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ABSTRACT BOOK

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2023 Rochester Academy of Science Abstracts

ORAL PRESENTATIONS

Alphabetical by title

A COMPARATIVE STUDY OF PCR-BASED ASSAYS USED TO SURVEY FOR RANAVIRUS INFECTIONS

Najiyah Williamson, Susan Hammerly, Jennifer Olori, and Nicholas Sard. SUNY Oswego.

Amphibian populations are crucial bioindicators that provide information about ecosystem stability and function. However, many amphibian populations are declining due to diseases caused by Ranavirus infections. Viral infections are commonly detected using molecular tests but their performance among assays varies considerably. This study focuses on a comparison of two such tests: the endpoint polymerase chain reaction (PCR) developed by Mao in 1997 and the SYBR-green quantitative polymerase chain reaction (qPCR) to determine a better method of ranavirus detection in amphibian populations. This was done using three standard curves derived from a synthetic positive control, along with tissue samples collected from the field over the course of two years. The limit of detection (LOD) was determined based on detection probability across the three standard curves. The LOD was lower for the qPCR assay, with qPCR consistently having positive detections in each standard curve, even to 1 copy/µl. Among tissue samples tested, those with low relative viral loads were detected in a single technical replicate, which is in contrast to samples with relatively high viral loads that were detected in all technical replicates. Results validate that qPCR is a more sensitive and accurate method for detecting ranavirus infections; however, the Mao assay lacked a sufficiently low LOD (e.g., < 10 copies/µl). Results based on the application of the Mao assay likely provide a bias low estimates associated with the prevalence of ranavirus infections. Other assays to survey for ranavirus infections should be considered, as the quality of data can influence conservation efforts aimed at mitigating the effects of pathogens like ranavirus in local amphibian communities and around the world.

COSMIC ARCHEOLOGY: EXAMINING THE STRUCTURE OF GALAXIES OVER COSMIC TIME

Wynter Petersen. Rochester Institute of Technology.

Archaeologists study the fossils of extinct animals to uncover how the Earth has changed over its history. This pursuit similarly applies to the cosmos, where astronomers seek to understand how the universe's galaxies have evolved since they first formed. Just like we analyze the shape of bones to

gain insight into the animal they came from, we can analyze and classify the structure of galaxies during different cosmic epochs to get a picture of what the universe looked like during those periods. Previously, the deepest regions of the universe have been locked away to us, but with the advent of JWST, thousands of early-universe galaxies have been brought out of uncertainty and into detectable detail. By utilizing the batch-fitting algorithm GALAPAGOS-2, a vast amount of COSMOS-Web galaxies will be modeled with Sersic fits across four passbands. The resulting models will also be used to investigate the existence of low surface brightness features in galaxies both near and far afield. These results will be analyzed as a function of several other measured properties, as well as compared with their theoretically expected values.

DETERMINATION OF THE VESICULAR STOMATITIS VIRUS COMPONENT(S) THAT REGULATE NF-KB-DEPENDENT ANTIVIRAL RESPONSES IN RESISTANT PROSTATE CANCERS.

Zach Black, Maureen Ferran, Tori Russel, and Hyla Sweet. Rochester Institute of Technology.

Viral infection is often recognized when the viral RNA is detected and bound by a cellular cytoplasmic receptor such as RIG-I. Upon binding, these receptors turn on signaling pathways that activate cellular transcription factors (e.g., NF-κB, IRF-3, AP-1) that migrate into the nucleus and induce expression of antiviral genes such as interferons, apoptosis, and autophagy. The main focus of our research is to investigate the role of NF-κB -dependent host antiviral responses and immune evasion by vesicular stomatitis virus (VSV) - and how this impacts the use of this virus as an oncolytic agent to treat resistant tumors that constitutively express antiviral genes. The most prominent viral suppressor of the host innate response is the matrix (M) protein, which inhibits host transcription, nuclear-cytoplasmic RNA export, and translation. However, our recent evidence suggests that the M protein alone does not inhibit NF-κB activation in the VSV-resistant PC3 prostate cancer cell line. Therefore, the goal of this project is to identify the viral protein, or combination of viral proteins, that inhibits NF-κB activation in VSV resistant PC3 cells. Our methods consist of optimized and well-developed assays such as transfection, immunofluorescence, and confocal microscopy. A deeper understanding of the individual viral genes that regulate NF-κB in resistant prostate cancer cells, and the mechanisms by which VSV regulates innate immunity, is critical to the development of this virus as a potential oncolytic therapy that successfully kills resistant cancer cells.

FIGHTING BIG OIL AND WINNING: THE RISE AND FALL OF HAROLD GEIGER

Mailey Geiger. SUNY Geneseo.

Historical appraisal of gasoline stations has previously been limited primarily to their growing association with Big Oil in the twentieth century. Research emphasis has included: branding, architecture, place-product packaging, and the attrition of small independent operators, a withering which reached a crescendo in the 1970s. The middle ground of multiple station independent ownership in regional or metropolitan settings remains largely unexplored. Based on oral sources, this paper traces the emergence and growth of a 134 - station 'empire' of independent discount retail gasoline stations in mostly, a single city. Now in their late 80s, Harold Geiger and his wife Patricia bought their first Buffalo, NY gasoline station in 1967. Creative financing added three dozen stations within a decade. Thereafter, rapid expansion relied on cheap but not "Big" oil imported from Montreal. The Geiger-owned stations achieved recognition without branding, without distinctive architecture or signage, with canny location choices, impressive price competition, early adoption of self-service, and even with a foretaste of the minimart revolution. However, their near-ascendancy in the 1970s could not survive an oil crisis.

HOUSEHOLD COMPOSTING TO REDUCE FOOD WASTE: A COMPARISON OF METHODS.

Hannah DeFelice and Dr. Kaitlin Stack Whitney. Rochester Institute of Technology.

Food waste is a significant problem around the world. For example, each year roughly 183 billion pounds of food, worth an estimated $161 billion dollars, is wasted at the consumer and retail level in the US. Wasted food frequently ends up in landfills and incineration facilities, where it contributes to greenhouse gas emissions. For households and individuals, the best method of reducing food waste is prevention, but complete prevention is not possible. Some food waste results from the preparation of food for cooking (such as peels of fruits and vegetables) or because foods spoil before being eaten (such as leftover cooked food). Rather than throwing these items in the trash, composting provides a more environmentally friendly method of managing food waste.

HYBRIDIZATION AND ANALYSIS OF VOCALIZATIONS IN BARRED OWLS AND SPOTTED OWLS

Nathali Panora, Rachel Sturge and Nandadevi Cortes. Ithaca College.

