Paper Session
ABSTRACT BOOK

November 16, 2024

Hosted by: Departments of Science, State University of New York at Brockport
Editors: Michael Grenier RAS President, Theodore W. Lechman
Please send any correction or changes to Paleo@frontier.com

Rochester Academy of Science
Larry King Memorial Lecture Abstract

DID A MAGNETIC FIELD COLLAPSE TRIGGER THE EMERGENCE OF ANIMALS?

John Tarduno, PhD., Founder Paleomagnetic Research Group and laboratory, Department of Earth and Environmental Sciences at the University of Rochester.

The origin of life as we know it on earth is one of our major scientific questions. The Ediacaran Period, spanning from about 635 to 541 million years ago, was a pivotal time in Earth's history. It marked a transformative era during which complex, multicellular organisms emerged, setting the stage for the explosion of life. But how did this surge of life unfold and what factors on Earth may have contributed to it?

University of Rochester Paleomagnetic Research Group researchers uncovered compelling evidence that Earth's magnetic field was in a highly unusual state when the macroscopic animals of the Ediacaran Period diversified and thrived. Their study raises the question of whether these fluctuations in Earth's ancient magnetic field led to shifts in oxygen levels that may have been crucial to the proliferation of life forms millions of years ago and fueled the proliferation of complex, multicellular organisms. Though invisible, the magnetic field is essential for life on Earth because it shields the planet from solar wind—streams of radiation from the sun. But Earth's magnetic field wasn't always as strong as it is today.

Their data indicates that Earth's magnetic field at times during the Ediacaran Period was the weakest field known to date—up to 30 times weaker than the magnetic field today—and that the ultra-low field strength lasted for at least 26 million years. The research conducted by Tarduno and his team suggests that during the Ediacaran Period, the ultraweak magnetic field caused a loss of hydrogen over at least tens of millions of years. This loss may have led to increased oxygenation of the atmosphere and surface ocean, enabling more advanced life forms to emerge.

From University of Rochester Press Release May 2, 2024, by Lindsey Valich

Rochester Academy of Science
Larry King Memorial Lecture

Dr. John Tarduno

William Kenan, Jr. Professor
Earth and Environmental Sciences
University of Rochester
Paleomagnetic Research Group

Did a magnetic field collapse trigger the emergence of animals??

Scan for more information

(University of Rochester illustration / Michael Osadciw)

Public Lecture

▫ **Saturday, November 16, 2024** ▫

SUNY BROCKPORT

Edwards Hall, 191 Holley Steet

Brockport, NY 14420

1:00 p.m. ▫ Free

2024 Rochester Academy of Science Abstracts
Oral Presentations (Alphabetized by Title)

ANCIENT ALIENS ARCHIVE: AN ANALYSIS OF THE POP CULTURE REPRESENTATION OF ARCHAEOLOGY ON THE SHOW ANCIENT ALIENS.

Logan Wray, *SUNY Brockport*.

This research project aims to analyze the claims made on the television show *Ancient Aliens* spatially, both to understand what the show itself is presenting and to check the veracity in how the show is discussed by academics. I have watched 8 seasons of the show and collected data on each location mentioned in each episode, as well as the claims made with reference to each location. From there, I have used GIS to create visual representations to better be able to spatially analyze the locations the hosts discuss and which types of claims they typically make about each location. These maps help to show the actual nature of the show and its pop culture spin on archaeology, which could potentially have an impact on the way the field is seen by the public. A goal of this project is to make the data and maps from this project freely available to the public and other researchers.

ANALYSIS OF BACTERIOPHAGE AGAINST CLINICALLY RELEVANT STRAINS OF MRSA.

Sriya Machiraju, Finune Shaibi, Arrianna Blachowicz, Matthew Long, and Mark A. Gallo, PhD., *Niagara University*

Antimicrobial resistance is a growing clinical problem. Therefore it is imperative to find alternative ways to deal with this crisis. *Staphylococcus aureus* is a major pathogen present in both human and animal health. The use of bacteriophage against *Staphylococcus* is a novel mechanism with great potential in that it is very specific against a particular microbe. In this study, bacteriophage isolated from exotic farm animals were tested for their ability to kill clinically relevant strains of *Staphylococcus aureus*. It was presumed that differing degrees of lethality were observed due to genomic variation amongst the phage. Sequence analysis of the phage will allow us to propose potential genes responsible for their range of action against Methicillin-Resistant *Staphylococcus aureus* (MRSA).

ASSESSING THE RESPONSE OF WILDLIFE TO THE 2024 TOTAL SOLAR ECLIPSE IN OSWEGO, NY, USING REMOTE BIOLOGICAL MONITORING METHODS.

Amber Clarke, Katrina Alfred, Desirae Minns, and Griffin Kutny, *SUNY Oswego.*

As a total solar eclipse is not common during an animal's lifespan, we were curious to see how one would affect the behavior of local species. On April 8th, 2024 there was a total solar eclipse that created a path across eastern North america. The location of Oswego, NY during the eclipse was unique as it had one of the longest periods of totality. We analyzed the acoustic behaviors of bats, birds, and amphibians. It was hypothesized that bats and amphibians would become active during totality and start calling, whereas most birds would stop calling during totality. We recorded data for a full week; three days before the eclipse, during the eclipse day, and three days after the eclipse to search for any change in animal behaviors, as well as tested for associations with temperature and light levels using acoustic loggers. As predicted, amphibians (specifically spring peepers) were recorded calling during totality and although no bats were recorded, one was observed visually. Avian results are still being analyzed. Although the response to the total solar eclipse was not as drastic as we expected, local wildlife were shown to be impacted by a rare phenomenon, expressing similar behaviors to those used at nightfall.

ATTEMPT OF STUDYING AMYLOID OLIGOMERS IN THE ALZHEIMER'S DISEASE RAT BY UTILIZING GOLD COLLOID AGGREGATES

J. Mukkatt,* K. Yokoyama, Department of Chemistry , SUNY Geneseo, Geneseo, NY.

Abstract: In-situ detection of gold-colloid aggregates in the brains of the Alzheimer's disease rat was conducted through Raman Imaging. Imaging has allowed us to identify the aggregates found, to exhibit a distinctive physical identity compared to the gold colloid aggregates

that were observed and formed from the Ab1-42-fibrill coated gold colloid. This testing is mainly done through Raman Imaging. While analysis is still underway, our current data has shown that a beta-sheet conformation may have a vital role in the formation of the gold colloid aggregates.

BROOK TROUT POPULATION AND HABITAT CHARACTERISTICS IN THE BLACK CREEK WATERSHED.

Brad Britt, *The College at Brockport, State University of New York*

Brook trout (*Salvelinus fontinalis*) have been extirpated from much of the Black Creek watershed in western New York State. In 2021, brook trout were reported in a small stream near Black Creek in Genesee County; however, little is known about this population or the habitat. The discovery of this previously undetected population highlights the importance of evaluating this and other streams within the watershed for suitable brook trout habitat, to learn if other undetected populations exist, and to determine population size where found. To gain a better understanding of brook trout population and habitat within the Black Creek watershed, I selected six streams for this research: one where the brook trout were reported and five other streams that may have the potential to support brook trout. To estimate brook trout populations, I will use a one-pass electrofishing method as part of a mark-and-recapture survey. Captured brook trout will be weighed, measured, and marked with a visible implant elastomer (VIE) tag with a color unique to each stream. Tagged fish will be used to monitor movement, while body size and weight are used to determine condition. Furthermore, I established multiple 18m-radius survey plots along each stream to evaluate in-stream and riparian habitat characteristics such as vegetation type, water quality, and stream substrate. Based on the presence or absence of brook trout within each stream, the similarities or differences between these habitat parameters may be useful in identifying suitable brook trout habitat, which is critical for brook trout conservation.

THE CELLULAR ROLE OF PAR-! IN THE DEVELOPMENT OF THE C. ELEGANS MALE TAIL.

Abigail Garvey and Dr. Daryl Hurd, *St. John Fisher University Division of Life Science.*

The par-1 gene codes for PAR-1 kinase protein which contributes to cell polarity during cellular development in C. elegans and other organisms. The human orthologs of par-1 have been found to contribute to the progression of Alzheimer's disease through phoshorylation of Tau protein in the brain. Previously, PAR-1 has been found to play an essential role in the development of the C. *elegans* vulva with a post-embryonic RNAi silencing approach. Several new worm strains were created in order to visualize development of the tail cells with GFP reporters. Post-embryonic RNAi treatment of par-1 was used to study the development of C. *elegans* male tails. Worms that underwent RNAi treatment showed visible defects in the male tail rays and cuticle shape. Visualization by DIC and epifluorescence microscopy shows that par-1plays a role in the development of the C. *elegans* male tail.

COAL SKINK ACTIVITY IN UPSTATE NEW YORK.

Mason E. Shute and Dr. Andrew S. Hoffman, *St. John Fisher University*

The Northern Coal Skink (*Plestiodon anthracinus*) is one of four species of lizard that inhabits New York State. The species is typically known to occupy forested areas in proximity to swamps and wetlands and well as dry, rocky hillsides and bluffs. Their elusive nature leads many to assume that the species is rare despite being widespread throughout the state. Even for well-known populations, tracking daily and seasonal activity as well as quantifying individual populations has still proven to be difficult with common surveying techniques. The AHDriFt Fence technique is an ecological surveying method that involves the use of two camera trap buckets connected by a long, sheet metal fence. We deployed five AHDriFT fences at different locations across a privately owned and managed preserve in Genesee County New York and tracked Coal Skink activity over a six-month span. With 57 individual captures and 198 photos this study has resulted in one of the largest datasets on seasonal activity for this species. Using these data we can narrow in on specific environmental characteristics that make a habitat more suitable for the species as well as map out general behavioral trends in coal skink activity.

DEVELOPING A CAM ASSAY; EVALUATION OF ANTI-ANGIOGENIC COMPOUNDS PRODUCED IN THE HWS BIOCHEMISTRY LAB.

Aidan Staunton, Justine Simms and Thomas Jensen, *Hobart and William Smith Colleges.*

Angiogenesis is crucial for cancer growth because solid tumors require a steady blood supply to grow. This process of new blood vessels forming branches from existing blood vessels is crucial and an obvious point to attack the cancer. Tumors force blood supply to form by

producing chemical signals, including EGF, which promotes the process of angiogenesis (National Cancer Institute). In ovo CAM assays are commonly used to study the influence of anti-angiogenic compounds on the process of solid tumor angiogenesis. To assay a compound's anti-angiogenic effects, a small piece of tissue is placed on the CAM for seven days followed by tissue analysis. We evaluate angiogenesis in several ways including transplant gross morphology (tissue color and visible blood vessels) and micro-dissection of the transplant to assess the presence of neovascularization. This assay will be used to assess novel anti-angiogenic compounds produced by the Hobart and William Smith Colleges Biochemistry Lab, as the first screen for their cancer treatment potential.

DIGITAL MORPHOLOGY OF ANURAN SKULL MICROANATOMY WITH A FOCUS ON FRONTOPARIETAL CARTILAGE STRUCTURES.

Gianna Durazzo, *SUNY Oswego*.

Species morphology is a vast area of biological interest that aids in our evolutionary understanding of osteologic adaptations and patterns, though difficulty arises when there are wide varieties in taxa development. Anura, for example, is made up of more than 7,000 species dispersed globally with a large range of species-specific morphologies. When working with Computed Tomography (CT) scans of frog skulls, I noticed a gap of differing sizes between the frontoparietal bones that exposed the brain case. In one frog (*Myobatrachus gouldii*) there was a partial cartilage formation toward the posterior end of the frontoparietal covering a piece of this large gap, whereas another (*Atelopus elegans*) had a smaller gap with no cartilage, and another (*Lepidobatrachus asper*) had no gap at all with a hyper-ossified skull. Those differences led me to question how such gaps are maintained evolutionarily in some taxa, as well as how these differences aid or hinder function within their environment. Each frog has unique burrowing natures ranging from atypical forward burrowing (*M. gouldii*), normal hind-limb burrowing (*L. asper*), and the absence of burrowing as a whole (*A. elegans*). I used models made from the CT scans to reconstruct skeletal microanatomy, which were utilized to study the thickness and compactness of the frontal-parietal, nasal, and premaxillary bones. Separate models of *M. gouldii* were tested to determine the effect of frontoparietal cartilage in this species and no significant difference was found across the skull. Initial analyses of skull thickness and compactness have shown individual differentiations in data that are likely due to lifestyle.

EARLY DETECTION AND RAPID RESPONSE FOR INVASIVE MILE-A-MINUTE (PERSICARIA PERFOLIATA) IN THE FINGER LAKES AND WESTERN NEW YORK REGIONS.

Jacob Silberstein and Kathryn Amatangelo.
Department of Environmental Science and Ecology SUNY-Brockport.

Mile-a-minute (MAM), *Persicaria perfoliata,* is an invasive annual vine introduced to the U.S. in the late 1800s. Two populations were recently discovered in western New York, one in Geneseo in 2017 and another in Oakfield in 2018. Since then, project technicians and volunteers have physically removed vines multiple times each year with a long-term goal of eradication. MAM seeds can last at least 7 years in the seed bank, and efforts are ongoing. The Oakfield population has decreased from estimates of over 5000 individuals per growing season in 2022 to fewer than 1000 individuals in 2024. The site at Geneseo has seen a population decrease from approximately 400 in 2022 to fewer than 100 germinants in 2024. As of 2024, the populations have declined enough to allow exact counts and GPS locations of every vine or vine cluster. Our current research is focused on understanding whether previous germinants predict the location of future germinants. Future efforts to eradicate these two populations will rely on accurate mapping of existing populations and presence of fruiting bodies to better track potential germination surges.

EFFECTS OF MULTIPLE EXPOSURE OF ANESTHESIA ON EMBRYO DEVELOPMENT.

Rianna Tomm, Justine Simms and Thomas Jensen,
Hobart and William Smith Colleges.

General Anesthesia is used every day in surgeries. Research suggests that repeated surgery with general anesthesia may have even greater adverse effects, including cognitive decline, than other risk factors such as high blood pressure and type 2 diabetes (Henderson). The effects of anesthesia are not limited to the patient but, if they are pregnant, will include the embryo. Previous studies by Rosen, et. al. demonstrated that embryos can experience serious effects such as low birth weight, abnormal brain development, and lowered survivability (1999). While studies have been conducted testing the effects of anesthesia on women in their third trimester, there is a lack of research assessing exposure effects during early pregnancy, as well as repeated

exposure. Using the chicken embryo model system between embryonic day 8 and 12 we can emulate human fetal development during the second trimester. We tested the effects of daily chloroform exposure on embryo heartbeat and movement. Our post-treatment embryo movement data show that they develop an increased tolerance to chloroform between the 1st and 6th treatment, which is most likely due to an increased tolerance to chloroform as the embryos aged, rather than from repeated exposures. This is supported by Olivia DuRoss and Ariel Messenger (see their poster) who showed that a one-time exposure on day 12 yielded a movement score which was not different from my treatment day 6 (embryonic day 12).

GENERATING AN IN-VITRO MODEL OF MPS-IIIA "SANFILIPPO SYNDROME" VIA CRISPR/CAS9.

Emma Cooper[1,2,3] and Zachary Murphy, PhD..[2,]
St. John Fisher University [1]Department of Chemistry and [2]Biology, [3]SJF Honors Candidate

Autosomal recessive inheritance of a defective *SGSH* gene coding for the enzyme sulfamidase is responsible for mucopolysaccharidosis (MPS) type IIIA, characterized by the effects of heparan sulfate accumulation in lysosomes. The syndrome presents with coarse facial features, central nervous system dysfunction, behavioral difficulties, intellectual disability, sleep disturbance, hyperactivity, loss of communication skills, and loss of mobility. Failure to develop cost effective research methods and long-term treatment options leaves the average age expectancy at just 10-20 years of age. Gene editing techniques including ZFNs, TALENs, and CRISPR/Cas9 have been explored as both models and potential therapeutic interventions for mucopolysaccharidosis types I, II and III. However, an in-vitro model of MPS IIIA, the most severe type of MPS, has yet to be developed. Therefore, we set out to generate and test an in-vitro human cell line model of MPS IIA using a K562 lymphoblast cell line, CRISPR/Cas9 gene editing, and a heparan sulfate enzyme-linked immunosorbent assay (ELISA). We hypothesized that disruption of *SGSH* would reduce or eliminate function of the sulfamidase enzyme, resulting in toxic heparan sulfate accumulation in the cell that could be quantified by an ELISA. Furthermore, we hypothesized Fluoxetine, an experimental drug treatment, would reduce heparan sulfate levels in the cell based on previous evidence in an MPS-IIIA murine model. Our work demonstrated the K562 lymphoblast cell line is a cost-effective and viable cell type for quantifying heparan sulfate levels. Preliminary drug treatments also suggest Fluoxetine is capable of reducing cellular heparan sulfate levels in-vitro. Altogether, this work points to the potential of creating a sustainable cell model of MPS-IIIA, with the possibility of recapitulating specific patient mutations via the CRISPR/Cas9 editing system in the future.

THE IMPACT OF BARGE CANAL WATER RELEASE ON CROSS CANAL BROOK, FAIRPORT, NEW YORK.

Paul L Richards[1] and Kevin Fisher[2], *Department of Earth Science, SUNY Brockport, Brockport, NY 14420; prichard@brockport.edu[1], Department of Ecology and Environmental Science, Suny Brockport, Brockport, NY 14420[2]*

Cross Canal Brook is a small tributary of Irondequoit Creek that flows underneath the Erie (Barge) Canal. It also flows through a developed portion of Perinton, NY and comprises the picturesque backyard of tens of families. The creek has experienced recent changes in channel morphology that are threatening properties along its course. People living along the Creek are witnessing severe stream bank and bluff erosion, flooded basements, toppled trees, and in one location, a washed away landscape bridge. Culvert infrastructure has also collapsed at a road intersection. Some residents observe that these events have accelerated in recent years. The purpose of this study was to identify the causes of this erosion and deduce the role that climate change and increased watershed imperviousness have on it. In addition to precipitation and runoff, this Creek also receives flow from the Barge Canal though a three-foot opening during the non-navigation season which in 2023 went from November 20, 2023 to April 26, 2024. This dewatering is necessary so that the Canal Authority can maintain the earth wall banks that comprise the sides of the canal from Lock 32 in Pittsford to Lock 33 in Macedon.