Invasive species have been widely study because of how they compete with native species. The case of the Spotted Owl (*Strix occidentalis*) is an interesting one. They inhabit west old growth forests mostly; however, due to deforestation, their habitat has been invaded by the Barred Owls (*Strix varia*) whose historical distribution has been west of the Great

Plains in the USA. Barred Owls are larger in size and are very territorial which drove Spotted Owls away from their habitat and pushed them even more to the west. The presence of Barred Owls has suppressed the calling behavior of Spotted Owls which is why their population continues to decline. There has also been evidence of hybridization of Spotted and Barred Owls. The main objective of this paper is to evaluate if there are differences in songs between these two species and their hybrids. To answer these questions, we obtained songs from Barred Owls and Spotted Owls from the Macaulay Library and analyzed their frequency and amplitude using Raven Pro. We found that the Barred Owl calls from the west are very similar to Spotted Owl calls. The only hybrid call found and analyzed was very similar to Barred Owl calls.

IDENTIFYING ANTIOXIDANT COMPOUNDS IN LAVENDER OIL THAT PROTECT CELLS AGAINST OXIDATIVE STRESS.

Cassie Pierce and Lindsay Burwell. Wells College.

Oxidative stress is associated with many diseases, including neurodegeneration, cardiovascular disease, and metabolic disorders. This stress comes from reactive oxygen and reactive nitrogen species that are byproducts of inefficient cellular metabolism. The reactive oxygen species studied in this project will be hydrogen peroxide. Organisms have endogenous and exogenous pathways that mitigate oxidative stress from stressors like hydrogen peroxide. This investigation looks at the ability of exogenous antioxidants from lavender oil to help *Saccharomyces cerevisiae* cells survive H2O2 stress. It was found that lavender oil, whose main compounds are linalool and linalyl acetate, does protect *S. cerevisiae* cells. These compounds are terpenes known to cross the blood-brain barrier and have neuroprotective properties. Work is now being done to determine if these are the bioactive compounds eliciting lavender oil's protective effects in an *S. cerevisiae* model. Finding the bioactive compounds in lavender oil will provide a starting point for potential drugs to treat oxidative stress and related disorders.

IMPACT OF SENOLYTICS ON MOUSE FLU VACCINATION RESPONSES.

Sofie A. Fischler, Andreia N. Cadar, and Jenna M. Bartley. Nazareth University.

Impaired immune responses to vaccination in older adults leave the aged population exceedingly vulnerable to severe flu infection despite widespread vaccination. Many deficits that occur with aging include increased basal inflammation in part due to the accumulation of senescent cells. Use of senolytics will reduce the senescence burden and may alleviate dysregulated immune responses to vaccination resulting in improved vaccine-induced protection. In this study, young and aged mice were treated with dasatinib and quercetin (D+Q), a well-characterized senolytic drug combination, prior to flu vaccination and subsequent challenge with flu virus. Vaccine and flu-specific immune responses were evaluated by weight monitoring following infection, quantification of serum flu antibodies via ELISA, and lung viral load via qPCR. In an unexpected finding, results showed D+Q treated young mice exhibited several markers of increased protection outside of weight gain. There were no significant differences found in aged mice cohorts treated with D+Q. Future research is ongoing to better understand the effects of senolytics on vaccination and immune responses and determine if the use of senolytics is an appropriate treatment to address age-related immune dysfunction in older adult.

IMPACTS OF DEER ABUNDANCE ON OAK SEEDLING REGENERATION.

Charlotte Buechi and Dr. Kathryn Amatangelo. SUNY Brockport.

During the past century, white-tailed deer populations have increased throughout eastern North America. This has led to an increase in understory vegetation browse. Deer focus their foraging efforts on the more nutritious younger buds and leaves, such as those of tree seedlings. This herbivory stunts tree growth, hindering forest regeneration. This is especially true in oak forests; as oak seedlings are favored by deer over other species. Our objective was to quantify deer abundance and seedling herbivory in forested sites at Erwin, High Tor and Rattlesnake Hill WMAs. Deer abundance was calculated in each forest site from deer pellet-group counts along five 50mx2m transects in late April and early May. Deer herbivory of oak seedlings was monitored throughout the summer on 20 planted seedlings per site, with 10 protected and 10 controls. Lowest deer densities (estimated 0-1.5 deer/km^2) were found at High Tor WMA, and only 1.25% of seedlings were browsed there. In contrast, both Erwin and Rattlesnake Hill WMAs had higher deer estimates (1.3-7.9 deer/km^2) and 4% and 7.5% of seedlings were browsed, respectively. However, at the site scale deer abundance and deer herbivory of oak seedlings do not appear to be correlated. Some sites had dense understories, leading to greater food sources for deer and more protection for oak seedlings. Deer browse will most likely increase as herbaceous vegetation recedes, making testing in spring advised.

IMPROVING THE ENVIRONMENTAL DENSITY MAPPING OF GALAXIES AT REDSHIFT 0.5 < z < 1.7 USING THE CANDELS-HERSCHEL ENVIRONMENTAL SPECTROSCOPIC SURVEY (CHESS).

Jitrapon Lertprasertpong, Jeyhan Kartaltepe, Brittany Vanderhoof, Sadie Coffin, Rohan Pattnaik, Ali Ahmad

Khostovan, and Ash Bista. Rochester Institute of Technology.

Many studies have indicated that the star formation rates (SFRs) of galaxies in densely populated environments tend to decline with time, as shown in the SFR-density relation. However, there exists a discrepancy in how the SFR-density relation evolves among different studies at redshift z>1. Much of this discrepancy arises from the limited availability of spectroscopic data for galaxies at z>1, which can lead to inaccurate estimations of the environmental density in extragalactic fields. To address this matter, we introduce the CANDELS-Herschel Environmental Spectroscopic Survey (CHESS), which is a spectroscopic survey designed to enhance the spectroscopic completeness in the CANDELS COSMOS, UDS, and EGS fields at the redshift range of 0.5 to 1.7. This spectroscopic survey mainly focuses on Herschel-selected galaxies with stellar masses greater than 10^10 solar masses to acquire an unbiased spectroscopic sampling within our targeted redshift range. From the CHESS observing program, we have obtained 677 new high-quality spectroscopic redshifts within the CANDELS COSMOS, UDS, and EGS fields. By combining this new spectroscopic catalog with existing archival spectroscopic data, we can improve the environmental density mapping of galaxies in all five CANDELS fields through the Monte Carlo Voronoi tessellation method. Furthermore, the CHESS catalog allows us to improve the SFR-density relation at z>1. This new catalog offers new insights into the evolution of the SFRs across varying redshifts.

INTERESTING INTERACTIONS: PLURONIC F68 AND A ROOT-COLONIZING PROBIOTIC BACTERIUM

Amanda R. Streeter, Mohamad Zargaran, Anagah Wankhade, Anne Anderson, and Dave Britt. Utah State University.

With climate change, the decreasing acreage of arable land and reduced quality irrigation water, novel methods will be required to improve agricultural crop yield/quality without negatively impacting the soil microbiome. In an effort to achieve this goal, the adjuvant compound Pluronic F68 (an 8.4 kD block copolymer) was explored to determine its effects on the root-colonizing, probiotic bacterium, *Pseudomonas chlororaphis* O6 (PcO6). Experiments revealed that while being membrane active, F68 did not influence PcO6 growth rate at concentrations below 1 mg/mL; reduced growth occurred above 10 mg/mL. Additionally, it was found that F68 was not metabolized by the bacterium, and that despite showing cryoprotective effects in a variety of other cell types, concentrations of 0.1% - 1% F68 did not exert any cryoprotective effects on PcO6. These assays demonstrate F68 to be relatively inert toward important soil microorganisms, supporting applications of F68 as an adjuvant in agricultural formulations.

KARYOTYPING THE WEHI-231 CELL LINE: CHALLENGES AND OPPORTUNITIES.

Anne-Marie Pearson, Kyra Coughlin, and Matthew Temple. Nazareth University.

The WEHI-231 cell line is an immature B-cell lymphoma line originating from mice after mineral oil injection. Used in immunological and oncological research, the WEHI-231 cell line displays an odd behavior: when exposed to lipopolysaccharide, WEHI-231 will produce IgM. This ability to readily produce lipopolysaccharide, along with its behavior as a B-cell lymphoma, makes it a valuable cell line to research. However, the karyotype of the WEHI-231 cell line has yet to be described in literature beyond a cursory study regarding a possible metacentric chromosome found in the cell line. This study focused on identifying the modal karyotype of the WEHI-231 cell line by observing the karyotype across over one hundred cells and identifying the possible origin of its metacentric chromosome by trypsin G-banding in order to uncover the reason for its behavior, both its origin as a lymphoma and the origin of its ability to produce IgM.

MASS LOSS OF BIODEGRADABLE PLASTIC MULCH FILMS IN LABORATORY AND INDUSTRIAL COMPOSTING ENVIRONMENTS

Harshal J. Kansara, Yvan D. Hernandez-Charpak, Robert M. Putney Jr., Jeffrey S. Lodge, Thomas A. Trabold, and Carlos Diaz-Acosta. Rochester Institute of Technology.

Plastic mulch films have been used in specialized agriculture since the 1950s due to the incredible advantages they offer for maintaining weed control, soil temperature and moisture, etc. Since the 1980s, as an alternative to conventional non-biodegradable films, development of more sustainable biodegradable films began. These biodegradable films had all the advantages that were offered by conventional films but could be directly tilled into the soil to breakdown in-situ. This helps to reduce the cost of labor to pull the conventional films which then end up in landfills after every harvest cycle. But, during winters, the film biodegradation is affected by low soil temperatures, which leads to a long mineralization time of several years. As a possible alternative to the film tillage, composting could prove a faster and more sustainable option. To assess this option, a 50-gallon lab-scale composting apparatus was set up to test accelerated breakdown of BPMs. Virgin and field weathered commercially available biodegradable films (EcoVio) were tested, as well as an in-house developed experimental film evaluated in the same compost apparatus over one year. Mass loss of 44±12% was observed for the weathered EcoVio material as compared to virgin film, showing

10±4% loss over 365 days. Mass loss in mono layered poly- (butylene succinate-co-terephthalate) (PBAT) film was recorded to be only 9±18% in 365 days as compared to a multi-layered PBAT-starch-PBAT film with a significant mass loss of 64±7% over the same time period. Slow biodegradation of the films was attributed to the low temperatures and short heating period of the compost process in the lab (60°C for less than 5 days), followed by an extended cold period. A similar experiment was set up at a large commercial compost facility, elevated temperatures between 60°C and 80°C during test, using the same sets of films. The results showed 100% mass loss by fragmentation for all films in about 66 days. Weathered films showed faster mass loss over time with 73±7% in just 23 days as compared to 37±26% in the same time frame for the lab-scale experiments. The RIT-developed multi-layer film showed a mass loss of 85±5% in 23 days as compared to a mono layer pure PBAT film with 63±9% mass loss. Based on these preliminary data, it appears that composting of BMFs could prove to be a sustainable alternative pathway to the conventional practice of landfilling.

MIGRATING WITH MALARIA: HOW DO HAEMOSPORIDIAN PARASITE INFECTIONS IMPACT THE PHYSIOLOGICAL CONDITION OF BIRDS DURING MIGRATION?

Gabriella Orfanides and Susan Smith Pagano. Rochester Institute of Technology.

Avian malaria and related blood parasites (haemosporidians) are globally widespread and commonly exist as chronic infections in migratory songbirds. The costs associated with maintaining chronic haemosporidian infections are poorly understood in migratory birds; however, it could be expected that chronically infected birds may maintain an active immune system throughout migration, which could force trade-offs with refueling rates at stopover sites and/or migration pace. In this study, we sampled Canada Warblers (*Cardellina canadensis*) and Black-Throated Blue Warblers (*Setophaga caerulescens*) at a Lake Ontario stopover site (Braddock Bay) during spring migration to evaluate physiological trade-offs that could be associated with avian haemosporidian infections during migration stopover. Warblers were screened for haemosporidians using a PCR-based method, total leukocyte counts were derived as indices of immune status, and plasma metabolite profiling was used to assess refueling rates and nutrient utilization of birds during migration stopover. Arrival timing with respect to uninfected and infected individuals was compared to evaluate potential effects on migration pace. Additionally, we used Sanger Sequencing to identify distinct genetic lineages of parasites. Results provide insight into the impact of blood parasite infections on migrating birds as well as the diversity of haemosporidian lineages that infect migratory warblers.

MONITORING OF THIAMINE DEFICIENCY IN LAKE ONTARIO STEELHEAD TROUT.

Mya Henry, Desmond Barber Jr, Matthew Futia, Thomas Kielbasinski, and Jacques Rinchard. SUNY Brockport.