A gage and water level recorder was established in Cross Canal Brook at Harvest Road just downstream of the Barge Canal. Since 2022, we have been taking periodic flow measurements at the site as well as water quality measurements (including suspended sediment concentrations). We have developed preliminary rating curves at the site and now have almost a year of continuous 15-minute flow data. An analysis of this data suggests that during the non-dewatering period (and growing season) the flow in the creek is usually less than 1 cfs. It is, however, very responsive to precipitation events and flows as high as 30 or more cfs are observed. Bankfull discharge at Harvest Road proved to be approximately 30 -35 cfs. Response times are short at the creek, with a time of concentration of approximately 1 to 1.5 hours. Thus, while high flows are possible during the canal non-dewatering season, they rarely persist more than a few hours. In contrast, the flow record during the Canal

dewatering period suggests that Creek flow is significantly elevated, with continuous weekly flows as high as 20 cfs. At the start of the dewatering season in 2023, 20 cfs flow was observed in the creek for 77 hours. Similar flows were also observed during much of the months of February and March. These flows are high enough to cause erosion and augment the natural storm and snowmelt events that also cause erosion.

To better quantify the erosion that might be caused by canal dewatering, a HEC-HMS hydrologic model was developed and calibrated for the site using several Wunderground precipitation stations in the watershed as input. 15 minute precipitation data and a user-supplied unit hydrograph based on observed flows was used to force the model to predict the flow that would have occurred without canal dewatering. Since the erosive energy of streams is determined linearly by discharge, the difference between the observed flow and the model flow is the additional erosive energy added to the creek from canal dewatering. This value proved to be at least 4.6 times the erosive energy that would have taken place if no canal dewatering took place. Based on these results, we conclude that canal dewatering does have an impact on the stream and that it may be a partial cause for channel erosion during the Canal non-navigation season

THE IMPACT OF TIRE WEAR PARTICLE LEACHATE ON FATHEAD MINNOW LARVAE BEHAVIOR AND MORTALITY.

Grace Mattson, Dr. Susan Allen, *Ithaca College Environmental Science.*

Tire Wear Particles (TWPs) are shed from tires as vehicles drive on the road, they are composed of synthetic materials, heavy metals, and antioxidants. TWPs enter the environment as particulate matter in the air as well as in stormwater runoff, where they have detrimental effects on ecosystems. As TWPs enter waterways they begin to leach certain additives and heavy metals into the water that cause harm to aquatic life. Freshwater fish are particularly vulnerable to the effects of TWP leachate. To assess if tire wear particle leachate had effects on the behavior and mortality rate of fathead minnow larvae, acute toxicity tests were performed. Test subjects were exposed to either the 7-day leachate, the 14-day leachate, or a control solution (tank water). Changes in behavior were then assessed using video tracking software as well as manual ethograms, feeding assays, and mortality. A dilution study using 4 different diluted leachate treatments was conducted to assess the mortality rate of leachate at more ecologically relevant concentrations. Some of the main takeaways from these experiments were that the 14-day leachate was more toxic than the 7-day leachate, fish exposed to leachate exhibited different behaviors from the control fish, and how deadly the leachate was to fathead minnow larvae was dependent on its concentration.

LONG-TERM EFFECT OF PFOA ON HEPG2 CELLS.

Kayleigh Ronas[1], Ananya Dutta Ph.D.[2], and Jason Somarelli, Ph.D.[2,] *Nazareth University, Rochester, New York[1], Department of Medicine, Duke Cancer Institute, Durham, North Carolina[2]*

With the advent of per- and poly-fluoroalkyl substances (PFAS), environmental contamination from these 'forever chemicals' has increased. This experiment aimed to assess the cancerous impacts of perfluorooctanoic acid (PFOA), a type of PFAS, including oxidative stress and DNA damage response activation, when exposed through drinking water. To investigate this, HepG2 cells were maintained for six months and treated with DMSO as a control, 1 nM PFOA, or 100 nM PFOA. Western blot analysis was performed to determine the presence of proteins such as p53, ATM, and caspase-3, -7, -8, and -9 in each treatment. As PFOA concentration increased, p53 expression decreased, p-ATM increased, and both ATM and p21 remained constant. Caspase-9 was found in both procaspase and active forms, while caspase-3, -7, and -8 were only in their active forms. A separate caspase-3/7 assay was performed for ten days, revealing significant cell death only in the 100 nM PFOA treatment. These results suggest impaired DNA damage repair and cell cycle arrest signaling; however, whether apoptosis is occurring requires further investigation. To evaluate reactive oxygen species (ROS) induction, cells from each long-term treatment group were exposed to DMSO, 1 nM PFOA, and 100 nM PFOA for three days, regardless of the original treatment. This was done to determine whether oxidative stress occurs gradually or with acute exposure. It was found that the cells treated with 100 nM PFOA long-term had more ROS induction irrespective of the acute three day treatment. Overall, prolonged exposure to environmentally relevant concentrations of PFOA, similar to those found in drinking water, may increase the risk of DNA damage and oxidative stress.

MAPPING WETLAND-BREEDING AMPHIBIAN POPULATIONS AT MENDON PONDS COUNTY PARK.

Alyssa Karsten and Dr. Andrew Hoffman, *St. John Fisher University.*

In the wake of global amphibian population declines, the importance of detection and occupancy surveys is urgently growing. We surveyed three amphibian species:

the spotted salamander (*Ambystoma maculatum)*, blue-spotted/jefferson's salamander complex (*A. laterale/A. jeffersonianum* complex), and wood frog (*Lithobates sylvaticus)*, at Mendon Ponds County Park in Pittsford, New York. We used visual and auditory surveys to estimate egg mass density and adult amphibian presence during the spring breeding season. We also employed trapping and dip-netting surveys during summer larval sampling at each site, and conducted visual surveys around the perimeter of each site to estimate adult presence. We detected spotted salamanders at ten sites out of twenty, jefferson/blue spot complex at fifteen sites, and wood frogs at fifteen sites. We found dip-netting to be the most effective method of sampling both amphibian and invertebrate diversity at each site. We determined that spotted salamanders were more prevalent at sites within older and larger forest complexes than were other species. Going forward, we hope to continue our data analysis to create a model displaying both occupancy and abundance of amphibians throughout the park.

A MULTIWAVELENGTH ANALYSIS OF ASASSN-22CS: A UV-LUMINOUS AND FAST-DECLINING TDE CANDIDATE.

Allison Blum[1,2], Jason Hinkle[2], Benjamin Shappee[2], and Ka-Wah Wong[1] *Department of Physics, SUNY Brockport[1], Brockport NY, Institute for Astronomy, University of Hawaii at Manoa[2], Honolulu HI.*

We present multiwavelength observations of the nuclear transient ASASSN-22cs (AT 2022dsb), discovered by the All-Sky Automated Survey for Supernovae (ASAS-SN), located at a distance of 102.7 Mpc in the host galaxy ESO 583-G004. The transient exhibited a rapid decline in UV/Optical luminosity following its peak, faster than any previously observed tidal disruption event (TDE) with similar peak luminosity. Spectral energy distribution (SED) modeling revealed significant temperature evolution, inconsistent with the typical behavior of TDEs. We also estimate the mass of the host black hole using scaling relations, finding values consistent with those of TDE host supermassive black holes. Spectroscopic observations revealed a strong blue continuum, along with prominent Hα, [O II], and [N II] emission lines, but a lack of [Mg II] emission. These characteristics suggest a combination of TDE and AGN activity, positioning ASASSN-22cs within the growing category of ambiguous nuclear transients (ANTs).

NATURAL HISTORY OF A NON-NATIVE ANT-MIMICKING SPIDER, MYRMARACHNE FORMICARIA (SALTICIDAE).

Jennifer L. Apple, Brenna Dunn, Daniel Fleischman, Cassidy Mills, Eliana Ontiveros-Oberg, and Anna Schell, *SUNY Geneseo.*

The ant-mimicking spider *Myrmarachne formicaria* (Araneae: Salticidae) is a recent arrival to North America from Eurasia, first noted in Ohio in 2001. Relatively little is known about its natural history in its native or invaded range. From 2017-2022 in western New York, we have been monitoring the phenology of this species in natural settings in fields and woodlands to track the appearance of adult males and females, eggs, spiderlings, and juveniles. Comparisons of field data from New York to species occurrence data from the Global Biodiversity Information Facility (GBIF), as well as experience searching for this species in Europe, suggest differences between the phenology of *M. formicaria* in its native range and that observed in North America. Sequencing of a 600-bp mitochondrial DNA gene region in spiders from 14 localities in New York, Pennsylvania, and Ohio yielded little genetic polymorphism, consistent with a single invasion of *M. formicaria* from one source locality, but data from other molecular markers and more samples are needed to confirm this conclusion. Comparison to a limited number of European samples revealed <1% sequence divergence, except for samples from Spain and southern France which showed >8% divergence, warranting further investigation of their identity. In another effort to examine geographic patterns in these spiders, we assayed them for the presence of bacterial endosymbionts, including *Wolbachia, Cardinium,* and *Rickettsia.* All specimens tested positive for *Cardinium,* while *Wolbachia* infection was less widespread.

PREPARATIONS OF POLYMETHINE DYES.

Liam Almekinder, Dr. Jeremy Cody, *Rochester Institute of Technology, School of Chemistry and Materials Science*

Fluorescent dyes continue provide interesting synthetic targets as charged conjugated heterocycles. Our work onthe synthesis of polymethine dyes has been optimized and refined after considering temperature and reaction mechanisms. Future derivatives of these molecules show promise in fluorescence studies and as biosensors.

THE STRUCTURE OF MALE TAIL SENSORY CILIA AND CEM CILIA IN THE ABSENCE OF TBB-4 IN THE MODEL C. ELEGANS.

Katarina Weldy and Daryl Hurd Ph.D., St. *John Fisher University Division of Life Sciences*

Cilia are cellular cytoplasmic extensions made up of a microtubule based axoneme. The axoneme is composed of a ring of microtubules in either a 9+0 formation for stationary cilia or 9+2 for motile cilia. *C. elegans* has 60 ciliated sensory neurons and 16 genes that encode for tubulins. To understand the structure of cilia we are using tubulin mutations and tubulin fluorescent protein reporters. Our results show that one of the nine alpha-tubulin proteins, TBA-6, is exclusively expressed in ray neurons. TBA-6 is found in the dendrites at the end of the cilia. The beta-tubulin, TBB-4 has a sequence motif located in the ciliary beta-tubulins. Currently we are investigating the role of TBB-4 using the localization of TBA-6.

NEAR INFRARED PROBES FOR IMAGING AND PHOTODYNAMIC THERAPY FOR BREAST CANCER.

Gabriella Redman, *Rochester Institute of Technology.*

The aim of our research was to synthesize targeted molecular imaging agents (TMIAs) for the confocal fluorescence microscopy (CFM) of breast cancer (BrCa) cells, as a method of assessing receptor binding. The overall goal involves synthesis of single and dual-dye systems for fluorescence-guided surgery (FGS) and photodynamic therapy (PDT) of BrCa using a near infrared (NIR) dye and a photosensitizer (PS) dye, then coupling to a peptide called 18-4 that targets BrCa cells. This would enable fluorescence-guided surgical lumpectomy operations, followed by the eradication of all cancer cells remaining in the margins by PDT. The synthesis method involves the use of a modular “puzzle piece” to attach Cy5 and Cy5.5, which are NIR dyes with properties ideal for CFM, to the targeting 18-4 peptide. The goal is to show that good binding properties of the probe will lead to an effective agent for combined imaging and therapy of BrCa.

THE SYNTHESIS, CHARACTERIZATION, AND TRIBOLOGICAL LUBRICATION MECHANISMS OF ENVIRONMENTALLY-COMPATIBLE PROTIC IONIC LIQUIDS

Erik C. Dillon[1], Kiboi Davis[2], Patricia Iglesias[2], Michael G. Coleman[1], *[1]Chemistry and Biochemistry Department, SUNY Brockport; [2]Mechanical Engineering Department, Kate Gleason College of Engineering, Rochester Institute of Technology.*

The development of high-performance and environmentally-compatible lubricants is crucial for minimizing energy losses in mechanical systems while preserving our environment. While ionic liquids (ILs) have emerged as promising next-generation materials for lubrication purposes owing to their attractive physicochemical properties, several challenges currently limit their use in engineering application, including their high cost and corrosivity. Recently, eco-friendly, protic ILs (PILs) have been synthesized in our research laboratory and showed great advantages compared to tradition (aprotic) ILs, such as low cost, ease of preparation, and good lubricating properties. In this work, the physicochemical and lubricating properties of a family of PILs synthesized by using only renewable, biodegradable and biocompatible products andconstituted by the same choline cation and amino-acid anions with different side chains, were investigated. The molecular structures of the PILs were established through nuclear magnetic resonance and Fourier transform infrared spectroscopy. The tribological results showed that anti-wear ability of the PILs is greatly influenced by the side chain of the amino acids. The results of this work open the path for the rational design of environmentally-friendly PILs for tribological applications.

TENTACULITES MINUTUS HALL 1843 – ADVENTURE IN CURATION OF A SILURIAN MICROFOSSIL

Over, D.J., DeMott, Alyssa, and Zaffino, Noah, *SUNY Geneseo.*

Tentaculties minutus Hall 1843, one of three Silurian tentaculitids described by Hall, was first illustrated in Geology of New York, Part IV (Hall, 1843) and described in Paleontology of New York, Volume II. (Hall, 1852). The type specimen, as indicated by Hall (1852), comes from the “the upper green shale at Rochester” – the Sodus Formation. In Rochester Gorge the Sodus Formation lies on top of the Reynales Formation, which forms the middle falls of the Genesee, the sight of the RG&E dam at Brewer Street and the Genesee Riverway Trail crossing of the

river. Curiously, the type specimen in the American Museum of Natural History, where much of the Hallcollection, initially reposted in the New York State Museum, now resides, a result of financial issues encountered in the publication of the Paleontology of New York volumes, is not from the Sodus Formation. The cataloged type specimen – AMNH 1575 – is an external mold preserved on a brown-orange fossiliferous sandstone labeled as "Clinton Oneida", and consistent with strata exposed in Clinton, Oneida County, New York, laterally equivalent, in part, to the Sodus Formation. Search for well preserved specimens to be illustrated and described paratypes or a plesiotype, from the Sodus Formation in Rochester, goes apace. Well preserved specimens have been recovered from carbonate beds in the Sodus Formation at Rochester Gorge, from shales of the Sodus Formation in Palmer Glen, and specimens in the Pickett Collection reposited in the New York State Museum, which are lithologically similar to carbonate beds in the Sodus Formation in Rochester, but no locality information other than "Clinton Beds, Rochester" and reference to Hall (1888) is associated with these hypotypes.

WORK TOWARDS THE SYNTHESIS OF HUMAN MILK SUGARS USING AN ENGINEERED ENZYME

Katherine Pieczonka, *Nazareth University*

Human milk oligosaccharides (HMOs) are non nutritional sugars occurring naturally in human breast milk that support cognitive and digestive development as well as immune response. The complex synthesis and limited availability of HMOs has restricted the study of this class of molecules. The goal of this project is to use the engineered glycosynthase enzyme BbhI to make HMOs and HMO derivatives which are currently inaccessible using known biosynthetic methods. This talk will focus on optimizing the synthesis of the *N*-acetyl-D-glucosamine 1,2-oxazoline sugar substrate using protecting group chemistry. This sugar will then be combined with a glycosyl acceptor and BbhI to validate the activity of our sugar-enzyme system for the synthesis of new carbohydrates.

2024 Rochester Academy of Science Abstracts
Poster Presentations (Alphabetized by Title)

ACUTE TOXICITY OF TIRE WEAR PARTICLES ON IMMATURE DAPHNIA MAGNA.

Amelia Meneses, *Ithaca College*.

This study investigates the effects of tire wear particles (TWP) on the mobility and behavior of immature *Daphnia magna*. Acute toxicity tests were conducted to assess the impact of varying concentrations of TWP on Daphnia mobility, sugar uptake, and overall movement. The results showed that exposure to TWP reduced the mobility of *D. magna* after both 24-hour and 48-hour exposure periods. The 24-hour tests revealed that 50% of D. magna were immobile when exposed to 1 mg TWP/mL. The 48-hour tests revealed that 50% of exposed D. magna became immobile when exposed to 0.1 mg TWP/mL. Imaging analysis revealed that TWP stuck to the outer body of the daphnia, with some particles being internalized. Additionally, daphnia movement patterns were analyzed using Ethovision software after a 48-hour exposure to TWP, furthering our understanding of the effects of these particles on daphnia behavior. Our findings show the potential ecological implications of TWP in aquatic environments, particularly regarding the health and mobility of key aquatic organisms.