Thiamine deficiency complex (TDC) has been documented in salmonine species from the Great Lakes. In this study, we measured thiamine concentrations in steelhead trout eggs collected at the Salmon River Fish Hatchery between 2015 and 2023. Eggs were also fertilized in 2015, 2016, 2017, 2022, and incubated to determine offspring survival and the lethal concentration that causes 50% of offspring mortality (LC50). A new LC50 was determined at 5.4 nmol/g, lower than the previously estimated concentration. Egg thiamine concentrations significantly varied among years ($p<0.05$). A substantial number of fish (84.5 ± 17.92%) produced eggs below the LC50 across all years. To assess the cause of TDC, we investigated yearly changes in lipid content and fatty acid composition. Lipid content differed among years ($p<0.05$) with the lowest content in 2020 and the highest in 2023. Finally, yearly fatty acid signatures in eggs significantly differed among years ($p<0.05$) and the fatty acids most responsible were 22:6n-3, 18:1n-9, 20:5n-3, and 16:0. Although these results suggest a potential shift in steelhead trout diet, average egg thiamine concentrations were below the LC50 across years and further investigation are required to determine how diet affects thiamine concentration.

MONITORING THE PREVALENCE OF RANAVIRUS: AN AMPHIBIAN PATHOGEN IN OSWEGO COUNTY.

Grace Cordone, Anica Sampson, Najiyah Williamson, Joy Zientara, Susan Hammerly, Jennifer Olori, and Nicholas Sard. SUNY Oswego.

Amphibian populations worldwide are experiencing severe decreases due to a variety of factors, including amphibian pathogens like ranavirus (Rv), a double-stranded DNA virus that can cause ranavirosis in amphibians by infecting various organs and causing physiological problems that lead to severe illness and death. Our project is a decade-long assessment of the prevalence of this disease in Oswego County in order to learn more about how local amphibian populations are being affected. To date, 1958 amphibians have had toe clip tissue samples collected to be tested for Rv. The tissue samples then have their DNA extracted (with an average of 42.64 ng/µl of DNA per sample, SD 90.19) and tested by using polymerase chain reaction assays and a Rv-positive control to ascertain the prevalence of the disease in local populations. The results have been used to establish a long-term

timeline that documents the prevalence of Rv in Oswego County, New York. In the first five years of the project, disease prevalence remained consistently at 25-30%, while in more recent years the prevalence has been lower, around 20%. The change in prevalence pattern, along with simply tracking disease levels, presents new avenues for our lab to explore, as it could be due to environmental conditions in local areas, the nature of the virus itself, or from turnover in lab reagents and materials.

PEROVSKITE SOLAR CELLS: UNDERSTANDING AND OVERCOMING RADIATION CHALLENGES FOR SPACE MISSIONS

Ahmad Kirmani. Rochester Institute of Technology.

In the challenging environment of space, metal-halide perovskite (MHP) semiconductors exhibit extraordinary properties, including low temperature coefficients and exceptional radiation tolerance. These unique characteristics, combined with the absence of moisture in space and the demand for shorter-duration operations, have led to extensive research on MHP as a promising technology for powering future space missions, both in near-Earth and deep space environments. I will provide an overview of our recent investigations into radiation-matter interactions in MHPs. Our collaborative efforts with organizations such as the National Aeronautics and Space Administration (NASA), Air Force Research Laboratory (AFRL), and the Aerospace Corporation have resulted in comprehensive guidelines for testing the space compliance of perovskite solar cells (PSCs). One of the key challenges we addressed is the protection of these ultralight and ultrathin solar cells from low-energy protons (50 – 150 keV). We have developed a promising space barrier layer technology based on silicon oxide (SiOX) to address this issue. Surprisingly, despite being soft materials, MHPs show remarkable resilience against displacement damage. Through a unique dual-dose irradiation experiment, similar to a “pump/probe” spectroscopy setup, we have discovered that electronic ionization effects, and likely resulting phonons, facilitate the healing of displacement damage, leading to the recovery of device performance. This conclusive evidence sheds light on the intricate mechanisms of defect creation and healing in MHPs. My talk will underscore the immense potential of MHPs as the future choice for space photovoltaic and electronics technologies.

PHOTOACOUSTIC IMAGING OF PROSTATE CANCER USING PEPTIDE-BASED TARGETED MOLECULAR IMAGING AGENTS

Anna Rooney. Rochester Institute of Technology.

This project explores targeted molecular imaging agents (TMIAs) and applying them to advance healthcare technology. Near-infrared (NIR) dyes for photoacoustic imaging (PAI) can be used for the detection of cancer. While this method has been shown to work, problems such as low sensitivity may arise. We have proposed a dual dye system that should improve the signal in PAI, where a dual dye system based on the hypothesis that a Förster Resonance Energy Transfer (FRET) system pair of fluorescence and quenching dyes will convert the absorbed energy into ultrasound waves instead of losing energy as fluorescence. This is hypothesized to provide a sensitive PAI screen and enable a painless and effective detection method for cancer. A practical synthesis for the symmetric NIR water-soluble dyes IR78 and the quencher QC-1 has been fine-tuned in our lab. Also in our lab a similar FRET pair using a tetraproline spacer was synthesized and successfully tested. The goal here is to see if reducing the prolines from tetra to di-proline will be as effective and if so, the smaller the molecule the better in terms of bioavailability. A targeting group for any type of cancer may be conjugated to our modular FRET imaging system in the final synthetic step. Most importantly, the synthesis of IRDye78, QC-1, and final TMIA will be followed by the testing of PAI using this dye in *in vitro* and *in vivo* at a collaborator’s lab. My contribution to this project will help change the standard of imaging technology and save the lives of many individuals.

PREPARATIONS OF RHODACYANINE DYES

Liam Almekinder. Rochester Institute of Technology.

D112 is a potential chemotherapy drug with great promise for selectivity for killing cancer cells over human cells while having the potential to avoid the harmful side effects caused by other chemotherapy drugs. We will be describing our progress towards a robust synthetic route for D112 and analogues of MKT-077, another chemotherapy drug that made it to phase 1 trials.

QUANTIFYING ULTRA-FINE ATMOSPHERIC MICROPLASTICS

Emily Ruddell. Rochester Institute of Technology.

Microplastics (MP) are known environmental contaminants and recent studies have shown the atmosphere's capability to transport and deposit MP far from the initial source. The number of MP found in the environment increase in number the smaller they are, and smaller MP will stay aloft for longer periods. Because of this, it was hypothesized that the number of atmospheric microplastics in the PM2.5 range is underestimated or under-quantified because most common analysis techniques used to analyze microplastic particles cannot analyze this size. Therefore, to identify and determine the fraction of airborne PM2.5 MP, a method using pyrolysis coupled with gas chromatography-mass spectroscopy was developed. From there, a series of

common polymers were analyzed. Indicative peaks were determined for each polymer based on literature and the generated chromatograms. Current work is focused on pushing the limits of detection and quantification within this method. In addition, we will present preliminary results on active air sampling within our research lab.

REDSHIFT WRANGLER: A CITIZEN SCIENCE PROJECT WITH GALAXY SPECTROSCOPY

Sadie Coffin. Rochester Institute of Technology.

I present the citizen science project Redshift Wrangler, designed to use the contributions of volunteers to analyze large samples of galaxy data and build a repository of spectroscopic measurements. When we know how to read it, the spectrum of a galaxy can tell the story of its stellar population, distance, and interactions with any close companion galaxies. Through Redshift Wrangler, citizen science measurements become our main tool for extracting information from enormous quantities of collected spectra. Several main goals motivate this work: first, designing and launching Redshift Wrangler on citizen science platform Zooniverse to bring more people motivated by curiosity or the desire to be involved in research into our scientific process. Second, I determine redshifts from user measurements of key features in the spectra to compare them with existing values, checking the quality of our program and improving our methods as we go. Finally, by confirming fits to the emission and absorption lines and using those fits to estimate line fluxes, I will be able to constrain physical properties like star formation rate, metallicity, and AGN content of galaxies. Our initial results are based on measurements taken during the beta testing phase of Redshift Wrangler, complemented by initial outcomes from the first post-launch month.

RESTRICTION ENZYME-MEDIATED INTEGRATION MUTAGENESIS SCREEN TO IDENTIFY NOVEL PARTNERS OF ADHESION REGULATOR KINASE RESPONSIVE TO STRESS B (KRSB) IN DICTYOSTELIUM DISCOIDEUM.

Quinn Jones and Dr. Yulia Artemenko. SUNY Oswego.

Directed cell migration is instrumental for many physiological processes, including wound healing and cancer metastasis. Optimal adhesion of a cell to the substrate is integral to cell movement, but remains poorly understood in cells exhibiting rapid amoeboid-type motility. Kinase responsive to stress B (KrsB), a homolog of mammalian tumor suppressor MST1/2 and Drosophila Hippo, negatively regulates cell spreading and substrate attachment in social amoeba *Dictyostelium discoideum*, which is a commonly used model organism for the study of directed migration. Despite its involvement in regulating adhesion and migration, the molecular mechanism of KrsB action is not clear. To identify potential regulators or effectors of KrsB we conducted a forward genetic screen using restriction enzyme-mediated integration (REMI) mutagenesis of cells lacking KrsB to generate mutants showing either a rescue or an enhancement of the KrsB-null phenotype. KrsB-null cells have a distinct phenotype when they form plaques on a bacterial lawn, with an expanded region of aggregating cells in streams and a rough edge due to uneven expansion of vegetative cells. We isolated 44 mutants whose plaques appeared different from KrsB-null cells. In addition to confirming plaque morphology, we are also analyzing adhesion, spreading and migration of the mutants since these phenotypes are significantly different in KrsB-null compared to wild-type cells. Several mutants display promising phenotypes, with changes in adhesion and/or random migration. Intriguingly, some mutants do not follow the predicted trend where increased adhesion leads to reduced migration, which may suggest independent regulation of these processes. We are currently analyzing the genomic insertion sites to identify the genes responsible for the significantly different mutant morphology. Identification and isolation of novel partners of KrsB will open avenues for research regarding the specific molecular mechanisms that allow it to regulate cellular adhesion and migration.

SELF-ASSEMBLING HIGH-RELAXIVITY PROSTATE-CANCER-TARGETED MRI CONTRAST AGENTS

Andrew O'Brien. Rochester Institute of Technology.

Abstract not received.

SOCIAL COGNITION AND WORLDVIEWS AFFECTING ENVIRONMENTAL ATTITUDES AND REDUCED MOWING EFFORTS.

Erika Mitchell, Dr. Marjorie Prokosch, and Dr. Kaitlin Stack Whitney. Rochester Institute of Technology.

Recent literature has called for an uptick in research concerning human and non-animal relationships to be examined more thoroughly. However, no research has explored how predisposed ideologies, such as social cognition, influence pro-environmental attitudes with a specific lens on mowing efforts. Using social psychology background to investigate environmental science, free-response and quantitative questionnaires were given to participants across the Northeastern United States using Qualtrics that gauged for worldviews and commitment to the environment, as well as specific prompts geared towards reactions surrounding reduced mowing and uncontrolled mowing along roadside highways and residential lawns. Results found that there were strong correlations between worldviews and controlled, traditional mowing, as well as worldviews correlating with verbal commitment and ideology surrounding utilization of nature. Further

research surrounding this topic hopes to expand knowledge on worldviews and ideologies influencing reduced and uncontrolled mowing efforts or other influences that were not tracked in the original study. Furthermore, future research hopes to explore and create interventions based off of results to raise awareness of the benefits of uncontrolled mowing efforts.

SUBSTRATE AND PROCESS ENGINEERING FOR BIOCATALYTIC SYNTHESIS AND PURIFICATION OF HUMAN MILK OLIGOSACCHARIDES (HMOS)

Sandra Perkins. Nazareth University.

Abstract not received.

THE DEVIL IS IN THE DETAILS: OPTIMIZATION OF PHAGE GROWTH FOR ELECTROKINETIC PURIFICATION.

Zak Azad. Rochester Institute of Technology.

Bacteriophages are viruses that infect and replicate in bacteria. Phages can be found virtually anywhere there are bacteria and are used in an array of therapeutic applications, particularly to control and treat bacterial pathogens. Due to the myriad of different types of phages, there is a limited understanding of how to optimally grow and purify multiple phages. To address these challenges, our research has focused on optimizing the parameters that impact phage growth, and the development of a highly novel purification pipeline using electrokinetics. My research has shown that the manipulation of parameters, such as media and host growth state, during phage stock preparation can have a major effect on the yield and stability of phages. Identification of these parameters is important to maintain the consistency and quality of phage samples used for downstream applications.

THE REPRODUCTIVE CYCLE OF *PELODYTES IBERICUS*, AN ANDALUCIAN ANURAN AMPHIBIAN

Kiara Roman, Stephen Busack Ph.D., and Alin Vonica Ph.D. Nazareth University.