ANALYSIS OF MUON ATTENUATION FOR VARYING ALTITUDES WITH RESPECT TO THE ATMOSPHERIC PRESSURE AND TEMPERATURE OF THE ENVIRONMENT

William Russell and Biruk Nardos Abebe, *Department of Physics, Hobart and William Smith Colleges*

Muon detectors are essential instruments in particle physics, providing crucial data for cosmic ray research and particle physics experiments. This experiment investigates muon flux across varying altitudes and underwater depths in Seneca Lake. However, environmental factors, particularly temperature, significantly influence the performance and reliability of these detectors. By utilizing our assembled Adafruit Geiger Counter, we measured muon flux at various depths to analyze how natural atmospheric and aquatic environments impact muon flux attenuation. This study also investigates how temperature variations impact the operational efficiency, detection rate, and signal stability of a muon detector. We expect a noticeable shift in detector sensitivity at extreme temperatures, suggesting that temperature stabilization or compensation methods may be necessary for optimal detector performance. This setup allowed for a direct comparison of the shielding effects of the atmosphere versus water. Previous results stated that muon flux increases at higher altitudes due to reduced atmospheric thickness and decreases significantly with increasing water depth. We present our findings in this poster. This research provides insights for improving muon detector reliability, especially in field applications where environmental conditions are variable, ultimately contributing to more accurate and consistent cosmic ray and particle detection data.

ANCIENT RETROTRANSPOSONS FROM MOSSES AND FUNGI.

Hope Haley (Masters Student), Dr. Olga Novikova, Assistant Professor, *Biology Department, SUNY Buffalo State University.*

Ty3/Gypsy LTR retrotransposons are arguably the most prolific and successful group of transposable elements in plant genomes. Historically, two major clades of these elements have been recognized in plants: the Chromoviruses and the Athila/Tat elements. In this study, we identify and characterize a third distinct clade of Ty3/Gypsy LTR retrotransposons, termed Ylt1, found specifically in mosses.

Our research involved both experimental and computational approaches. We conducted empirical analysis using moss specimens from the collection at the Eckert Herbarium at Buffalo State. In parallel, computational investigations, including a detailed distribution analysis of Ylt1-like LTR retrotransposons and an examination of genome assemblies from various moss species, revealed that Ylt1-like LTR retrotransposons are unique to moss and fungal genomes. A focused study of the Ylt1 elements in the genome of the model moss *Physcomitrium patens* demonstrated a distinct preference for insertion into palindromic sequences. Phylogenetic analysis suggests that Ylt1 elements originated from a single ancient event in mosses and fungi. We further explore the possibility of horizontal gene transfer between fungi and plants as a mechanism for the distribution of Ylt1 elements. Additionally, we propose that the sequence-specific insertion preference may represent a vestigial characteristic of an ancient lineage of transposable elements, indicating evolutionary remnants of a sequence-specific targeting mechanism.

ANTIBIOTIC TOLERANCE IN COCULTURE BIOFILMS.

Aaliyah Aguilar and Kasia M. Dubiel, *Department of Biology, SUNY Brockport.*

In nature, many microbes exist as members of complex, multi-species biofilms. Biofilms are structured communities of cells encased in a self-produced extracellular matrix that protects the encased microbes from stressors including antibiotics. Here, we investigate the dual-species interaction between *Bacillus subtilis* and *Pantoea agglomerans*, two soil-dwelling, plant-associated microbes that serve as a mimic of environmentally relevant biofilms. When grown together, *B. subtilis* and *P. agglomerans* exhibit unique antibiotic survival compared to when grown in isolation. Specifically, coculture growth increases *P. agglomerans'* survival when exposed to the antibiotic gentamicin. However, the behavior of these two bacterial organisms remains unknown in the presence of other antibiotics. In this study, we investigate the response of *B. subtilis* and *P. agglomerans* in monoculture and coculture when exposed to various concentrations of different antibiotics. Behavioral changes between monoculture and coculture were examined via colony-forming units, microscopy, and growth curves. Our work validated increased *P. agglomerans* survival in coculture upon exposure to gentamycin. Interestingly, *P. agglomerans* survives ampicillin exposure in monoculture. However, *B. subtilis* dominates the coculture in the presence of ampicillin, with no *P. agglomerans* growth observed. Together, these data illustrate that bacterial antibiotic response is altered when grown with other bacterial species and in the context of biofilms.

BEECH LEAF DISEASE SYMPTOM PROGRESSION THROUGHOUT NEW HAMPSHIRE.

Sara Sternick, *SUNY College of Environmental Science and Forestry.*

The invasive nematode *Litylenchus crenetae* ssp *macanii* is the causal agent of Beech Leaf Disease (BLD), which has spread throughout the northeastern US since symptoms were first documented in Ohio in 2012. While potassium phosphite has shown some promising effects in lowering nematode counts through experimental trials, the importance of the amount of time since initial infection has yet to be emphasized. This experiment has tested various combinations of application timing and amount of potassium phosphite, in addition to testing the effect of both phosphite (as DryPhite) and potassium (as KCl) on their own against BLD. The three sites included in this project represent a time series for the number of years since detection: 2, 1, and 0. By the time BLD banding is visible during the growing season, *L. crenetae* has already overwintered in leaf buds, and the infection is well under way. In summer of 2025, it is likely that BLD symptoms will be worse at the two sites with established BLD, and that there will be visible symptoms at all three sites. This study will involve collecting beech buds over the winter and screening each bud for leaf damage and nematode counts. This information regarding nematode counts will provide insight into population levels at early stages of infection, which can then be used in tandem with management plans to better manage BLD symptoms.

BIDIRECTIONAL COMMUNICATION BY DEVELOPING ADIPOCYTES: INWARD RECRUITMENT OF IMMUNE CELLS AND OUTWARD SIGNALING TO CONTIGUOUS TISSUES, INCLUDING THE ORAL MICROBIOTA

Drew Johnston, SUNY Brockport.

Adipose tissue is made up of a number of different cell types, including immune cells like macrophages, blood cells, and neurons. Secretions from adipocytes may influence the delicate balance between the positive and negative influences of inflammation on human health. Preliminary data from our lab indicate that an appetite-stimulating hormone, MCH, elicits changes in the expression of immune-regulating genes from developing adipocytes, and potentially adipocyte secretions. The first aim of this project was to optimize the quantification of fluorescently labeled macrophages that were induced to migrate into an adipose cell layer by MCH. Data was obtained using a Synergy M1 fluorescence plate reader and compared to predicted fluorescent units from a Countess II FL automated cell counter. The data indicates the plate reader was more sensitive and effective at quantifying relative migration of these hormone-induced macrophages. The second aim of this project was to determine whether MCH-induced adipocyte secretions would promote the formation of an *S. mutans* biofilm. This bacterium is a major causal factor in the formation of dental caries and contributes to negative oral health consequences. Preliminary results using a crystal violet assay show MCH-related changes in biofilm formation, but more datapoints need to be collected to improve our confidence level. Overall having the ability to quantify migrating immune cells and having a reliable assay, like the biofilm assay, will aid in testing adipocyte secretions for negative health outcomes, including obesity-related conditions like periodontal disease.

BIOGEOCHEMICAL DYNAMICS OF IRON AND NITROGEN IN DEVIL'S BATHTUB, A FERRUGINOUS MEROMICTIC LAKE.

Mangioni, B.R., Marnocha, C.L., and Edwards, W.J. , *Niagara University*.

Meromictic lakes are permanently stratified with anoxic monimolimnia. Our study site, Devil's Bathtub (DBT) in Rochester, NY, is a ferruginous meromictic lake with high concentrations of iron and nitrogen compounds in the monimolimnion. Contrary to typical thermodynamic expectations, nitrate and nitrite exceed the ammonia concentrations in the monimolimnion. This suggests that ammonia oxidation to nitrate or nitrite is occurring with a current unexplained source. Due to anoxic conditions within the monimolimnion, ammonia oxidation would require a different electron acceptor, which based on the redox state and availability could be Fe(III). Ferric iron is regenerated at the surface and sinks to the bottom which then could fuel the ammonia oxidation to complete cycling mechanisms. We hypothesize that iron-dependent ammonia oxidation is responsible for the observed geochemical profiles and meromixis, either through feammox, an energy metabolism coupling these reactions, or by separate taxa carrying out iron-reduction and ammonia oxidation. To determine which taxa may be responsible, we extracted DNA from the water column for 16S rRNA gene sequencing to characterize the microbial community. We found the presence of *Pirelullaceae*, known ammonia oxidizers, and *Geobacter*, an iron reducer. This relatively understudied pairing may contribute to the biogenic meromixis of DBT and give us insight to a better understanding of iron-nitrogen interactions in hypereutrophic conditions.

BRAIN SIZE DOES NOT PREDICT NEURON NUMBER IN POECILIA FISH.

Grace Zhang, Helen Stec, and Ben Sandkam, *Cornell University*.

The brain is a central processing center for processing information, memory, and fine motor skills, consisting of neurons and glial cells. Brain size varies dramatically across species with the evolutionary drivers behind brain variation remaining a topic of ongoing research. Historically, brain weight has been used to correlate with cognition, but studies have shown that neuron number may be a better predictor. Additionally, neuron numbers do not scale proportionally to brain size; rather, brain size may depend on the size of neurons and the amount of glial cells. In our study, we examine the correlation between brain weight and neuron count within and across species of *Poecilia parae*, *Poecilia picta*, and *Poecilia reticulata*. These freshwater fish are closely related and have evolved different reproductive strategies with the *P. parae* having five genetically distinct male morphs (immaculata, parae, red melanzona, blue melanzona, yellow melanzona). For example, melanzona males use courtship displays with their colorful appearance while paraes chase away other male competitors and force-copulate with females. The three species inhabit the same ecological niche, minimizing confounding environmental influences on genetics and allowing us to see how the evolution of different reproductive strategies led to differences in brain size/neuron count. We dissected the brain and used a homogenization method, known as isotropic fractionator, to quantify the number of neurons in the whole brain. This method utilizes DAPI and Alexa Fluor 488 staining, fluorescence stains that bind to nuclei and NeuN respectively, to count the number of neuronal and nonneuronal cells. When comparing brain size and neuron count within species and across species, females across species have similar brain weight but *P. parae* females have significantly more neurons. Within the species of *P. reticulata* and *P. picta*, there were opposite relationships between brain weight and neuron number. *P. reticulata* had no differences in brain weight, but females had more neurons. In *P. picta*, males have larger brains, but no differences in neuron number compared to females. Our results support the hypothesis that brain weight does not correlate with neuron number, suggesting that studies should also take into consideration neuron count when assessing brain variation.

CATALYTIC HYDROGENATION OF BENZALDEHYDE USING RHODIUM-BASED CATALYSTS.

Sawyer Oppenneer, *SUNY Fredonia*, Isabelle Price *SUNY Fredonia*, Thuy Thanh Le, *Pacific Northwest National Laboratory,* and Allan Jay Cardenas, *SUNY Fredonia*.

Improving our ability to recycle biomass and waste products has become an integral focus in research due to the global energy crisis. Catalysis is a leading field in harnessing the potential energy in biomass and waste products. Hydrogenation reactions are one such avenue which can be scaled up to industry level. These catalytic reactions call for a cheap, recoverable, and efficient catalyst. Rhodium catalysts, while expensive, show great promise. To get around the price, nanometer-sized heterogeneous rhodium catalyst loaded on a titania solid support was studied in the efficiency of benzaldehyde hydrogenation. The reaction pathway was proposed for the rhodium nanoclusters on titania from computations and isotope labelling experiments. The pathway showed the need for multiple coordination sites for the catalyst, which led to research into the optimal number of rhodium

binding sites on a molecular catalyst. Three complexes, from one to three rhodium sites, were loaded onto titania support and tested in the same way.

CELL SURFACE GLYCOSYLATION IMPACTS ANTIBIOTIC SUSCEPTIBILITY IN PSEUDOMONAS AERUGINOSA.

Lorelei Robinson and Stefan Schulze, *Gosnell School of Life Sciences, Rochester Institute of Technology.*

Antibiotic resistance is a prominent medical issue with a pressing need for novel solutions. Antimicrobial compounds can target cellular functions internally (e.g. ribosomes) or externally (e.g. cell wall). Correspondingly, bacterial cells have different mechanisms to deal with antibiotics, which often include enzymes that inactivate antibiotics, proteins like efflux pumps, or cell wall components. The functions of proteins can be affected by post-translational modifications such as protein glycosylation. The cell wall can be altered by glycans such as O-antigens. That means that the disruption of glycosylation pathways could lead to changes in the susceptibility of a bacteria to antibiotics. Utilizing protein glycosylation pathway mutants in *Pseudomonas aeruginosa* for the genes *tfpW* and *fgtA*, and an O-antigen pathway mutant for the gene *orfN,* comparative antibiotic susceptibility assays were performed to determine the impact of these mutations. Disk diffusion assays were used to determine susceptibility to a range of different antibiotics, then 96-well plate assays were used to determine the MIC for strains and antibiotics that showed differences in the disc diffusion assays. These assays revealed differences in responses of the mutants to certain antibiotics. For example, the *orfN* transposon and knockout mutants show lower susceptibility to chloramphenicol, streptomycin and tetracycline than the wild type and a correspondingly higher minimum inhibitory concentration. There was no difference in the response of the wild type and the knockout mutant for the *tfpW* pathway, indicating that the pilin modification enzyme does not affect antibiotic response. Since chloramphenicol and tetracycline have different mechanisms of action, these results indicate that the *orfN* glycosylation pathway affects multiple cellular processes related to antibiotic resistance. Our work thereby sets the stage for follow-up analyses that could identify specific mechanisms and glycans that are involved in bacterial responses to antimicrobial compounds. This knowledge could potentially inform new ways of treating bacterial infections in the face of antibiotic resistance.

CHALLENGES OF hDNA BARCODING FROM KEUKA COLLEGE BIRD MUSEUM COLLECTION.

Luciana Cursino, Brenden Crotty, and Sarah O'Brien, *Jephson Science Center, Natural Sciences Division, Keuka College.*

The study of historical DNA (hDNA) from museum specimens has recently gained prominence, revealing new insights into organisms that lived up to 200 years ago. This research aimed to identify hDNA from skin specimens in the Keuka College NSM bird museum collection. Toepads and talon samples were obtained from 35 skin specimens. Total hDNA was extracted, amplified, and sequenced using DNA barcoding. All sequences were analyzed for identification with the Basic Local Alignment Search Tool. Despite degradation hindering molecular identification for most samples, a few talon samples provided insights into the carnivorous diet of birds of prey. Challenges associated with working with hDNA are discussed. Future research will focus on improving hDNA preservation during extraction and targeting fewer extinct bird specimens.

CHARACTERIZATION OF MICROBIOMES ASSOCIATED WITH JAPANESE KNOTWEED: AN INVASIVE PLANT SPECIES.

Daniel Morgan and Kasia M. Dubiel, Department of Biology, SUNY Brockport.

Invasive species are one of the greatest threats to biodiversity and ecosystem processes. Evidence suggests that invasive plants change soil structure, chemistry, and microbial communities. One taxa that may have significant below-ground impacts is Japanese knotweed (*Reynoutria japonica*). Japanese knotweed impacts the soil environment by releasing chemical compounds called phenolics. It is known to alter soil chemistry and microbial composition, but limited work has evaluated how bacterial diversity and behavior are impacted. To investigate this question, we collected soil samples from a diverse plant area and a Japanese knotweed patch and isolated bacteria using a range of growth media. Isolated bacteria were identified using sequencing, and bacterial growth was tested in the presence and absence of a phenolic compound, resveratrol. Visually, petri plates from knotweed patches had less diversity of bacterial species compared to native plant patches. This suggests that the phenolics may decrease microbial diversity. Our bacterial growth data indicates that Knotweed-associated bacterial isolates have increased survival in the presence of resveratrol compared to bacteria isolated from diverse

plan-associated soil. Our preliminary data suggests that Japanese knotweed produced compounds such as resveratrol, may alter soil microbe composition by preferentially selecting for organisms resistant to the presence of phenolics. Overall, this work aims to expand our understanding of invasive plants, specifically Japanese knotweed, on soil microbes.

CHARACTERIZING THE DIET OF LOWER NIAGARA RIVER USING 16S AND 18S rRNA GENE SEQUENCING.

Wrobel, S.E., Edwards, C.R, Marnocha, C.L., Edwards, W.J., and Edwards, C.T., *Niagara University*.

Zooplankton regulate the flow of carbon and nutrients from phytoplankton to higher trophic levels. Previous efforts to differentiate food choice have focused on fatty acid profiles and stable isotopies, with recent efforts utilizing genetic identification of prey in the dissected guts of larger marine zooplankton. We apply our whole organism digestion and DNA extraction technique to determine the diet of *Daphnia galeata* from the lower Niagara River. We extracted DNA from whole *D. galeata* and river water phytoplankton samples followed by amplicon sequencing of the 16S rRNA V3-V4 region and 18S rRNA V4 region. We found evidence of selective feeding in the diets of *D. galeata*. The most abundant members of the bacterial community were Micrococcales, Frankiales, and Rhizobiales. In the diet of the *D. galeata*, Micrococcales were highly represented while Corynebacteriales also had a high abundance relative to the bacterial community indicating food selection. The eukaryotic community was dominated by rotifers, *Cladophora*, and mussel veligers, as well as less abundant phytoplankton. The *D. galeata* diet was primarily rotifers and *Cladophora*, but changed to dreissenid veligers over the sample period. This indicates that the *D. galeata* favored the dreissenid veligers over the other abundant food sources. Currently, we are applying this method to copepods from the Niagara River, and moving forward, it will allow us to understand feeding patterns and nutrient cycling in other major lake and river systems.

COMPARISON OF LIPID AND FATTY ACID PROFILES IN LAKE WHITEFISH EGGS FROM THE GREAT LAKES.