The species *Pelodytes ibericus* is found in Andalucía, Spain. It is a nocturnal species that reproduces in temperate lands with humid environments. Amphibians living in warm climates are sexually active throughout the year, while amphibians in temperate climates adjust their reproductive cycle for the time of year when tadpoles find the best conditions for development. For this study, *P. ibericus* was collected in different months and at different locations in Andalucia over 3 years. Testes were collected and prepared for histological analysis. By analyzing the maturation stages (0-4) of the testes, we were able to conclude that *P. ibericus* is sexually active mainly in the October to February period of the year, and inactive over the summer months. We conclude that *P. ibericus* fertillity correlates with the wetter months of year in the habitat of this amphibian. We were interested in the annual sexual cycle of *Pelodytes* because the Andalucian climate is Mediterranean, at the southern border of the temperate climate area, with seasonal variation but enjoying warm weather for most of the year. For amphibians, temperature is considered the main regulator of reproductive activity.

THE SEASONAL IMPACTS OF JAPANESE KNOTWEED ON ARTHROPOD COMMUNITIES IN WESTERN NEW YORK.

Ray Marszalek and Kathryn Amatangelo. SUNY Brockport.

Japanese knotweed (*Fallopia japonica*) is one of the most aggressive invasive plant species. By forming thick, fast-growing thickets, it shades out and displaces native plants and may also affect invertebrate communities. The goal of this study was to determine how Japanese knotweed impacts invertebrate communities, and if the severity of knotweed impacts are seasonal. Fifteen pairs of pitfall and bottle insect traps were placed across seven parks in western New York. In May, August, and October, traps were collected twice over a two-week period. Twenty-six different orders of invertebrate were collected. Some of the most common groups found were ants, rove beetles, scuttle flies, and flat-backed millipedes. We found that the impact of knotweed on invertebrates was dependent on both invertebrate types and season. While some invertebrates were negatively affected by knotweed across all seasons, some impacts of knotweed were seasonally dependent. Ants, for example, had greater numbers in control areas than knotweed in the summer, but in fall knotweed stands contained more ants than the control. In fall, when it was expected knotweed would have more pollinators due to its later flowering season, that was found to not be the case. Across seasons, knotweed has negative impacts on our invertebrate communities, and needs to be managed to insure a healthy ecosystem.

TOPLINE DEVELOPMENT IN AGED PERFORMANCE HORSES USING LATERAL EXERCISE.

Kendra Roberts and Lindsay Burwell. Wells College.

As horses age, muscle integrity must be maintained. This is especially true of the back muscles in a horse's topline. Atrophy of the topline muscle can lead to conformational and pathological conditions, causing horses discomfort and impaired mobility. Several approaches are known to develop topline in younger horses, including incorporating lateral movement exercises. Lateral movement requires the horse to move in directions other than straight forward. This includes bending, shoulder in, shoulder out, backing, and leg yields. This has

increased middle back measurements in younger horses while dropping loin and croup measurements, equating to a horse building quality core muscle. This project looked at using these exercises in older horses. It was found that lateral movement exercises build core muscle in older horses, independent of regular forward exercise. The regime that was developed was also not as rigorous as is used in younger equine athletes, so it was found that the muscle building did plateau between weeks 6 and 12. This plateau was attributed to the need to increase lateral work. Future research will involve developing the next stage of lateral exercises for aged horses to continue building topline and maintain core muscle status.

USING SACCHAROMYCES CEREVISIAE AS A MODEL ORGANISM FOR LEIGH SYNDROME CAUSED BY MUTATIONS IN PYRUVATE DEHYDROGENASE.

Bailey Hamm. Wells College.

Leigh syndrome is a childhood disease caused by many different nuclear and mitochondrial mutations in metabolic enzymes, resulting in low muscle tone, organ failure, and brain lesions. One of these enzymes includes pyruvate dehydrogenase, which converts pyruvate from glycolysis to acetyl-CoA for use in the TCA cycle. Mutations in the E3 subunit of pyruvate dehydrogenase (Lpd1p) are associated with Leigh Syndrome. This project aims to create a *Saccharomyces cerevisiae* model of Leigh syndrome by inserting the *Homo sapiens* E3 subunit (Dld1p) into a *lpd1Δ::URA3* strain. It is hypothesized that Dld1p will complement *lpd1Δ*. Dld1p strains containing Leigh Syndrome mutations will be created and used to conduct drug screens to identify therapeutic small molecules that can treat the disease.

VERTEBRAL FUSION AND EXCESS BONE GROWTH IN A LATE OLIGOCENE SNAKE FOSSIL FROM THE RUKWA RIFT BASIN OF TANZANIA

Ariana D. Montalvo, Jacob A. McCartney, Cassy Mtelela, Eric Roberts, and Nancy J. Stevens. Nazareth University.

The late Oligocene Nsungwe Formation in the Rukwa Rift Basin of Southwestern Tanzania has produced a diverse vertebrate fauna including species of fishes, lizards, turtles, and mammals. It also includes the largest known sub-Saharan snake fauna from the Paleogene, consisting of nine colubriform and constrictor snakes. Among the specimens of one of the colubriform morphotypes is a pair of fused anterior trunk vertebrae. The specimen shows excess bone growth along the ventral and lateral aspects of the centra, causing fusion of the vertebrae around the cotyle-condyle joint. A microCT scan demonstrates that the articular surfaces inside the joint capsule are intact. All of the other intervertebral joint surfaces are normal, as is the single preserved rib articular surface. The cotyle of the anterior vertebra and the condyle of the posterior vertebra show no signs of fusion, indicating that the pathology was limited to this single joint. Vertebral fusions may result from infection, congenital defects, trauma, spondyloarthropathy, and non-pathological ossification of vertebral ligaments (diffuse idiopathic skeletal hyperostosis, or DISH). The preserved evidence is equivocal, but congenital defect, infection, and DISH can be ruled out.

POSTER PRESENTATIONS

Alphabetical by title

(AVOIDED) CROSSINGS IN THE SPECTRA OF MATRICES WITH GLOBALLY DEGENERATE EIGENVALUES.

Sam Silliman and M. Bhattacharya. Rochester Institute of Technology.

We developed a novel analytical technique to determine the location and degeneracy of (avoided) crossings in the spectra of matrices with globally degenerate eigenvalues. The technique involves introducing a perturbation in the matrix to remove the global degeneracy. It was shown that as the perturbation vanishes, the (avoided) crossings of the perturbed spectra give the correct (avoided) crossings for the nominal matrix.

A CTPASE NUDIX HYDROLASE FROM *MYCOBACTERIUM TUBERCULOSIS* AS A POTENTIAL NOVEL ANTIBIOTIC TARGET

Peggy Chen, Mya Soto, Kenneth Gerien, Sarah Denial, Christopher Daley, Emmanuella Delva, Elizabeth Richter, Brent Cotman, and Suzanne F. O'Handley. Rochester Institute of Technology.

Mycobacterium tuberculosis (Mtb) currently infects ~1/4 of the world's population, kills ~1.5 million people annually, and there are many strains that are multidrug resistant. Thus, investigating potential novel antibiotic targets for Mtb is essential. We have been systematically discovering the activity for and characterizing the Nudix hydrolases from Mtb as potential drug targets due to their ability to hydrolyze substrates involved in important metabolic and pathogenic processes. One Nudix hydrolase from Mtb that we have been studying is a (d)CTPase, which has an ortholog in *E. coli*. One substrate for

this enzyme is CTP, which is the feedback inhibitor of pyrimidine biosynthesis, and a precursor to lipid biosynthesis including cell membrane formation; the CTPase may help regulate these pathways through degradation of CTP. The *E. coli* knockout mutant is less susceptible to streptomycin and thus indicates a phenotype consistent with a change in the cell membrane; the CTPase from Mtb complements this *E. coli* homolog. Another substrate for this enzyme is 5-Methyl-dCTP. There are some bacteriophage that can synthesize 5-Methyl-dCTP, which could then be incorporated into bacterial DNA in place of dCTP. Thus, this bacterial (d)CTPase could be a defense mechanism against phage infection, which we are in the process of testing by comparing phage infection of the wildtype *E. coli*, knockout *E. coli*, and the knockout complemented with the Mtb enzyme. If our (d)CTPase is part of a defense mechanism against phage, targeting this enzyme and infecting with phage could be a treatment against Mtb.

A DIADENOSINE POLYPHOSPHATASE OF THE NUDIX HYDROLASE SUPERFAMILY IN *M. TUBERCULOSIS*.

Aidan Lynch, Michael L. Gleghorn, and Suzanne F O'Handley. Rochester Institute of Technology.

M. tuberculosis contains 11 potential Nudix hydrolases, and we are characterizing these enzymes as potential novel antibiotic targets. The diadenosine polyphosphatases (ApnAases) / mRNA decapping enzymes are a family of enzymes within the Nudix hydrolase superfamily. In *M. tuberculosis* there is the primary Nudix ApnAase and the secondary Nudix ApnAase. There are also orthologs of these two ApnAases in *M. leprae*. The diadenosine polyphosphatases from *Legionella pneumophilia* and *Bartonella bacilliformis* have been found to be important in each pathogen's ability to invade its host cells. It is of interest to know whether these enzymes act in the same way in *M. tuberculosis* and *M. leprae*. If they are all found to be involved in invasiveness and thus in virulence, then these enzymes could be novel antibiotic targets. We have cloned and overexpressed the primary Nudix ApnAase from *M. tuberculosis* and have subcloned it into a HisTag vector to optimize purification. This enzyme has been purified and characterized, and is in the process of being crystalized for structure determination. This research has been supported by an NIH AREA grant, a CUR-Goldwater Scholars Faculty Mentor Award, an ASBMB undergraduate research award, a RAS student research grant, and a RIT COS Emerson SURF.

A NOVEL MASS SPECTROMETRY-BASED APPROACH TO EVALUATE DRUG-DOCKING SIMULATIONS—ONE THAT WE ARE USING TO SCREEN DRUG CANDIDATES TO TREAT ALZHEIMER'S DISEASE.

Emma Ryan, Abigail Wheeler, Kara Dawson, and Paul Martino. Houghton University.

In-silico docking simulations are powerful methods to screen potential medications for binding to specific proteins. The proteins are previously solved by traditional methods such as NMR spectroscopy, and x-ray crystallography and are held static, while a library of potential ligands is evaluated for binding interactions within a grid volume identified by the investigator. During the simulation, the ligand molecule is allowed to be dynamic and bond rotations are allowed. We report a sensitive and rapid mass spectrometry-based approach to measure *in-vitro* docking locations of ligands on proteins. The method utilizes gas phase footprinting strategy using carbene gas within an electrospray ionization beam to selectively derivatize carbene gas accessible amino acids—those that are not "covered up" or in complex with the ligand. Subsequent mass spectrometry MSMS analysis reveals which amino acids (or sites) were in complex with the ligand. Data will be shown indicating the binding site of regorafenib, a clinically approved kinase inhibitor, that was bound to amyloid-beta(1-16), a peptide which comprises the putative zinc-binding domain of amyloid-beta. We will compare our chemical footprinting measurements with our docking simulation results for validation of our Alzheimer's disease medication screening protocol.

AN ANALYSIS OF THE BETA PICTORIS MOVING GROUP VIA VIRTUAL REALITY.

Ryan Butler, Joel Kastner, and Tom Skillman. Rochester Institute of Technology.

Nearby Young Moving Groups (NYMGs) are loosely bound comoving associations of young (age < 150 Myr) stars within ~100 pc of the Sun. Members of NYMGs are essential subjects for the study of pre-main sequence stellar evolution, the late stages of circumstellar disks, and nascent extrasolar planetary systems. To further establish and enhance the membership of NYMGs, we are analyzing the rich spatial, kinematic, and photometric data from Gaia Data Release 3 (DR3) with a new virtual reality tool, StarGateVR, designed for efficiently parsing and filtering the Gaia data. We report a StarGateVR-based recovery of some 200 members and candidate members of the ~20 Myr-old Beta Pictoris Moving Group (BPMG). The star 2MASS J15460752-6258042, previously associated with the ~55 Myr Argus association, is among these new BPMG

candidate members. Our proposed membership in the younger BPMG is more consistent with the status of 2MASS J15460752-6258042 as actively accreting from a circumstellar disk. These results illustrate the potential for StarGateVR-based exploration of Gaia DR3 data in application to the problem of distinguishing nearby young stars from the field population. This research is supported by NASA XRP grant 80NSSC19K0292, NASA ADAP grant 80NSSC22K0625, and NASA/GSFC subcontract 80NSSC21K0401 to RIT.

ANTIBIOTIC IMPACT ON THE RELEASE OF OUTER MEMBRANE VESICLES IN E. COLI

Gabriela Gonzalez. Rochester Institute of Technology.

Sepsis is currently the leading cause of deaths in hospitals in the United States. Antibiotics are an important part of sepsis treatment, but may contribute to the over-exuberant inflammatory response that is the hallmark of sepsis due to its trigger of the release of outer-membrane vesicles (OMVs) from bacteria. We tested nine different antibiotics from three different antibiotic families, for their effect on OMV release from *Escherichia coli* bacteria. Following incubation of the bacteria with individual antibiotics, we isolated the OMVs using ultracentrifugation and quantified the OMVs using immunoblotting and nanoparticle tracking analysis. Our results show that several commonly used beta-lactam antibiotics significantly enhance the release of OMVs from *E. coli*, while aminoglycoside and quinolone antibiotics kill the bacteria without significantly enhancing OMV release. These results suggest that the selection of antibiotics may have a significant impact on bacterial OMV production, which could in turn contribute to sepsis-related inflammation.