Joseph Bessinger[1], Jarrod Ludwig[2], Megan Belore[3], Emma Bloomfield[4], Andy Cook[3], Mike Diefenbach[5], Angel Guerrero[6], Tim Johnson[4], Tom MacDougall[3], Erik Olsen[7], Joseph D. Schmitt[8], Jason Smith[9], and Jacques Rinchard[1]. *[1]SUNY Brockport – Department of Environmental Science and Ecology, [2] New York State Department of Environmental Conservation, [3]Ontario Ministry of Natural Resources and Forestry – Lake Erie Management Unit, [4]Ontario Ministry of Natural Resources and Forestry – Glenora Fisheries Station, [5]Northern Michigan University, [6]Little Traverse Bay Bands of Odawa Indians, [7]Grand Traverse Band of Ottawa and Chippewa Indians, [8]United States Geological Survey – Lake Erie Biological Station, [9]Bay Mills Indian Community*

Lake whitefish (*Coregonus clupeaformis*) populations across the Great Lakes have experienced declines in recent decades. The purposes of this study were to analyze the lipid content and fatty acid signatures (FAS) of lake whitefish eggs collected from multiple locations across lakes Superior, Michigan, Huron, Erie, and Ontario. Lake whitefish eggs were collected in fall of 2023. Lipids were extracted and quantified gravimetrically, while fatty acids were transmethylated and analyzed using gas chromatography/mass spectrometry. Statistical analyses revealed significant differences in both lipid content and FAS among locations. Eggs from the western basin of Lake Erie had the highest lipid content, while eggs from the Sault Tribe area in Lake Huron exhibited the lowest. The major fatty acids contributing to egg differences included 18:1n-9, 22:6n-3, 16:1n-7, 20:5n-3, and 16:0, with eggs from Green Bay in Lake Michigan showing the most distinct FAS. These findings suggest dietary differences among lake whitefish populations and provide a foundation for future research into the factors affecting lake whitefish recruitment in the Great Lakes.

CREATING A SPATIAL INVENTORY OF CAMPUS TREES TO INFORM A MORE HOLISTIC APPROACH TO MANAGEMENT

Abigail Miller, Josh Lefkowicz, and Brian Hoven, *SUNY Geneseo*

Understanding that native trees and commonly planted street trees may differ in their ecosystem service benefits is crucial in determining what trees offer the greatest ecological benefit to SUNY Geneseo. In the spring of 2024, ecosystem services were assessed for 70 trees planted on campus, including the number of species of Lepidoptera they could potentially host; while iTree Design was used to determine stormwater runoff avoided, air pollution removed, and carbon sequestered. Results indicated that even though there was no statistical difference, there was a trend toward native trees providing greater ecosystem benefits compared to common, established street trees, suggesting that a larger sample size may yield more conclusive results. To expand

upon these findings, a spatial survey of all managed trees on SUNY Geneseo's campus is currently being conducted. The goal of this survey is two-fold: provide the Department of Facilities with an up-to-date campus tree inventory, and enable a comprehensive evaluation of their ecosystem services. The inventory is being conducted using QField, a spatial application that fully integrates with QGIS. For each tree entry, the species and its diameter at breast height (DBH) are recorded, to be later uploaded to iTree Design. An inventory of campus trees provides insight into the role trees play in SUNY Geneseo campus sustainability and informs future tree planting selections.

DATA COLLECTION, NORMALIZATION, AND ANALYSIS OF BENDER ELEMENT SIGNALS.

Leo Arbitman, *Hobart and William Smith Colleges/Ohio State University.*

3D-printed concrete is an emerging construction technology that promises to reduce costs, increase design freedom, and minimize waste. The success and viability of 3D-printed concrete depend on two significant factors: the concrete must be fluid enough to extrude yet stiff enough to support subsequent layers without deformation. Measuring the concrete's early age properties is crucial to maximizing the efficiency of the printing process.

Bender elements, piezoelectric transducers originally developed for soil testing, can measure concrete's small-strain shear modulus (G_{max}) by generating and detecting shear waves through the material. This provides real-time insights into strength development and workability without disturbing the printing process. However, when used in concrete mixes, typically wetter and more conductive than soils, bender elements face significant challenges, including crosstalk, electrical coupling, and near-field effects.

These issues are particularly pronounced in fresh concrete due to its high ionic content and changing properties during hydration. A modified bender system and Arduino computers were interfaced to improve measurement reliability and precision. This system characterized and normalized signal transmission and reception patterns across varying concrete compositions, bender geometries, and input signals.

DETECTION OF DONOR-DERIVED GERMLINE STEMCELLS POST TRANSPLANTATION USING PCR AMPLIFICATION.

Kendall Wilcox, Justine Simms and Thomas Jensen, *Hobart and William Smith Colleges*.

How to increase reproductive lifespan post-mortem! Zoo and conservation breeding programs often have individuals who do not breed, which makes them increasingly genetically valuable. Our method aims to reintroduce genetically valuable individual's germplasm back to the population by transplanting GFP transgene donor germline stem cells to host embryos. Using PCR detection of the GFP transgene, we demonstrated that donor-derived germline stem cells migrated to and colonized host gonads.

DETECTOR GEOMETRY AND MUON FLUX.

Javier Pacheco and Tony Wang, *Hobart and William Smith Colleges*

Cosmic rays are high-energy particles primarily composed of protons. Upon interacting with the Earth's atmosphere, they generate secondary particles, such as muons. These muons reach the earth at different angle of incidence. Therefore, the muon flux should be dependent on the detector geometry. This study investigates the correlation between different geometry of the detectors and the muon flux.

We measured muon flux using two Adafruit Geiger counters that we built from scratch. We connect the detectors in coincidence, and stack one on top of another. To test the effect of detector geometry, we first change the distance between the two detectors and record the muon flux. Different distances will affect at what angle muons can travel in order to interact with both detectors. Next, we set the detectors in two different configurations, parallel and perpendicular. This will change the overlap area between the two detectors. A decrease in overlapping area or an increase between the detector distance will both reduce the muon flux. Percentage reduction in muon flux was also theoretically calculated for all detector configurations. Multiple measurements were taken to factor in uncertainties and results are presented in this poster.

DETERMINATION OF BACTERIAL SPECIES ISOLATED FROM FRESHWATER SAMPLES.

Fair J, Ontiveros F, and Herman M, *Department of Biology, St. John Fisher University.*

The identification and classification of microbial flora in bodies of fresh water has the potential of enhancing our understanding of the ecosystem and improving water management and bioremediation. Such efforts may be facilitated by remote sensing technologies. For the past four years, undergraduate students from St. John Fisher College and RIT collected water samples from Lake Ontario and Irondequoit Bay, with the goal of constructing a database of bacterial species and water parameters (ex: with organic matter and chlorophyll content). This kind of database is necessary to establish potential correlations between the presence of certain bacterial species and water parameters that can be measured via satellite images collected by the Landsat 8 OLI and TIRS sensors. Bacterial species have been collected and identified via comparison of DNA sequences. In the past, initial efforts at mapping the distribution of bacterial species were reported using 16S rRNA. Over the past 3 consecutive summers, of the approximately 450 bacterial isolates, 40 different species spanning over 20 genera have been cultured and identified. From past research, several fish and human pathogens were identified, and antibiotic-resistance profiles were determined. The end goal of this experiment is to determine the specific bacterial species that live in certain bodies of freshwater.

DEVELOPMENT OF VIROKINES AS TAGS FOR MAMMALIAN CELL PROTEIN EXPRESSION SYSTEMS.

Theodore A. Lee, Annika N. Diaz, and Diego G. Diel, *Department of Population Medicine and Diagnostic Sciences, Cornell University College of Veterinary Medicine.*

Mammalian cell systems are common when researching expression and purification of proteins. These systems are desirable for their ability to produce correctly folded proteins and perform post-translational modifications that regulate the action of these proteins. Transfected cells use a variety of methods to aid protein expression, including inducing expression of anti-apoptotic proteins, arresting cells in growth phases of the cell cycle, and alteration of DNA methylation and acetylation patterns. However, reaching this point comes with many challenges. Mammalian cells have high costs and maintenance requirements, and may produce less protein than their insect or bacterial counterparts. This research thus seeks to develop a reproducible and specific system to reliably express secreted proteins in mammalian cells, utilizing viral proteins known to be expressed extracellularly during infection as secretion tags.

The objectives of this project are: 1) to design and generate an expression plasmid for cloning of proteins in fusion with the CBP secretion tag, and 2) to validate the mammalian secretion expression system using a diverse array of viral proteins. By developing a virokine-based system of isolating protein targets, we hope to produce recombinant proteins faster and more efficiently than is possible with existing methodologies, allowing for more effective routes towards their use in therapeutic and research settings.

DIVERSITY OF GLYCOSYL HYDROLASE FAMILY 98 ENZYMES AND EFFECTS ON ERYTHROCYTE ANTIGEN CLEAVAGE.

Evan Wilde and Mark Gallo, *Niagara University Biology Department, Niagara University.*

Glycoside hydrolases are enzymes that cleave sugar polymers. GH families classify enzymes in accordance with amino acid sequence similarity, which typically confers both mechanism and substrate specificity. GH98 family enzymes, which are endo-β-galactosidases, have been previously demonstrated to cleave specific glycosidic bond types present in A and B blood antigens. Though the previously identified enzymes displayed functionality, it was hypothesized that many more active GH98 enzymes may be present in other bacterial species. Both BLAST and AlphaFold were used to identify homologous GH98 enzymes from other bacterial taxa. This information will be used to isolate the genes, overexpress their respective proteins, and analyze their activities as it relates to antigen cleavage.

DOWN TO THE BONE: AMPHIBIAN SKULL MICROANATOMY AND ITS RELATIONSHIP WITH ECOLOGY.

Sonja Anderson, *SUNY Oswego*.

Amphibians exhibit a wide array of ecologies, from fossorial to fully aquatic. Morphologically, adaptations such as a thicker and more compact skull could correlate with lifestyles like burrowing, offering insights for understanding evolutionary histories. From similar studies on Lepidosaurs (snakes and lizards), the fossorial lifestyle has convergently evolved repeatedly, with a pattern of a highly compact skull roof. However, the skull microanatomy of herpetofauna is greatly unexplored and could be key to unlocking a relationship between ecology and evolution. If there is a correlation between

microanatomy and ecology, then this framework could also predict the lifestyles of extinct species. I focused on the premaxilla, nasal, frontal and parietal (fused frontoparietal in frogs) bones, which were segmented from CT scans of 27 salamanders and 12 frogs using 3D Slicer. Each skull was analyzed in Fiji, an image processing software, to calculate the compactness and thickness. The average thickness for the salamanders was 2.78 mm-3.02 mm with an average compactness of 0.98 mm-0.986 mm; while the values for the frogs showed greater variability. These results differ across species with similar ecologies, not showing a clear pattern of thickness and compactness. Effectively, there is not enough evidence that microanatomy exhibits a correlation with ecology in amphibians and more analyses need to be completed.

AN EAR TO THE WATER: AN INVESTIGATION OF A WESTERN NEW YORK POND SOUNDSCAPE.

Bryan Armpriest, Katelyn Stancliffe, Anna Tessier, Maya Tucci and Kristina Hannam, *Department of Biology, SUNY Geneseo.*

Organisms can create sound for many different reasons, and as such, soundscapes (the collection of all sounds in a habitat) can tell us about the biotic activity in an environment based on the quantity and characteristics of sounds being produced. Freshwater soundscapes are generally understudied compared to terrestrial soundscapes. A wide variety of species are active and vocalize in freshwater environments, and studying patterns within these soundscapes can give insight on broader ecosystem health. Four days' worth of continuous underwater acoustic recording of South Park Pond near Geneseo, New York in April 2024 was collected, and we plan to analyze it for temporal and seasonal patterns. We used OcenAudio to cut and collect ten-minute segments from every hour of the recording and calculated the acoustic complexity index (ACI) and acoustic diversity index (ADI) in RStudio based on these time chunks. These acoustic indices will give us some measures of variation in daily acoustic activity in the ponds. Thus far, the ADI points to several time frames when changes in acoustic activity occur. We plan to explore these time frames in the recordings to identify the kinds of sounds and potential soniferous species present in the pond.

EFFECTS OF LOW-LEVEL LIGHT THERAPY (LLLT) ON DIFFERENTIATED VASCULAR SMOOTH MUSCLE CELL (DVSMC) WOUND RECOVERY.

Abigail Guiher and Risa Palmer and Abigail Pixley and Ransom Poythress, Ph.D, *Houghton University*

Previous research in skeletal muscle has indicated that low-level light therapy (LLLT) can accelerate wound recovery in certain circumstances. The purpose of this study was to discover if LLLT had similar effects on differentiated vascular smooth muscle cell (dVSMC) wound recovery. One theory on the mechanism for LLLT suggests that red LED photons absorbed into the mitochondria cause increased ATP production for cellular processes, including the rate of cell division. If so, then dVSM could benefit from similar treatment. To test this, rat aorta cells (A7r5) were cultured in vented flasks and subcultured in well plates where they underwent a scratch wound assay. The scratch width was measured before and after ten, twenty, or thirty minutes of LLLT, where some treatment groups received constant LED light exposure and others received pulsing. There was no significant data recovered from the pulsing LED light treatment. Constant LED light treatment yielded a p-value of 0.00455 after the ANOVA test which signified LLLT's effectiveness on regeneration time, with the best result after thirty minutes of treatment.

EVALUATING ANTIMICROBIAL POTENTIAL OF NOVEL HETEROCYCLIC AMINO ESTERS.

Kassidy Tucker, Undergraduate Student, *Biology Department, SUNY Buffalo State University*
Dr. Sujit Suwal, Associate Professor, *Chemistry Department, SUNY Buffalo State University*
Dr. Olga Novikova, Assistant Professor, *Biology Department, SUNY Buffalo State University*

Antimicrobial resistance is a major concern as bacteria rapidly adapt to withstand different concentrations of drugs, similar to how individuals build tolerance to certain substances over time. One of key measures in assessing bacterial resistance is the minimum inhibitory concentration (MIC), the lowest concentration of an antimicrobial agent required to prevent visible bacterial growth. A high MIC indicates increased resistance to the antimicrobial, signaling the need for stronger or alternative treatments. In our study, we determine the MIC of a group of compounds, heterocyclic amino esters, for several common bacterial strains associated with infections, including *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, and *Staphylococcus aureus*. Heterocyclic moieties serve as key pharmacophores in almost all modern FDA-approved drugs, and we recently synthesized a library of functionally diverse heterocyclic amino esters using Buchwald–Hartwig amination. To test the antimicrobial

properties of our library of compounds, we employ a serial microdilution technique in a 96-well plate, allowing us to assess how varying concentrations of the compounds inhibit bacterial growth over 18-hour period and to identify the lowest concentration that halts proliferation. Our preliminary results indicate that some of the compounds in our set may have a potential for further diversification and development into antimicrobial agents.

EVALUATING NUTRIENT LIMITATION OF PHYTOPLANKTON IN BRADDOCK BAY, LAKE ONTARIO, MONROE COUNTY.

Brayden Link, Michael Chislock, *SUNY Brockport*.

Braddock Bay is a shallow bay marsh within 10 miles of Rochester, Monroe County, New York. Through wave action erosion from Lake Ontario, the bay lost its protective barrier beach and over 100 acres of marshland habitat. In 2016, the U.S. Army Corps of Engineers started a restoration project of the area, with the objectives to restore the barrier beach as well as improve habitat for native fish and wildlife. While water quality within the bay initially appeared to improve after the barrier construction, there have been several recent mid-summer algal blooms as well as an uptick in most trophic state metrics. In summer 2024, we sampled all eight original sites: one in two major tributaries; one in Lake Ontario; three protected from Lake Ontario by the barrier; and two sites directly connected to Lake Ontario. We collected *in situ* water chemistry data using a YSI multiparameter sonde (e.g., temperature and dissolved oxygen), as well as samples for major nutrient analysis (i.e., nitrogen and phosphorus). We conducted monthly laboratory nutrient limitation assays using water collected from these sites throughout the summer, the treatments had varying N:P ratios to help determine if nutrient limitations differed between protected and unprotected sites and if there is a shift in that limitation as the summer progresses. Phytoplankton growth was generally highest for the tributaries and the bay sites closest to the tributaries, which suggests that the bay is nitrogen limited. This poses potential threats for algal blooms of taxa capable of nitrogen fixation.

EXERCISE-INDUCED FUNCTIONAL CONNECTIVITY CHANGES IN PARKINSON'S DISEASE.

Takreem Ahmed, Gloria Chen, Laetitia Faye, Senegal Mabry, Adam Anderson. *Cornell University*.

Parkinson's disease (PD) is the second most common disease in the world. In addition to physical symptom manifestations of PD, such as tremors and gait disturbances, there are also non-motor dysfunctions related to the autonomic system. These changes involve interoception, the sensation of the body's visceral signals that encompass multiple dimensions and bodily axes. Individuals with Parkinson's Disease may experience changes in their ability to perceive internal signals such as heart rate under conditions that will physiologically increase heart rate, such as exercise or stress. In this research study, participants will undergo a stress task involving perceived social threat and an exercise intervention at SUNY Cortland that will include 24 sessions of lower body training on the reACT machine, a machine used to improve coordination, strength, balance and stability. Participants will be asked to perform a heartbeat detection task where they'll be assessed on accuracy, awareness, and sensitivity under those conditions of stress and exercise. Participants will also undergo MRI functional connectivity scans, allowing us to analyze variations in hemodynamic response among regions responsible for interoception (ex: cerebellum) and other brain regions in both PD participants and healthy controls. Thus, our study aims to answer: 1) how interoception is different in PD during exercise; 2) how interoception is different in PD during stress; and 3) how cerebellar functional connectivity is different in PD.

FROM PARTICLE PHYSICS TO ARCHITECTURE: INVESTIGATING MUON ATTENUATION FOR SAFER BUILDING DESIGNS.

Elizaveta Telepova and Jack Norkus, *The Physics Department of Hobart and William Smith Colleges*

Muon particles, byproducts of cosmic ray interactions in the Earth's atmosphere, exhibit a high mass relative to electrons and an ability to penetrate dense materials, making them of particular interest in fields such as particle physics, materials science, and architectural design. This study investigates how different materials, including concrete, steel, iron, and wood, affect muon flux. Using a custom-built Adafruit Geiger counter, we measured the attenuation of muon flux across these materials, comparing experimental absorption rates with theoretical predictions.

Understanding the interaction between muons and materials contributes valuable insights for both scientific and architectural applications. In architectural design, optimizing material selection for radiation shielding can enhance building safety by reducing occupants' exposure to cosmic radiation. By characterizing muon absorption properties across a range of materials, this research

informs material choices that balance structural integrity, environmental performance, and radiation shielding in building design. Our findings underscore the importance of interdisciplinary approaches to material science and architecture, using particle physics data to drive innovations in construction and safety.

FROST TOWN IN THE LAB: ARCHAEOLOGICAL DOCUMENTATION AND POST-FIELD PROCESSING.

Cyan Carter, Alexander Smith Ph.D, Department of Anthropology SUNY Brockport.

Frost Town was a village in what is now South Bristol, New York, just east of Honeoye Lake. Established in the late 18th century by Gamaliel Wilder, a Revolutionary War veteran and member of the Sullivan Campaign, the town was one of the first logging developments in Western New York. Although the town went from logging to agriculture in the 19th century, it was eventually abandoned by World War I and many years later became the Cumming Nature Center (CNC). Frost Town Archaeology is a project run by SUNY Brockport's Department of Anthropology as a field school at a series of house foundations that now are part of the CNC. This project allows students to become immersed within the field of anthropology, archaeology, and a hands-on experience with material culture in the field and in the lab. This poster will discuss post-excavation processes and documentation in the lab, for which interns assist with cleaning, databasing, and photographing material culture from the finds discovered in 2023 and 2024. It will also discuss what can be discovered by simple documentation processes that may be overlooked in the field. Finally, this poster will conclude with the future of Frost Town Archaeology and the Historical Archaeology Lab at Brockport.

GEOGRAPHIC INFORMATION SYSTEMS AND MUNICIPAL IMPLICATIONS.

Aurora Pardun, *SUNY Brockport.*

Geographic Information Systems (GIS) is a computer system that collects, stores, analyzes, and displays data related to positions on Earth's surface. I partnered with the Village of Brockport's Department of Public Works (DPW) to help them adopt GIS as their primary data storage vessel. More municipalities are adopting GIS because it allows them to run more efficiently, provides an easily digestible display for the public, and helps the municipality be a safer place for all residents.
I have created maps using Esri's ArcGIS program and a Bad-Elf GPS receiver. Maps can be made by transferring preexisting data to Esri, transferring data from paper blueprints by hand, or by using the GPS receiver in the field to plot precise points. I have created multiple maps for Brockport including maps of village owned trees, road easements, parks and ground management inventory, stormwater and sewage systems, and Lead and Copper Rule Revision (LCRR) compliance information.
Looking forward, I plan to continue digitizing the villages water system, including water boxes and water mains. I hope to present a poster at the Rochester Academy of Science Paper Session to discuss not only the usefulness of GIS for municipalities, but also for its ability to promote precision, reproducibility, and efficiency of scientific research as a whole.

GROWTH, LIPID CONTENT, AND FATTY ACID SIGNATURES OF LARVAL SEA LAMPREY FED FOUR DIETS IN CAPTIVITY.

Jack Gall[1], John Hume[2], Trisha Searcy[3], Michael Wilkie[4], Nicholas Johnson[3], Sara Good[5], Margaret Docker[6], and Jacques Rinchard[1, 1]*Department of Environmental Science and Ecology, SUNY Brockport, [2]Department of Fisheries and Wildlife, Michigan State University, [3]USGS Hammond Bay Biological Station, [4]Department of Biology and Laurier Institute of Water Science, Wilfrid Laurier University, [5]Department of Biology, The University of Winnipeg, and [6]Department of Biological Sciences, University of Manitoba*.

To better understand the nutritional requirements of larval sea lamprey and inform strategies for their captive rearing, we investigated the effects of four distinct diets on their growth, lipid content, and fatty acid signatures. Larval sea lamprey were reared in tanks with a surface area of 0.25 m^2, filled with sand to a depth of 5-7 cm, providing a water depth of approximately 15 cm. Lamprey were fed four diets: yeast, yeast and wheat flour, yeast and otohime A1, and yeast and fish meal for 3 months at a rate of 1 g feed per liter once a week. Lamprey were sampled at monthly intervals for growth (length and weight), whole body lipid, and fatty acid signatures. Lipids were measured gravimetrically, and fatty acids were quantified using gas chromatography/mass spectrometry. We will present the results of this study and the impacts of diet composition on larval sea lamprey.

IDENTIFICATION AND ISOLATION OF GLYCOSYL HYDROLASE GENES FROM PAENIBACILLUS JDR-2.

Bethany Gardner, Olivia Seitz, and Ferielle Bouali, *Niagara University*.

Glycosyl hydrolases are a class of enzymes that can cleave sugars. A particular interest stems from removing the

surface sugars from erythrocytes, thus making universal blood. Numerous genes have been identified in *Paenibacillus* JDR-2 that could perform this function due to sequence similarity to known glycosyl hydrolases. Oligonucleotide DNA primers were developed and PCR was performed to amplify these genes as the initial step towards cloning into pET28B-TEV and expressing in *E. coli.*

IMPACT OF HABITAT FRAGMENTATION AND EFFECTIVE POPULATION SIZE ON EASTERN REDBACK SALAMANDER, PLETHODON CINEREUS.

vanLieshout, C.A., and Edwards, W.J., *Niagara University.*

With habitat fragmentation, local populations can have reduced genetic variation due to allele loss through genetic drift. In practice, this occurs when an originally large population gets split by some natural or anthropogenic force, leading to the formation of two smaller populations. Typically, larger fragments or populations are thought to have reduced loss of genetic diversity and larger effective population sizes. Eastern redback salamanders (Plethodon cinereus) are the most abundant vertebrate in the Northeast United States, but have become fragmented due to human development. We aim to assess the effect of habitat fragmentation in the salamander populations along the Niagara Gorge on the effective population size. We will address this question using DNA extracted from salamander tails from historical (2008) and current (2022) samples, collected from a larger, intact population and a smaller fragmented population. Preliminary work showed that historical and current sequences show loss of microsatellite alleles in the two populations after the short, ten year, period. We will expand on our work by using analysis of three microsatellite loci. The results of our study will provide us with future insight on the effects of fragmentation in other (endangered) salamander populations.

IMPACT OF PROTEIN GLYCOSYLATION ON THE FORMATION OF PSEUDOMONAS AERUGINOSA BIOFILMS.

Maya Quaranta, Elena Fuentes Solano, and Stefan Schulze, *Gosnell School of Life Sciences, Rochester Institute of Technology.*

Pseudomonas aeruginosa is a versatile bacterial pathogen prevalent in clinical and natural settings and tends to be resilient to conventional treatment methods. One method of evading stressors includes the formation of biofilms by the bacteria. Although biofilm formation by this species is common, the roles of protein glycosylation in this process are unclear. This study investigates two different glycosylation pathways, specifically O-glycosylation, in relation to biofilm formation. Transposon and knockout mutants of strain PA14, *fgtA::tn* and Δ*fgtA* respectively, and a knockout mutant of strain PA5196, Δ*tfpW*, were investigated. By measuring the differences in adhesion between the wild type and mutant strains, the quantitative aspect of biofilm formation was analyzed. Overnight cultures of each strain were grown over fixed periods of time in a 96-well plate. The biofilms were stained with crystal violet and quantified by measuring the absorbance of the resolubilized stain. The average adhesion of each strain was compared to the respective wild type to determine the effects of the corresponding disrupted glycosylation pathway. Significant differences in adhesion between the mutants of *fgtA* and the respective wild type were observed. Therefore, these findings indicate a crucial role of this glycosylation pathway in biofilm formation. This information may contribute to potential strategies for combating biofilm-associated *Pseudomonas aeruginosa* infections.

IN OVO FERTILIZATION: CAN BIRD EGGS BE FERTILIZED POST-OVIPOSITION?

Ariana Obrochta, Justine Simms, and Thomas Jensen, *Hobart and William Smith Colleges.*

Unfertilized bird oocytes are widely considered “too old” to be fertilized post-oviposition, making in ovo fertilization impossible in birds. We are developing methods to evaluate whether this dogma is true. If post-oviposition in ovo fertilization is possible, it would have a significant impact on avian conservation projects as artificial insemination is at best difficult due to insemination timing and behavioral limitations. We here show that, with our microinjection setup, we can consistently deliver volumes of less than 2 mL into the sub-germinal disc space without damage to the membranes. Additionally, we can isolate and load small numbers of sperm into ~30 micron diameter beveled glass delivery needles.

THE INFLUENCE OF MACROMOLECULAR CROWDING ON Z-DNA FORMATION.

Sara Reeners and Joshua Blose, *SUNY Brockport Department of Chemistry and Biochemistry*.

Z-DNA is a structure of DNA that differs from the more widely known B-DNA structure. It is a left-handed helix as opposed to a right-handed one, lacks major grooves, and experiences syn pairing between the C and G bases. It has many cellular roles, including playing roles in replication and transcription. Previous studies with Z-DNA in our lab

have shown that osmolytes can promote the formation of Z-DNA. However, in this study we seek to extend that work by focusing on the macromolecular crowding that takes place in the cell. PEG molecules of increasing mass were used to simulate the crowded cellular environment. We performed Na^+ titrations of model DNA in the presence and absence of PEG cosolutes and monitored the B-DNA to Z-DNA transition using UV-Vis spectroscopy to determine if crowding promoted or inhibited the B to Z transition. We chose to use UV-Vis as a more widely available and less costly alternative to CD spectroscopy, and we show that we can monitor the transition successfully using UV-Vis and that increasing the size of the PEG inhibits Z-DNA formation at low salt concentration but promotes it at high concentration. These observations suggest the influence of crowding on this process is more complex than we originally thought. In the future, we will work to determine at what size of PEG does it become inhibitory to Z-DNA formation at low salt concentration, and at what salt concentration specifically do larger PEG molecules switch their mode of action.

THE INFLUENCE OF OSMOLYTES ON THE STABILIZATION OF Z-RNA.

Kachiri Guzman and Joshua Blose, *SUNY Brockport Department of Chemistry and Biochemistry*.

Within the bustling environment of a cell, biomolecules of different sizes interact and function together. This crowded cellular space is very different than typical in vitro experiments conducted under dilute solution conditions. RNA can adopt many structural motifs, but its stability and function are influenced by its chemical environment. It has been indicated that Z-RNA, a unique left-handed helical conformation of RNA, whether endogenous or induced, plays a role in the cellular immune response. Using previous studies with Z-DNA as a guide, we utilized UV-Vis spectroscopy was used to monitor the folding transition from A-form RNA to Z-form RNA. These studies utilized increasing concentration of sodium perchlorate in the presence and absence of osmolytes (small organic molecules that play a role in the cell response to environmental stress). Our results showed that high concentrations of salt can stabilize the Z-form in vitro. However, addition of model osmolytes lowers the concentration in which the Z-form of RNA is stabilized, leading us to believe that small metabolites may play a part in Z-RNA formation and function within the cell.

INTER-ELECTRODE MATERIAL TRANSFER APPLICATION METHODS AND SURFACE ENHANCED RAMAN SPECTROSCOPY.

Caroline Kamal[1,2], Mgr. Dušan Hemzal, Ph.D.[1], and Mgr. et Mgr. Vít Pavelka[1], *Masaryk University, Brno, Czech Republic[1], Hobart and William Smith Colleges[2]*

Nanoparticle research, particularly of noble metals like silver and gold, plays a crucial role in enhancing techniques such as Surface Enhanced Raman Spectroscopy (SERS). These nanoparticles amplify Raman signals, enabling the detection of trace analytes in soil and water, which has significant applications in environmental monitoring, biosensing, and chemical detection. Additionally, there are remarkable promises in the medical field with biomarker detection and improved surgical tools such as amplified antimicrobial surgical meshes.Surface Enhanced Raman Spectroscopy (SERS) has emerged as a critical tool for detecting trace levels of target analytes, relying on the amplification of Raman signals by metal nanoparticle substrates. This studyexplores how inter-electrode material transfer methods and electrode pretreatment impact SERS signal enhancement. Three different methods for applying metallic nanoparticle colloids to electrode surfaces were employed. These were spark discharge, dip-coating, and electrochemical deposition, which were each compared for their efficiency in enhancing SERS performance.

Our findings reveal that pretreatment of electrode surfaces consistently increases SERS signal intensity, irrespective of the material transfer method. This improvement is attributed to enhanced nanoparticle adhesion and more uniform distribution across the electrode surface, providing a larger active area for SERS. Furthermore, the material transfer technique significantly influences the degree of signal enhancement. Electrochemical deposition exhibited the most consistent and robust SERS signal, likely due to precise control over nanoparticle size, shape, and surface density. In contrast, spark discharge and dip-coating, while effective, produced more variable results.

This study underscores the dual importance of electrode pretreatment and the choice of material transfer method in optimizing SERS performance. These findings offer practical insights for improving the sensitivity and reproducibility of SERS-based sensors, which have critical applications in areas such as environmental monitoring, biosensing, and chemical detection.

Keywords: Surface Enhanced Raman Spectroscopy, Confocal Microscopy

INVESTIGATING POLYGLUTAMINE AGGREGATION AND THE POTENTIAL IMPACT OF rDNA COPY NUMBER.

Lena Paolicelli and Elizabeth Morton, *Department of Biology SUNY Brockport, Brockport, NY 14420*

Caenorhabditis elegans is a transparent microscopic model organism used worldwide in biomedical research such as research to understand Huntington's disease. Huntington's disease is caused by a polyglutamine, a stretch of the amino acid glutamine, forming protein aggregates. The age of onset of this disease varies. We are investigating the impact of genetic background on polyglutamine aggregation by exploring the relationship between aggregation and ribosomal DNA copy number. Ribosomal DNA (rDNA) is repetitive DNA used to make ribosomal RNA, a central and catalytic component of ribosomes, the organelles that assemble proteins. In *C. elegans* with the same polyglutamine stretch but different rDNA copy numbers, we are collecting data on the number of aggregates per individual at a particular age, using a strain with a fluorescent protein fused to 40 glutamines. Initial results did not show a direct correlation between rDNA copy number and polyglutamine aggregation, but there were multiple significant differences found between strains. Repetition will determine if these results are reproducible. Potentially, these results could lay the foundation for expanded research into the timing of aggregation onset, additional repeat numbers, or the mechanism of aggregation.

INVESTIGATING RISK REDUCTION FOR DEVELOPING ANEMIA POST RADIOTHERAPY BY OVEREXPRESSING BCL-XL

Regina Hilfiker[1] and Dr. Zachary Murphy[2], Wegmans School of Nursing, *St. John Fisher University[1], Department of Biology, St. John Fisher University[2]*

Cancer, characterized by uncontrollable cellular proliferation resulting from genetic mutations, has been effectively managed by radiation. While radiotherapy can effectively disrupt the cellular structure of cancerous cells, it can also destroy erythrocytes, including anemia. Anemia, or low red blood cell concentrations, can induce many complications such as hypoxia, organ failures, or developmental delays, warranting a solution to preserve erythrocytes post-radiation exposures. An erythrocyte progenitor that is less susceptible to apoptosis when exposed to radiotherapy was identified from existing studies. Among the genetic variabilities identified from previous studies, overexpression of BCL-XL, a transmembrane protein known to inhibit apoptosis, was noted and suspected for its potential to reduce anemia risks. To assess the effectiveness of BCL-XL overexpression, we treated K562 cells, a specific lymphoblast cell line that can differentiate into erythrocytes, under various conditions for comparison. Specifically, untreated, untreated with UV exposures, BCL-XL overexpressed, and BCL-XL overexpressed with UV exposures were compared for cell count and viability. We found that BCL-XL overexpression can promote live amplification and improve the viability of cells post-UV radiation.

INVESTIGATING THE EFFECTS OF PROPOFOL ON VOLTAGE-GATED POTASSIUM ION CHANNELS USING MOLECULAR SIMULATIONS.

Gabriella I. Hall, Devyn C. Scheidt, and Dr. Andrew D. Geragotelis. *Keuka College, 141 Central Ave, Keuka Park, NY 14478*

Voltage-gated ion channels, which are integral membrane proteins that regulate the passage of ions across the cellular membrane, play a vital role in electrical signaling by excitable cells such as neurons. These channels are highly sensitive to binding by various general anesthetics, which can have a wide range of effects. Understanding how anesthetics regulate the function of ion channels at the molecular level is of great importance in describing the cellular mechanisms. In this study, molecular dynamics simulations and small-molecule docking methods will be used to analyze the interactions between the intravenous general anesthetic, propofol, and several voltage-gated potassium ion channels.

INVESTIGATING THE IMPACT OF RDNA COPY NUMBER ON LONGEVITY IN C. ELEGANS.

Becki Walters and Elizabeth Morton, *Department of Biology SUNY Brockport.*

Individuals of the same species have many genetic differences, including differences in quantities of certain regions of DNA. One region of varying copy number is the ribosomal DNA (rDNA). rDNA encodes ribosomal RNAs, which are used in conjunction with ribosomal proteins to manufacture other cellular proteins. Individual humans have varying rDNA copy numbers, which may have relevance to health. The roundworm *Caenorhabditis elegans* is an excellent study organism because of the short maturation cycle and lifespan. Wild strains also vary in their rDNA copy number, with as many as 400 or as few as 70 copies. Studies by others have shown that altering the abundance of ribosomal protein impacts lifespan in *C.*

elegans, prompting our investigation into the potential effect of rDNA copy number on lifespan. We will compare *C. elegans* strains with different rDNA copy numbers to a laboratory strain (copy number ~130) and track how many days they live. Strains with copy numbers higher than 130 were compared and no lifespan differences were found. Investigations are currently underway to test if rDNA copy number below the natural range affects lifespan. We hope that understanding the relationship between rDNA copies and lifespan in *C. elegans* could help future understanding of the significance of human rDNA.

INVESTIGATION OF CYTOSKELETAL PROTEIN RECONSTRUCTION OF VULVAR CANCER WITH SURFACE-ENHANCED RAMAN SPECTROSCOPY.

Nicole Mathewson,[2] Kazushige Yokoyama,[1] Jani E. Lewis[2], *[1]The State University of New York Geneseo College, Department of Chemistry and Biochemistry, [2]The State University of New York Geneseo College, Department of Biology*

The A431 vulvar cancer cell line undergoes a defined cellular transformation when treated with the corticosteroid clobetasol, marked by changes in cytoskeletal protein biomarkers indicative of epithelial-mesenchymal transition (EMT). Replicated experiments demonstrate that this transformation provides a valuable model for studying protein interactions from a chemical perspective. To quantify these interactions, we employed surface-enhanced Raman spectroscopy (SERS) combined with gold nanoparticles, enhancing the detection sensitivity of cytoskeletal protein changes. By tracking protein dynamics and surface composition throughout the cellular transformation, we aim to elucidate the mechanisms underlying EMT. We have completed the data collection of A431 and A431D cells. Spectral analysis provided insights into the sequence of protein gains and losses, and comparison with established data revealed structural information related to protein folding, binding, and interactions. In addition, a three-dimensional SERS imaging technique was used to characterize alterations in the cytoskeletal proteins of individual cells. We conclude that a subtle differences were found in spectral features in the region between 250 cm^{-1} and 1250 cm^{-1}, reflecting the presence or absence of vimentin or cytokeratins.

INVESTIGATION INTO THE EFFECTS OF PSEUDOMONAS AERUGINOSA BACTERIOPHAGE ON THE HOST IMMUNE RESPONSE.

Alexander Fischette, Matthew Slowinski and Jonele Mattiacio Ph.D., S*t John Fisher University*.

Antibiotics as a bacterial infection therapy has long been a go-to for medical providers, however, as antibiotic-resistant bacteria have become more common and harder to fight, a new therapy must be looked into for the future of bacterial infections. Bacteriophages are viral agents that infect bacterial cells and use their cellular components and processes to replicate. Once a sufficient population of phage has been assembled in a bacterial cell, the immediate death of the bacteria is caused by its subsequent lysing. This makes phage a great tool in terms of bacterial population regulators. In the 1900s bacteriophage were discovered and theorized to be a potential therapeutic targeting system in terms of bacterial infections by Felix d'Herelle but the discovery of antibiotics in the 1940's led to a decline in phage therapy development. Phage therapy however has recently been revisited due to the high prevalence of antibiotic resistant bacteria. Progress has been made in this field in terms of successful implementation of phage therapy into patients dealing with various forms of bacterial infections. Although some of these clinical trials have shown promise, more research is needed to understand how the immune system impacts phage therapy. The immune system can impact phage therapy in multiple ways including directly interacting with phage, modulating bacterial clearance and general inflammation and tissue damage. This project focuses on the pro and anti inflammatory cytokine production in macrophage cells, when exposed to varying concentrations of Pseudomonas aeruginosa phage. Prior to incubation, the phage stocks were endotoxin purified to ensure that there were no contaminants from lysed bacteria in culture that could stimulate an immune response. Macrophage cells were incubated under the varying conditions of phage for 24 hours, total RNA was isolated to look into cellular response. Following that, various conditions were tested for DNase treatment prior to cDNA synthesis using GAPDH as a control. Current work is focused on analysis of pro-inflammatory cytokines, to give further insight into the cellular immune response to these phages. The pro-inflammatory cytokines being looked into are TNFa, CXCL5, IL-1B, IL-1A, and CXCL1. These cytokines will be monitored by RT-PCR, and analyzed for up and down regulation, giving insight into potential immune responses displayed by macrophages.

ION-DEPENDENT STRUCTURAL ENSEMBLE AND PHASE SEPARATION PROPENSITY OF SSRNA.

Peter Zhang and Hung T. Nguyen, Department of Chemistry, State University of New York at Buffalo, Buffalo, New York.

Single-stranded RNAs (ssRNA) play important roles in many physiological processes, one of which is regulating molecular recognition in biomolecular condensates. Despite having only 4 simple building blocks, ssRNA adopts a complex array of structures, often with the help of counterions, hindering structural characterization by conventional experimental and theoretical techniques.To faithfully capture the structural ensemble of ssRNA, we optimized our coarse-grained RNA model, where each nucleotide is represented by three interaction sites (TIS) and interactions between RNA and Mg^{2+} ions are modeled with liquid-based integral equation theory. We adjusted stacking interactions between two consecutive nucleotides along the RNA chain, which is essential for RNA folding and structure prediction, to reproduce thermodynamics as described by the nearest-neighbor model. The updated model captures well the structural ensemble of ssRNA homopolymers (polyrA_{30}, polyrU_{30}, and polyrC_{30}), reproducing known experimental results such as radii of gyration, small angle X-ray scattering profiles, and ion counting experiments. We demonstrated that ssRNA homopolymers, unlike well-folded RNA, binds mostly to diffusive Mg^{2+}. Interestingly, the RNA sizes depend non-monotonically on temperature, which may have a significant impact on their phase transitions. Our model provides a comprehensive treatment of ion-RNA interactions in terms of both energetic and structural features, allowing us to study ion-dependent RNA folding and phase transition.

ISOLATING MYTILUS EDULIS FOOT PROTEIN 3 THROUGH RECOMBINANT TECHNIQUES 1.

Trinity L. Choice, *SUNY Fredonia*.

This project focuses on isolating *Mytilus edulis* foot protein 3 (mefp-3) using recombinant techniques to evaluate its adhesive properties and potential as a water-resistant, eco-friendly glue. Biofouling — the accumulation of marine organisms on submerged structures — presents a persistent challenge for aquatic industries, as current adhesives often lack underwater efficiency or contain toxic chemicals. The marine mussel *Mytilus edulis* secretes mussel adhesive proteins (MAPs) that offer a promising, non-toxic alternative due to their strong attachment to various surfaces, including underwater environments. Of particular interest is mefp-3, found in the byssal threads of *M. edulis*, which contributes to its ability to withstand harsh conditions. Prior efforts to isolate mefp-3 through natural extraction yielded low-purity samples, but recombinant techniques promise a faster and purer isolation process. In this study, mefp-3 DNA will be amplified via PCR, cloned into two plasmid vectors, pACYC-Tyr-438 and pET-mfp-3, and expressed in *E. coli* BL21 (DE3) with IPTG induction. Affinity chromatography will then purify the protein, and analysis via SDS-PAGE and mass spectrometry will confirm its identity and purity. By isolating mefp-3 and exploring its adhesion mechanisms and molecular structure, this study aims to pave the way for developing bio-inspired adhesives that are effective, non-toxic, and resistant to biofouling.

ISOLATION AND CHARACTERIZATION OF GLYCOSYL HYDROLASES FROM PAENIBACILLUS JDR-2.

Ferielle Bouali, *Niagara University*.

Glycosyl hydrolases, a class of enzymes capable of cleaving sugar moieties, are essential for modifying blood types by removing specific sugars from A-type or B-type blood to create “universal” O-type blood. This process involves various enzymatic pathways, with exoglycosyl hydrolases critical for producing true O-type blood, while endoglycosyl hydrolases yield pre-O-type blood. This research consists of cloning multiple glycosyl hydrolase genes from *Paenibacillus* spp. JDR-2 has been undertaken, as this organism is a source of promising candidates identified in the Carbohydrate-Active enZYmes (CAZy) database. Proficiency in molecular biology techniques, developed through coursework, has been applied to support this project. Future work will involve conducting enzyme studies to characterize the activity of these cloned proteins and evaluate their potential for blood type modification.

ISOLATION, IDENTIFICATION, AND CHARACTERIZATION OF HYDROCARBON-DEGRADING MICROORGANISMS FROM SOIL.

Manikkuwadura De Silva, Cierra Lowrie, and Michel Pelletier. *Department of Biology, SUNY Brockport, Brockport, NY 14420.*

We have set up to isolate microorganism from soil that have the ability to utilize hydrocarbons, specifically gasoline, hexanes, or toluene as their only source of carbon. These microorganisms were isolated by inoculating Bushnell-Hass broths that contain all the

nutritional requirements except a source of carbon. The hydrocarbon was added as the source of carbon. Following enrichment for two weeks, we were able to isolate several different microorganisms. These include *Paenibacillus azotofixans*, and two strains of *Bacillus subtilis*. We also evaluated the ability of these microorganisms to grow in different concentrations of hydrocarbons. This
research allows for bioremediation as an option when looking at oil spills and gives an understanding of how this bacterium works in the greatest capacity.

MODIFYING THE GENOME OF THE BACTERIOPHAGE T4 USING CRISPR-CAS9 TECHNOLOGY IN ESCHERICHIA COLI; A MODEL OF PHAGE THERAPY.

Natalie Gantress and Dr. Zachary Murphy, *St. John Fisher University Biology Department*

Our goal is to modify bacteriophage T4 using CRISPR technology in E.coli. Modifying the bacteriophage T4 through the use of CRISPR technology in E.coli will allow us to explore the interactions between the viral and host genome and create a model for further phage therapy exploration.. CRISPR is a genome editing tool that allows us to add or cut out segments of a genome. We introduced an sgRNA sequencing targeting T4 capsid assembly and transduced for amplification of the plasmid. Sequencing will be used to confirm successful sgRNA insertion. Optimization of culture conditions for bacterial growth and plasmid selection were required for this project and shown here. Once successful transformation has been verified, we will perform plaque assays to determine if CRISPR-Cas9 targeting of the gp23 capsid protein, which is required for bacteriophage T4 to assemble, prevents T4 reproduction. By showing this method of engineering bacteriophages is possible in this lab setting, it sets the stage for more experiments to improve the idea of phage therapy as a treatment as opposed to antibiotics, as antibiotic resistance is a large and growing problem.

MOLECULAR IDENTIFICATION OF UNCULTURED KEUKA LAKE SEDIMENT BACTERIA.

Luciana Cursino, Jessica Price* and Sarah O'Brien, *Jephson Science Center, Natural Sciences Division, Keuka College*.

Evaluating the human impact on lake ecosystems has been revolutionized by molecular-based bacterial identification. This study aimed to identify bacterial presence and types in Keuka Lake sediment samples. Four sampling sites with four subsamples each were assessed along the Keuka Lakeshore. Sediment samples were collected, and genomic DNA was extracted. Using universal 16S rDNA primers, PCR was performed and analyzed via gel electrophoresis. Sequenced 16S rDNA amplicons were base-called and identified through BLAST analysis. The resulting sequences were aligned, and a phylogenetic tree was constructed using the maximum likelihood method. Conclusive information was obtained from only one sampling site. Most bacterial sequences matched uncultured freshwater bacteria in the GenBank database. Notably, one sample was identified as *Achromobacter sp.,* a group found in moist soils and waters, and emerging as human pathogens. This study is the first to identify bacteria in Keuka Lake sediment, offering insights into its microbiome and guiding future management and pollution control efforts.

NATIVE MASS SPECTROMETRY, CARBENE FOOTPRINTING, AND MOLECULAR SIMULATIONS REVEAL THE BINDING SITE OF THE MEDICATION REGORAFENIB TO AMYLOID-BETA 1-16 PEPTIDE (Aβ16).

Aiden Talcott, Annika Galen, Emma Ryan, Hayden Ulrich, Jorge Guerra Rincon, and Paul Martino, *Houghton University.*

Alzheimer's dementia (AD) is a devastating disease for which there is yet no identifiable cause nor an effective treatment. Until the past few decades, the only reliable diagnoses were in fact carried out, post-mortem. According to the Alzheimer's Association, 6.9 million Americans aged 65 or older are living with Alzheimer'sdementia and about 1 in 9 people (10.9%) aged 65 and older have Alzheimer's dementia (in 2024).

Our lab has previously found that a cancer medication, regorafenib, inhibits amyloid-beta 1-42 (Aβ42) aggregation, *in-vitro*. Our study utilized native mass spectrometry, carbene footprinting, and molecular simulations in order to identify and characterize the

regorafenib binding site to a smaller version of Aβ42, amyloid-beta 1-16 (Aβ16). Both Aβ42 and Aβ16 have identical sequences for the first 16-amino acids and both are proteolysis fragments of amyloid precursor protein (APP) and found in Alzheimer's brains. There are many related amyloid-beta peptides found in Alzheimer's brains with Aβ42 being considered the most pathological. dementia and about 1 in 9 people (10.9%) aged 65 and older have Alzheimer's dementia (in 2024).

Our lab has previously found that a cancer medication, regorafenib, inhibits amyloid-beta 1-42 (Aβ42) aggregation, *in-vitro*. Our study utilized native mass spectrometry, carbene footprinting, and molecular simulations in order to identify and characterize the regorafenib binding site to a smaller version of Aβ42, amyloid-beta 1-16 (Aβ16). Both Aβ42 and Aβ16 have identical sequences for the first 16-amino acids and both are proteolysis fragments of amyloid precursor protein (APP) and found in Alzheimer's brains. There are many related amyloid-beta peptides found in Alzheimer's brains with Aβ42 being considered the most pathological.

NEST SEARCHING AND MONITORING OF SAVANNAH SPARROWS IN MANAGED GRASSLAND HABITATS OF NEW YORK.

Madison Conrad and Dr. Kristen Malone, *SUNY Brockport*.

The loss of critical breeding habitat for grassland birds is an issue throughout North America and has been mostly studied in historic grasslands in the Midwest, with fewer studies addressing threats in non-historic grasslands of the Northeast (Perkins *et al.* 2013). Understanding best management practices for grassland bird habitat in the northeast is critical as grassland habitat declines throughout North America. To understand what habitat characteristics could be affecting the reproductive success of grassland birds in the Northeast, we located and monitored 30 Savannah Sparrow (*Passerculus sandwichensis*) nests in western New York over the course of two breeding seasons (2023 and 2024) using behavioral and opportunistic nest searching methods. We monitored nests to determine their fate and collected data on the vegetation and landscape structure surrounding the nests. Mean daily nest survival rate was 0.95 (95% CI: 0.915, 0.973). Using logistic exposure models implemented in R, we compared daily nest survival to distance to any non-grassland edge and distance to forest edge and found no significant effect, beta coefficients were -0.040 (95% CI: -0.686, 0.589) and -0.001 (95% CI: -0.008, 0.007), respectively. We were also interested in how season date could affect daily nest survival but found no significant effect, the beta coefficient was -0.017 (95% CI: -0.053, 0.025). Continued monitoring of obligate grassland breeding species in northeastern grassland habitats as a long-term dataset is necessary to gain understanding about what other variables could be affecting the breeding success of these species so that management practices to conserve these threatened birds can improve.

NESTING PATTERNS AND IDENTITIES OF CAVITY-NESTING BEES AND WASPS ON THE SUNY GENESEO CAMPUS.

Authors: Carly Wick, Julia Lingenfelter, Sophia Stang, Daniel Lemon, Emma Parker, and Jennifer L. Apple; *SUNY Geneseo*.

Cavity-nesting bees and wasps will lay eggs in hollow stems and other pre-made cavities and provision their larvae with food to overwinter until their emergence in spring. To observe the nesting patterns of these insects, we placed nesting boxes containing "bee tubes" made of hollow reeds in five locations around the SUNY Geneseo campus and photographed the tubes once a week over the summer as the tubes were gradually sealed off by insects to form larval cells. We took note of the type of material used to fill the tubes and then analyzed the trends in the phenology and site preferences of the various fill types using the photographic record. Over the winter, we dissected the tubes to determine their inhabitants and found the pupae of Eumeninae (Potter Wasps) in the mud-filled tubes, Megachilidae (Leaf-Cutter Bees) in the leaf-filled tubes, and Sphecidae (Grass-Carrying Wasps) in the grass-filled tubes. We also observed dead, undeveloped larvae and various, seemingly taxa-specific parasites in some of the tubes. In spring, tubes were maintained and as adults emerged, some were kept as voucher specimens as others were released into the field. This fall, we pinned all the specimens and have begun to identify them to the species level. Ultimately we will connect the different identities to the cavity fill type, site preferences, and timing of occupation. This information will give us a better understanding of our local native bee and wasp ecology.

NITROGEN AND PHOSPHORUS FERTILIZATION AFFECT MAPLE AND BEECH LITTER DECOMPOSITION.

Erica Albertson*, SUNY College of Environmental Science and Forestry,*

A majority of aboveground primary production in terrestrial ecosystems is contained in plant litter and enters the decomposition community as dead organic matter. Soil characteristics, such as nutrient availability, can alter rates of litter decomposition. For example,

elevated levels of nitrogen in the soil might cause a slower rate of decomposition due to an alteration of decomposer community makeup. This study aims to separate the effects of N and P addition in the leaves from N and P addition in the soil through a litter bag deployment within a long-term study of Multiple Element Limitation in Northern Hardwood Ecosystems (MELNHE). Decay curves were created to visualize leaf litter mass loss under N and P addition.

OPTIMIZATION OF SGRNA SYNTHESIS FOR USE IN CRISPR-CAS9 KNOCKDOWN STUDIES USING RNP COMPLEX DELIVERY.

Joshua Morris and Zachary Murphy. *St. John Fisher University*.

In CRISPR-Cas9 mediated knockdown studies, a ribonucleoprotein(RNP) complex is assembled with a specifically designed sgRNA and the Cas9 enzyme to target a specific gene of interest. The ideal concentration of sgRNA in this complex is between 1-1.5µg/µl for optimal transfection efficiency. Through experience in our institution's research lab and in course-based research experience, we identified an inconsistency and inefficiency in the method of sgRNA synthesis. This method was a kit obtained from NEB for both sgRNA synthesis and RNA purification (Method 1). We hypothesized that the limiting factor of sgRNA yield was the purification column used in the RNA purification kit and that this loss can be mitigated through phenol-chloroform isolation (method 2). We also hypothesized that the limiting factor was in the synthesis of sgRNA itself. In order to test this, we used a plasmid template to create and amplify DNA segments of our sgRNA which would then later be reverse-transcribed and purified using phenol-chloroform (Method 3). Two target-specific-oligo sequences were designed by our lab (Targeting MIF and CCL11) and synthesized by IDT. The sgRNA was synthesized in three separate trials for each method from these target-specific-oligos. We determined that Method 3 yields a significantly greater concentration of sgRNA compared to the two alternative methods. However, there still exists an application for the two alternative methods in a course-based research setting where the extended time requirement for Method 3 is not sufficiently available. This project is part the labs ongoing work to optimize molecular biology techniques for successful CRISPR-Cas9 used in our research.

PHENOTYPIC STUDIES OF A PHOSPHOGLYCOLATE PHOSPHATASE IN STAPHYLOCOCCUS AUREUS.

Mya L. Soto, Isreal Moreno, Kimbria Blake, Jasmine Edwards, and Suzanne F. O'Handley, *Department of Chemistry and Materials Science, Rochester Institute of Technology.*

Staphylococcus aureus is an opportunistic pathogen that is responsible for over 20,000 annual deaths in the United States, which accounts for more deaths than those from AIDS, Tuberculosis, and viral Hepatitis combined (Wojcik-Bojek, et. al, 2022). With the continual rise of multidrug resistant strains such as MRSA and VRSA, it is vital to investigate virulence factors as potential novel antibiotic targets. We are studying a phosphoglycolate phosphatase (PGPase) from *S. aureus* that has been established as a virulence factor (Begun, 2005). Phosphoglycolate is an inhibitor of the glycolytic enzyme triose phosphate isomerase (TPI) (Johnson, 1970). TPI is not only involved in glycolysis, but also has a moonlighting function as an adhesion protein (Hemmadi, 2020), thus inhibition by phosphoglycolate may interfere with *S. aureus's* ability to attach to host cells effectively; Our enzyme may work as a virulence factor by degrading phosphoglycolate, enabling TPI to adhere more strongly. We have cloned, overexpressed, purified and enzymatically characterized the PGPases from *S. aureus*. Currently, our focus is on understanding how this PGPase is a virulence factor and we plan to do that by comparing an *S. aureus* knockout mutant to the wildtype strain of *S. aureus*.

THE PHYSIOLOGICAL ROLE OF A LAKE ONTARIO STOPOVER SITE FOR SWAINSON'S THRUSHES.

April Soule[1], Mara Tysick[1], Yasmin Khan[1], Gabriella L. Orfanides[1,2], and Susan Smith Pagano[1]
[1]Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY
*[2]Advanced Facility for Avian Research, Western University, London, Ontario, CA*April Soule[1], Mara Tysick[1], Yasmin Khan[1], Gabriella L. Orfanides[1,2], and Susan Smith Pagano[1]

[1]Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY
[2]Advanced Facility for Avian Research, Western University, London, Ontario, CA

Migration is a very energetically demanding time for birds, and stopovers sites serve many crucial functions such as resting and replenishing energy stores. However, relatively little is known about the role of physiological

recovery and how it influences stopover site utilization by birds. This study aimed to quantify changes in key physiological metrics of Swainson's Thrushes (*Catharus ustulatus*) during autumn stopovers at an important site for migratory birds on the south shore of Lake Ontario. We took blood samples from nearly all individual Swainson's Thrushes that were captured at Braddock Bay Bird Observatory during a single fall season, with a focus on subsequent day recaptures. Leukocyte counts were used to evaluate immune condition, and plasma metabolites were used to assess refueling state and nutritional condition. We also molecularly sexed all individuals to explore sex-related patterns in migration strategy. Physiological metrics were compared across recaptured birds to determine how condition changed over the duration of stopover. The results are able to provide insight into factors that contribute to successful migration, and can provide support for future conservation efforts centered on areas commonly used for stopovers.

POLYSACCHARIDE AQUEOUS SOLUTION PROPERTIES MODULATED BY SALTS.

Cooper Bazulka and Mark P. Heitz*, *Department of Chemistry and Biochemistry, SUNY Brockport.*

Polysaccharides such as xanthan gum, guar gum, and cellulose have emerged as versatile materials with vast application potential owing to their inherent physicochemical properties. Xanthan gum (XG), derived from the fermentation of Xanthomonas campestris, shares structural similarities with cellulose, featuring a β-1,4-linked glucan backbone. In its molecular architecture, the trisaccharide β-D-mannose-(1-4)-α-D-glucuronic acid-(1-2)-α-D-mannose is linked to every other glucose residue's O(3) position. In water, XG exhibits conformational transitions from helices that are characterized by rigid chains and low viscosity to random coils that are flexible chains but higher viscosity. The transition is also sensitive to changes in aqueous solution pH, ion size, ionic strength, and temperature. However, the influence of salts and temperature on the physicochemical properties of XG in aqueous solutions remains a subject of exploration. We have applied absorbance and fluorescence spectroscopy to investigate the fundamental XG properties in water and in aqueous salt solutions using inorganic salts or ionic liquids at varied temperatures. Electrostatic interactions are known to play a crucial role in the XG chain expansion, and our work elucidates findings that offer valuable insights into how various factors modulate the rheological properties and structural characteristics of polysaccharide solutions.

PROGRESS TOWARD THE ENANTIOSELECTIVE SYNTHESIS OF RHYTISMATONES A AND B.

Jeb Braunscheidel and Timothy M. Gregg*, *Department of Chemistry and Biochemistry, Canisius University.*

Organic synthesis of natural products is the foundation for medical chemistry and can also be used in industrial applications. Rhytismatone A and B are chiral metabolites that were isolated in 2017 from an unknown fungal species, that are endophytes from the family of Rhytismataceae. An endophyte is an organism that lives within a plant without causing disease. These endophytes live in the host species of *P. mariana* (black spruce trees). Rhytismatone B exhibited moderate antifungal activity. Neither of these biological molecules, although found in nature, have ever been synthesized in a lab. The objective of the research is to synthesize both Rhytismatone A and Rhytismatone B in their racemic form. The core 5,6-dihydropyran-2-one ring opens when trying to acylate the ring. To get around this problem we protected a primary alcohol as seen in the general scheme below [see poster].

RANDOM NUMBER GENERATION USING MUON DETECTION.

Amina Assefaw and Shreas Settles, *Hobart and William Smith Colleges.*

The generation of truly random numbers has posed a longstanding challenge in mathematics and computing. While software-based random number generators (RNGs) are widely available, these are typically algorithmically derived and therefore inherently predictable. Consequently, numbers generated by such systems are classified as pseudo-random, as they rely on deterministic processes. For instance, if the initial seed value—a starting point for generating the sequence—is known, the sequence of numbers can be replicated. Seeds are often based on values like the system's clock, making the output potentially predictable to those with knowledge of the seeding time. Moreover, since computer algorithms rely on iterative loops, they inevitably introduce and rely on repeated patterns, undermining true randomness.

This project utilizes the inherent randomness of quantum systems to explore cosmic ray detection as a source for a random number generator (RNG). Cosmic rays are high-energy particles originating from outer space that constantly bombard Earth's atmosphere. They consist primarily of protons but also include heavier nuclei and high-energy electrons. When cosmic rays collide with particles in the atmosphere, they create a cascade of secondary particles, one of which is the muon.

The muon is an unstable subatomic particle similar to the electron but more massive. It is produced in the upper atmosphere and can travel through matter due to its relatively high energy and short lifespan. Because muons are highly penetrating, they can be detected at Earth's surface.

We each built a MightyOhm Geiger counter. The device detects ionizing radiation, measuring counts per second (CPS), counts per minute (CPM), and the environmental radiation level. Since it is impossible to predict when a radioactive atom will decay, the intervals between detections can be leveraged to generate random bits. These bits can then be used to produce a range of truly random numbers. We verified true randomness using various statistical tests. The results are presented in the poster.

THE RELATIONSHIP BETWEEN PERSONALITY AND MORPHOLOGY IN THE ANT-MIMICKING SPIDER, MYRMARACHNE FORMICARIA.

Theodore Charlap, Colton Judd, and Jennifer L. Apple. *SUNY Geneseo*.

The Eurasian ant-mimicking spider *Myrmarachne formicaria* (Salticidae) is a relatively new arrival to North America and has spread throughout the Great Lakes region. *M. formicaria* has evolved a remarkable ant-like appearance and behaviors. A distinctive feature of male *M. formicaria* is their unusually enlarged chelicerae. These exaggerated mouthparts may be critical in competitive interactions as they often spread them wide in confrontations with other males. The outcomes of these encounters could significantly impact courtship success. Our study aims to explore two main questions: (1) Do *M. formicaria* exhibit consistent variation in behavior that could be characterized as differences in personality? (2) If these spiders do exhibit consistent personalities, are these traits linked to physical features such as overall body size and chelicerae size? To address these questions, we carried out several behavioral assays, each repeated twice, to quantify potential personality traits. We measured voracity, defined as the intense drive to feed, as the time elapsed before attack on fruit flies in a petri dish arena. We assessed aggression levels as the time spiders spent displaying in front of a mirror in timed trials. Alongside these behavioral tests, we plan to take precise measurements of body size and chelicerae size. We hope to uncover whether there is a correlation between chelicerae size and behavioral traits like aggression and feeding drive. Understanding these relationships could reveal how physical and behavioral traits influence reproductive success, as larger chelicerae and aggressive or voracious behaviors may play a role in female preferences and male courtship outcomes.

RELAXATION DYNAMICS IN CHOLINE CHLORIDE DEEP EUTECTIC SOLVENTS: COSOLVENT SOLUTIONS WITH METHANOL.

Alex E. Guido and Mark P. Heitz*, *Department of Chemistry and Biochemistry, SUNY Brockport.*

Deep eutectic solvents (DESs) have an increasingly prominent place in liquids research because of their potential use as alternatives to organic solvents in a wide variety of chemical applications such as chemical synthesis, electrolyte media for batteries. Given the large number of potential component combinations, DESs may be considered as task-specific “designer” solvents. While this affords interesting and novel media formulations, the associated solution interactions ultimately govern their utility. Commonly, these solvents can be viscous (>100 cP), which implicates molecular transport properties. One viscosity mitigation strategy is to form solutions using molecular cosolvents. While much has been published on neat DESs, primarily focused on choline chloride coupled with alcohol hydrogen bond donors, our work gives attention to the study of methanol-modified DESs. We are interested in how the presence of methanol modifies solvation in the model DES “ethaline”, which is comprised of choline chloride + ethylene glycol. To address this general question, we used nuclear magnetic resonance (NMR) to measure T1 rotational relaxation dynamics of the solution components and diffusion-ordered spectroscopy to determine the diffusion coefficients. The NMR results are used as metrics to compare with and test molecular dynamics simulation results to yield detailed interaction parameters with the end goal to identify the underpinning of solvation in ethaline + methanol solutions.

THE ROLE OF INTRA- AND INTERMOLECULAR HYDROGEN BONDING IN THE PHYSICAL PROPERTIES OF OCTAN-1-OL AND RELATED ETHER ALCOHOLS.

Troy N. Smith and Markus M. Hoffmann, *Department of Chemistry and Biochemistry, State University of New York at Brockport, Brockport, NY 14420*

In response to the growing demand for environmentally friendly solvents, we investigated the influence of intra- and intermolecular hydrogen bonding on the physical properties of octan-1-ol and related ether alcohol isomers,

selected as model molecules for polyethylene glycol (PEG), a polyether alcohol. While PEG shows promise as a green solvent, its complex hydrogen bonding interactions remain poorly understood. To address this gap, we conducted molecular dynamics (MD) simulations using the CHARMM and OPLS force fields to explore how the positioning of ether moieties affects key properties such as viscosity, density, and self-diffusion coefficients, which were measured in prior studies. Our results demonstrate that introducing etheric oxygens significantly enhances molecular packing, yielding densities between 892.8–914.4 kg/m^3 (298K, experimental), 874.5–897.6 kg/m^3 (298K, CHARMM), and 882.0–911.9 kg/m^3 (298K, OPLS). These values reflect greater packing efficiency compared to octan-1-ol, with observed densities of 821.7 kg/m^3, 820.1 kg/m^3, and 824.0 kg/m^3 for experimental, CHARMM simulations, and OPLS simulations, respectively. Both experimental and computational measurements of viscosity show a sharp decrease from octan-1-ol to 2-pentoxyethan-1-ol, followed by a gradual increase as the ether group is moved further from the hydroxyl oxygen. In contrast, self-diffusion coefficients exhibit an opposite trend, with a marked increase between octan-1-ol and 2-pentoxyethan-1-ol, followed by a gradual decline as the distance between hydroxyl and ether oxygens increases. These findings provide critical insights into the molecular behavior of ether-substituted alcohols and offer a foundation for the further development of PEG as a sustainable alternative to traditional volatile organic solvents.

SEASONAL VARIATIONS IN FATTY ACID SIGNATURES OF PREY FISH IN LAKE ONTARIO.

Sean Kenley[1], Brian McMahon[1], Brian O'Malley[2], Jessica Goretzke[3], and Jacques Rinchard[1,]
[1]Department of Environmental Science and Ecology, SUNY Brockport; [2]US Geological Survey, Lake Ontario Biological Station; [3]New York State Department of Environmental Conservation – Lake Ontario Fisheries Management Unit

Prey species in Lake Ontario play a vital role in the food web, providing essential nutrients for top predators. The purpose of this study was to quantify and compare the seasonal lipid content and fatty acid signatures (FAS) of four prey fish species from Lake Ontario: alewife, round goby, rainbow smelt, and deepwater sculpin. Lipids were extracted from whole fish and measured gravimetrically. Fatty acids were transmethylated and analyzed using gas chromatography/mass spectrometry. Lipid content significantly varied among species and while season did not directly affect lipid content, the interaction between species and season was significant. Prey FAS also significantly differed among species and seasons, with 16:1n-7, 16:0, 20:5n-3, 22:6n-3, 18:1n-9, 18:3n-3, 20:4n-6 being the key contributors to these differences. These results provide the foundation for future comparisons with predator FAS in Lake Ontario, helping in the estimate their diets.

SPATIAL AND TEMPORAL EFFECTS ON POLLINATOR GUILDS.

Joseph Armstrong, *Buffalo State University, Biology Graduate Student*
Dr. Robert Warren II, *Buffalo State University, Professor Biology, Advisor*

Pollinator guilds use similar environmental cues to time emergence; however, guilds may respond uniquely given the same cue. The differential responses affect timing of emergence and in turn pollination. In this study we tested the importance of distance from a Great Lake, a spatial gradient, and weeklong time segments, a temporal gradient, as cues for a variety of insect orders. To determine the effect of distance and time we placed pollinator traps at various distances from Lake Ontario and gathered weekly samples. We identified samples to order. We found Hymenoptera (mostly bees) trended with seasonal warming, as did Coleoptera (beetles); however, Hemiptera (true bugs) trended with further distance from lake, while Diptera (flies) trended closer to shore. Thus, pollinator guilds not only respond differently to similar environmental cues, but also have distinct environmental regulators. Partitioning and evaluating environmental factors for pollinators will be become increasingly important for forests and agroecosystems as climate change puts increasing strains on plant-pollinator interactions.

STRUCTURAL ANALYSIS OF A SERIES OF IRIDIUM(III) COMPLEXES FOR BIOSENSORS.

Malachi Clay**[1]**, Trevor Gienau**[1]**, Silas Martin[1], Joshua Blose[1], William. W. Brennessel[2] and Carly Reed[1]*,
[1]Department of Chemistry and Biochemistry, SUNY Brockport, Brockport, NY.
[2]Department of Chemistry, University of Rochester, Rochester, NY.

Cyclometallated iridium(III) complexes have recently emerged as luminescent signaling agents that can be integrated into G-quadruplex (GQ) biosensing assays. GQ nucleic acid structures are being readily applied in biosensors due to their cost-effectiveness, stability, and

ability to act as either the target recognition component or the signal transducer within a biosensor. Structural changes to the iridium complex as well as GQ sequence and topology impact the binding affinity and luminescence enhancement. In this work we explore the synthesis, structural analysis, and luminescence enhancement of a series of iridium(III) complexes containing the 2,9-dimethyl-1,10-phenanthroline ligand. X-ray crystallography was used to characterize the iridium(III) structures. Fluorescence titrations were conducted to determine the extent of the luminescence enhancement. It was found that the methyl substituents on the phenanthroline ligand impact bond lengths and angles around the iridium center when compared to the unsubstituted phenanthroline ligand. All four complexes in the series exhibited luminescence enhancement in the presence of GQ DNA. The impact of structural variation among the iridium complexes on luminescence enhancement will be discussed.

STRUCTURAL COMPARISON OF MOLECULES CONTAINING NONCONVENTIONAL HYDROGEN BONDS.

Jonas Simora, *State University of New York at Fredonia.*

The hydrogen bond, an important intermolecular force that dictates many phenomena including protein folding and crystal structure, is thought to simply be an interaction between hydrogen and electronegative atoms (F, N, O). However, in recent years there have been several examples of hydrogen bonds forming with unconventional H-bond acceptors. These nonconventional H-bond acceptors include any Lewis base aside from those containing Fluorine, Nitrogen and Oxygen, that could in theory perform hydrogen bonding. And under very specific conditions these nonconventional bonds can be created and even form crystal structures, allowing us to research these examples more in depth. Thus, this research consists of preparing solid structure examples of conventional and nonconventional hydrogen bonds using a sterically hindered proton.

STUDYING THE VARIATION IN MUON FLUX WITH ATMOSPHERIC TEMPERATURE AND PRESSURE CHANGES.

Jake Romney and Zac Chamish , *Hobart and William Smith Colleges*

Muography is a technique that uses cosmic ray muons to create images of the internal structures of dense objects such as volcanoes, large buildings, and archaeological sites. The attenuated muon flux traveling through the objects can detect internal cavities, structures, or anomalies. One hindrance that can affect the imaging is the dependence of the incident muon flux on the atmospheric conditions, including temperature and pressure. Previous studies have found divided conclusions on the correlation between atmospheric pressure/temperature and muon flux, where some determine them as inversely related while others say they're directly related. This experiment intends to explore how atmospheric temperature and pressure affect the muon flux using a self-built Geiger Counter. The results are presented on the poster.

A SURVEY OF THE FRUITING PLANTS AND THEIR INSECT PARASITES IN THE FORESTS OF WESTERN NEW YORK

Nolan Miller. *SUNY Geneseo*.

In Western New York's agricultural regions, non-native, cultivated and native plants occur near each other. The distribution of these plants potentially affects the instance of parasitism by insects. This study surveys the interactions between parasitising insects and their host plants in forests that are adjacent to farms of cultivated fruits. I hypothesize that the forests surrounding farms act as reservoirs for parasites during the times when fruits are absent from the farm. Additionally, fruit density may impact rates of parasitism with higher density correlated with higher rates of parasitism. Since fall 2023, I have characterized host-parasite interactions by sampling late-season fruiting plants in forests adjacent to farm fields, at two separate farms. Preliminary results reveal that a majority of the larvae are found in a single species, Glossy Buckthorn (*Frangula alnus* Mill). The effect of species on the instance of parasitism was found to be the most influential factor that was assessed in this study. I discuss how effective management of pest species on farms may also need to include reducing the abundance of alternate host plants in neighboring forests.

SYNAPTOTAGMIN AND GABA EXPRESSION IN JUVENILE BRITTLE STARS.

Eric Lian, Nicole Luo, Tess Morrison, Izac Rebres, and Hyla Sweet, PhD., *Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology.*

Adult brittle stars have five-fold symmetry and develop from a bilateral larva. The species *Ophionereis olivacea* has a unique brooding pattern that is paired with a reduction in larval swimming and feeding structures. We hypothesize that the larval nervous system that controls these behaviors would be reduced. To test this, antibodies for synaptotagmin, tubulin, and GABA were used to stain the nervous system in the juveniles and larvae of *O. olivacea*. Synaptotagmin is involved in the function of synapses. In juveniles, synaptotagmin was found in the circumoral nerve ring, radial nerves, ring ganglia of the tube feet, and ganglia at the base of the tentacles. No larval neural structures were stained with synaptotagmin. Tubulin is a marker for neuronal cell processes and labels most neurons in the juveniles. GABA is a neurotransmitter and was found in the arm tips and spines of the juveniles. Some of the results revealed in this experiment did not align with our expectations. Synaptotagmin was expected to be expressed in neurons associated with the larval ciliary bands; however, neurons were not detected in these regions. GABA was expected be associated with the tube feet. Instead, we found GABA expression in the cells at the tip of the arms and the spines. Additional experiments will be done to further characterize the nervous system in the juveniles. We will also examine the expression of neural markers in earlier stages to determine whether the nervous system is reduced in brittle stars with brooded embryos.

SYNTHESIS AND CHARACTERIZATION OF IRIDIUM (III) COMPLEXES FOR G-QUADRUPLEX BIOSENSORS.

Silas Martin, *SUNY Brockport*.

G-quadruplex (GQ) nucleic acid structures have gained attention in the field of biosensing in recent years due to their cost-effectiveness, easy modification, stability, and ability to act as either the target recognition component or the signal transducer within a biosensor. Cyclometallated iridium (III) complexes have emerged as luminescent signaling agents that can be integrated into GQ biosensing assays. The present advantages over organic and other transition metal lumophores include strong, long-lived phosphorescence; high photostability; and selectivity over other forms of DNA. Structural changes to the iridium complex, as well as, GQ sequence and topology impact the binding affinity and luminescence enhancement of signaling agents. In this work we explore the synthesis, characterization, and luminescence enhancement of a series of iridium (III) complexes containing the 2-phenyl-1H-imidazo[4,5-f][1,10]phenanthroline ligand. Fluorescence titrations were conducted to determine if luminescence enhancement occurred. It was found that three of the four complexes exhibit luminescence enhancement in the presence of GQ DNA. X-ray crystallography was used to characterize the iridium(III) structures. Luminescence differences as they relate to structural differences will be discussed.

TEACHING ORGANIC CHEMISTRY OUTSIDE OF THE TEXT.

Ventura, Dominic L., *Department of Natural Sciences and Mathematics, D'Youville University.*

While it is important to follow the chemistry curriculum to cover the necessary material to ensure students will be successful in subsequent courses, it helps to excite the students by relating the content to chemistry outside the text. This not only invigorates the instructor, it can also energize the students to the point where they *want* to share some information with friends and family. This presentation will give several examples of how this can be done in organic chemistry courses. Drawing the students in and making the course relatable, also helps the instructor maintain the "freshness" of the lectures and also emphasizes the importance of the traditional coursework. In the instructor's mind, this illustrates the larger picture of why the students need to take these courses; where very few of these students taking these courses at the presenter's institution are chemistry majors. In fact, some of them will never take another chemistry course again after completing organic chemistry. Past students have actually come back to tell me that they "missed organic chemistry". While another tried to avoid the course for years, it ultimately ended up being the "favorite class that I have taken in my life". While not all students may end up feeling this way, the students that reach out to show their appreciation make the extra work and emphasis worthwhile.

TEMPORAL CHANGES IN THE FATTY ACID PROFILES OF LAKE TROUT EGGS FROM CAYUGA LAKE.

Owen Hazard[1], Jarrod Ludwig[2], Matthew Futia[3], Thomas Kielbasinski[2], William Woodworth[2], and Jacques Rinchard[1],
[1]*Department of Environmental Sciences and Ecology, SUNY Brockport*
[2]*New York State Department of Environmental Conservation*
[3]*Rubenstein Ecosystem Science Laboratory, University of Vermont*

Thiamine Deficiency Complex (TDC) impacts salmonines in the Great Lakes region due to decreased thiamine concentrations, particularly in fish that primarily feed on alewife, frequently leading to poor recruitment. Alewife have been a key part of the lake trout diet in Cayuga Lake since their likely introduction in the 1800s. Round goby, first detected in the lake in 2013, became widespread by 2017, likely altering various aspects of the food web. This study aimed to compare the lipid content and fatty acid signatures (FAS) of lake trout eggs in Cayuga Lake between 2010 to 2023. Egg lipid content and FAS showed significant variation across the years. The fatty acids most responsible for these annual differences were 22:6n-3, 16:1n-7, 18:1n-9, 18:1n-7, 18:3n-3, 20:5n-3, 16:0, and 22:5n-3. In 2015 and 2016, lake trout eggs exhibited distinct FAS, particularly enriched in 22:6n-3. This shift likely reflects a dietary change following the spread of round goby in Cayuga Lake, followed by a reversion to primarily alewife-based diet. These findings suggest a brief decline in the prevalence of TDC in lake trout after the introduction of round goby.

ULTRASOUND EVALUATION OF OVARIAN FOLLICLE GROWTH FOR QUAIL COLONY MANAGEMENT.

Zulenny Reyes, Justine Simms and Thomas Jensen, *Hobart and William Smith Colleges*.

Zoo and conservation breeding programs often employ artificial insemination, which require knowledge of oocyte ovulation time for insemination timing. However, the most common method for timing is to inseminate immediately following the first oviposition, making that egg infertile.

Ultrasound is a non-invasive method used for visualization of internal organs in both humans and animals. This technique is especially useful for real-time evaluation of gonads without risking damage to gametes or potential offspring. Using ultrasound to monitor ovarian health is not common in bird breeding programs, but it could lead to greatly improved artificial insemination success rates, as well as overall breeding success through improved knowledge of ovarian health and reproductive status.

We are currently using ultrasound to monitor the reproductive status of the hens in our quail research colony. This significantly decrease our chances of stress and fighting, as males only have access to hens when they are reproductively active. In addition, this technique allows us to verify that young hens are sexually maturing and verify post-molt recovery.

Our group routinely use ultrasonography to monitor oocyte growth by measuring the diameter of the largest oocyte, which can then be used to estimate time of ovulation. In addition, ultrasound enable us to examine ovary size, shape, and any potential abnormality. To perform ultrasound the naked area above the left ovary between the dorsal and scapulohumeral pterylae is saturated with water to optimize ultrasound connectivity.

UNVEILING THE MICROBIAL MYSTERIES IN THE GREAT LAKES; DREISSENA POLYMORPHA'S ROLE IN ANTIBIOTIC RESISTANCE DETECTION.

Danaya A Oliver-Ragland, *Buffalo State University.*

Antibiotic-resistance poses a consequential threat to public health, driven by the widespread use of antimicrobials in medicine, agriculture, and industrialization. Zebra mussels (*Dreissena polymorpha*) have been proposed as bioindicators for assessing microbial load in freshwater ecosystems, tracking antibiotic-resistant bacteria and pathogenic organisms in aquatic environments through their filtration capabilities. This invasive species was collected from the Buffalo River, and then reintroduced into a site presumed to be contaminated. Mussels were re-harvested at set time intervals to monitor microbial changes and conducted two trials. Tissue samples were then homogenized using a glass micro tissue grinder, and the homogenates were plated on various selective and differential agars: VRE, KPC, BHI, CHROM Orientation, CHROM Salmonella, MacConkey, SLAB Agar, ESBL, ECC, and TSOY. Significant microbial growth observed across multiple selective and differential media highlights the diversity and prevalence of potentially antibiotic-resistant organisms within the sampled environment. Following colony identification, the BioLog MicroStation will be used to determine specific antibiotic resistance profiles, which will inform subsequent susceptibility testing. These findings will contribute to a broader understanding of antibiotic resistance in freshwater ecosystems, offering valuable insights for public health and environmental monitoring.

USING CRISPR-CAS9 GENE EDITING TO TEST ACIDITHIOBACILLUS THIOOXIDANS BIOLEACHING CAPABILITIES.

O'Bryan, C.J., Glazier, V. E., and Marnocha, C.L., *Niagara University*.

Acidithiobacillus thiooxidans is a sulfur-oxidizing, acidophilic, chemolithoautotroph that has an important role in the biohydrometallurgy process of bioleaching. This bacterium has added great value to the mining industry by offering an environmentally friendly way to extract metals from low grade ores. Our lab has isolated a strain of *A. thiooxidans* that encodes a set of genes known as the *dnd* operon. The operon is responsible for a process known as phosphorothioate modification. This process replaces non-bridging oxygen atoms in the DNA backbone with sulfur atoms. The *dnd* operon is not found in bacteria with common ancestors to *A. thiooxidans* and therefore it is hypothesized that the operon's origin is a result of horizontal gene transfer. We aim to determine the function of the *dnd*C gene in *A. thiooxidans* by generating a knockout strain. To do this, we have designed a CRISPR-Cas9 system that will generate a knockout of the gene through homology-directed repair. After a knockout is achieved, the mutant will be grown in varying environmental conditions including temperature, pH, and heavy metal concentrations. This will help us to determine if the *dnd* operon provides benefits to growth and survival in extreme conditions and ultimately if the *dnd* operon could add value to bacteria that are used in the process of bioleaching.

USING LIDAR TO QUANTIFY SHRUB LAYER RESPONSE TO EAB CAUSED ASH MORTALITY.

Thomas Back, Bryan Friedel, and Brian Hoven, *SUNY Geneseo.*

Emerald Ash Borer (EAB) (*Agrilus planipennis*) is an invasive wood-boring beetle first identified in New York in 2009. Responsible for the massive ash dieoff witnessed in Western New York wetlands. Since ash constitutes ~8% of all trees found in New York State, much of which is in wetlands, EAB will likely continue to have a profound impact on these plant communities. Ash dominated wetlands are common throughout the Greater Rochester and Finger Lakes Regions of New York, and how these plant communities will respond to widespread ash mortality is not well understood. One hypothesis is that the loss of ash in the canopy layer will result in an expansion of the shrub layer, due to an increase in resource availability. A release of the shrub layer is potentially problematic since in many of these wetlands, the shrub layer is dominated by invasives, such as multiflora rose (*Rosa multiflora*). A significant expansion in multiflora rose cover could have negative ecological, economic, and social repercussions. These wetlands are important for recreational opportunities, maintaining water quality, and wildlife habitat, and the loss of ash could be exacerbated by the expansion of invasive shrub cover. Our study aims to quantify recent changes in the canopy tree and shrub layer cover over the last 20 years. We propose using LiDAR point cloud data and field data to quantify the canopy tree and shrub layers prior to EAB invasion compared with current conditions. If successful, this model could be utilized by land managers to identify areas where invasive shrub release is most problematic following ash loss and focus resources for mitigation in those areas.

VEGETATION DYNAMICS ALONG WETLAND-UPLAND EDGES IN LAKE ONTARIO COASTAL WETLANDS.

Kendalyn Town and Dr. Rachel Schultz, *SUNY Brockport Department of Environmental Science and Ecology*

Along the Great Lakes, coastal wetlands have been degraded by human activity, and 50% of wetland area has been lost since European settlement. Additionally, Great Lakes coastal wetlands have been impacted by historically high lake levels, with wetland area lost during times of high water. Vegetation in marine coastal wetlands has been shown to migrate to upland habitats in response to sea level rise, using wetland-upland edges as refugia under these stressful conditions. While Great Lakes coastal wetlands have been widely monitored, their wetland-upland edges are understudied, and it is not well known how wetland plants are using these edge habitats. Our objectives were to determine 1) whether wetland vegetation has established on upland edges, 2) whether the edges support more native or non-native species compared to the wetland interior, and 3) how the bordering upland landscape type is related to the proportion of native vs. non-native species at the wetland edge.

We surveyed 23 wetlands around Lake Ontario in 2024 by sampling vegetation quadrats at up to three points along the wetland-upland edge at each site. To determine whether wetland species are establishing along wetland-upland edges, we compared the wetland edges to the wetland interior in their proportions of species with wetland indicator statuses. To determine whether native or non-native species are utilizing habitat edges, we compared the proportions of native species on the edges to the wetland interior. Finally, we determined whether

the proportions of native species along wetland edges differed by bordering landscape type.

These results can inform management by providing information about wetland habitats that have been excluded from previous monitoring efforts.

WHEN DO BIRD EMBRYOS DETECT AND PROCESS STIMULI FROM THE OUTSIDE WORLD? USING CHLOROFORM TO EVALUATE INITIATION OF HIGHER ORDER BRAIN FUNCTION IN BIRD EMBYROS AT EARLY MID-INCUBATION.

Randy Hong, Lina Hassini, Justine Simms and Thomas Jensen, *Hobart and William Smith Colleges*.

Ollivia Duross, Ariel Messenger, Justine Simms, and Thomas Jensen, *Hobart And William Smith Colleges*. [Separate poster]

Complex behaviors are initiated within the cerebral cortex, usually in response to external sensory stimuli. As essential as complex behaviors are to higher vertebrate life, the embryological ontogeny of it is poorly understood, and we currently do not know when cerebral activity and complex behavior begin during avian embryo development. Therefore, we intent to evaluate cerebral brain function in early mid-incubation (stage 33 HH) embryos.

When mid-incubation embryos are candled, they move towards the center of the egg. We propose that embryos interpret light as the removal of the incubating parent, and that moving towards the middle will keep the embryo warm for longer. If this behavior is initiated from the cerebrum and not just a cerebellum reaction, then anesthesia will eliminate the behavior. We therefore investigated the effect of chloroform on this candling behavior. Chloroform is a general anesthetic that depress CNS function by altering and reducing neuronal cell communication in information processing centers thereby impairing cognitive function (Lee, Sohyae et al. 2021; Chloroform and Cognitive Function in the General Population of the US Elderly: A Cross-Sectional Study. 10.21203/rs.3.rs-1102490/v1; Harvard Medical School website)

Our study showed a decrease in relative movement scores post-exposure of 0 compared to 3 pre-exposure, suggesting that this movement may be modulated by the cerebral cortex and that the cerebral cortex is at least partially active by stage 33 HH. These results will help clarify when avians begin higher order processing, thus furthering our understanding of avian embryo brain development and maturation.

ZURICH BOG MOSS COVERAGE AND DIVERSITY.

Mia Lamanna, *SUNY Brockport*.

Zurich Bog is a national natural landmark in Wayne County New York that contains several different ecosystems including a hardwood swamp, hemlock forest, and floating fen. As well as holding several different environments, Zurich is also home to many rare and endangered orchid species. During plant surveys we found the orchids in sporadic patterns throughout the bog, given that mosses were seen to take up about 20% of our sampling plots on average, my research investigated the possible limiting relationship that mosses have with orchids. I tested soil moisture, pH, and canopy to identify correlations with mosses and orchids. My results indicated a positive correlation between canopy cover and pH of the soil. This data was able to show correlation between moss and orchid species based on pH and canopy, which supports the hypothesized limiting relationship between the two, and can possibly be used in orchid conservation efforts in the future.

The Rochester Academy of Science and SUNY Brockport would like to thank all participating universities and institutions. In parentheses are the number of participants from that institution that registered.

Buffalo State University (4)
Canisius University (2)
Cornell University (3)
Cornell University, College of Agriculture and Life Sciences (1)
D'Youville University (1)
Eastman Kodak Company (1)
Hobart and William Smith Colleges (26)
Masaryk University (1)
Houghton University (6)
Ithaca College (2)
Keuka College (5)
Nazareth University (2)
Niagara University (21)
RAS, ASRAS, Fossil Section (11)
Rochester Institute of Technology (24)
St. John Fisher University (16)
Stone Industry Research (1)
SUNY Brockport (44)
SUNY Brockport/RAS
SUNY Buffalo (1)
SUNY College of Environmental Science and Forestry (5)
SUNY Fredonia (5)
SUNY Geneseo (19)
SUNY Oswego (6)

Rochester Academy of Science
50th Annual Paper Session
ABSTRACT BOOK