ARCHAEOLOGY AS A TOOL OF PUBLIC HISTORY: USING FROST TOWN TO CONNECT THE PAST AND PUBLIC

Bailey Hartman, Thomas Verhay, and Logan Wray. SUNY Brockport.

The material culture of the Frost Town Archaeology Project a series of excavations and archaeological field schools and internships that is co-hosted by the SUNY Brockport Anthropology department and the Rochester Museum and Science Center's Cumming Nature Center. Through the lab analysis and data collection of the human material culture recovered from the site as well as the extensive research into the families and land of the Frost Town community, the project has utilized both archaeological and historical methodologies and pedagogies to make the work of Frost Town accessible to its publics. This work has included educational events such as the Public Archaeology Days and the Frost Town Symposium as well as the *Frost Town: History and Ecology of a Ghost Town* exhibit at the Cumming Nature Center. There has also been continued work on the frosttownarchaeology.com website which provides information and publications about the Frost Town site to the public. This project combines archaeology, public history, and education to bridge gaps in knowledge and to create connections which can strengthen relationships between institutions and their publics.

BACTERIAL GENOME REANNOTATION AFTER 7 YEARS

Luciana Cursino, Sydnee Raymond, Giovanni Parent, and Jessica Katolik. Keuka College.

The genome of strain of a gram-positive bacterium was initially sequenced using the NGS Illumina technology and the draft genome was last annotated in 2016 using the RAST tool /Seed viewer 2.0. At that time 68% of the genome did not present any subsystem coverage (unknown function) and because of that, this genome would benefit from a consistent reannotation. In this work, after 7 years, we reannotated the 906 contigs from draft genome of the gram-positive bacteria using two newly developed bioinformatic annotation tools: the Bakta Web v1.8.1 tool for the rapid and standardized annotation of bacterial genomes and Proksee a system for genome assembly, annotation, and visualization. An extra reannotation round was attempted using RASTtk, a new version of RAST tool, as a controlled comparison. The goal was to evaluate the new program's ability to provide new insights on genome functionality and possibly increase functional coverage. The results showed that with the type of draft data input Proksee and RAStk were unable to provide further information on the genome annotation. On the other hand, Bakta provided an impressive large annotation cover for a genome of 3.7Mb, where only 22% of 3808 the CDS were not assigned function. High-quality genome reannotation has been shown to be essential to improve the utility of a sequenced genome.

BIODIESEL PRODUCTION OF ALGAL LIPIDS

Daniel Bergman, Nicole Gretzinger, Elizabeth Klosko, Sarah Mertson, and Barnabas Gikonyo. SUNY Geneseo.

In the age of climate change, the most important research must go towards finding green energy sources. Algae not only ingest excess carbon emissions from the atmosphere, but they also convert it into energy dense lipids which can be harvested, and then transformed into biodiesel. The overarching goal of this project was to make algal lipid extraction

more efficient through means of culturing the algae species *Chlorella vulgaris* and evaluating biodiesel produced via H1NMR, C13NMR, and IR. Powdered algae was then used to test and refine the biodiesel production procedure. A biodiesel standard was created from canola oil which was then compared to the powered algae biodiesel.

BIRD SPECIES OF THE ICNL; EFFECTIVENESS OF TRAIL CAMERAS AND AREA SEARCHES.

Anne Culbert. Ithaca College.

Photos from trail cameras and data from consistent area searches will provide a broad survey of the different bird species in the Ithaca College Natural Lands (ICNL). Trail cameras are a less invasive way of documenting wildlife and can capture more baseline activities due to the lack of human presence. Area searches are useful in documenting a larger range of species, as the observer can walk between different ecosystems during a short time period and use audio and visual observations to document species. The citizen science app eBird helps to collect data from multiple observers in a similar location over time, providing documentation of species seen, which will be used to supplement data collected by individual area searches. The goal of this research is to identify what bird species inhabit the ICNL in different seasons and to identify how the mosaic ecosystems in the ICNL impact species composition. I used trail cameras in a wetland, field, and different aged forest ecosystems, and used area searches in the surrounding areas. I combined the species composition data to establish a starting point for a year-long project of documenting the bird species of the ICNL, eventually to be made into permanent posts in the ICNL that educate the public about what species they may come across and how to identify them.

BISMUTH NANOPARTICLE CHEMOTHERAPEUTIC DRUG CARRIER: A NOVEL SYNTHETIC APPROACH

Mary Elizabeth Kane, Ryanne Carr, Katherine Chrisbacher, Thomas O'Connor, Molly Roesch, Morgan Singleton, Dr. Gary Skuse, and Dr. Ken Reed. Rochester Institute of Technology.

One of the most common obstacles for successful drug development is avoiding hepatotoxicity and nephrotoxicity due to self-aggregation in the liver and kidneys. Magnetically steerable nanoparticle drug carriers can be used to circumvent these issues by selectively guiding the drug to afflicted sites and subsequently removing them, however, magnetic particles tend to self-attract and may even aggravate the agglomeration issue. Potentially, one might alleviate or even avoid these issues by using diamagnetic drug carriers. A novel synthesis of diamagnetic bismuth nanoparticles has been developed for this purpose. The biological compatibility and high diamagnetic property of bismuth metal make it a good candidate for conjugation to D112, a novel chemotherapeutic dye, that has displayed a high selectivity ratio. The most promising synthesis involves a dual solvent system using propylene glycol and metformin along with fragments in the D112 synthesis to act as stabilizers. This system has reliably produced stable particles with an effective diameter between 5-10 nm according to DLS and TEM analysis. Initial, *in vitro* investigations with healthy, noncancerous cell lines as well as cancerous cell lines indicate that the bismuth nanoparticle system contributes nominally to cell death. The high cancer-to-healthy cell death selectivity of the dye, directability of the bismuth drug carrier, and the ability to both remove both from the body before organ failure can set new precedents in the field of cancer treatment and beyond.

BONE FRACTURE REPAIR: A COMPARISON OF POROUS AND MECHANICAL PROPERTIES OF COLLAGEN AND CHITOSAN BIOACTIVE CEMENTS AND PIG BONE.

Owen Vincent, Nobah Islam, Walker Pedinotti, Dr. Barnabas Gikonyo. SUNY Geneseo.

Calcium phosphate cements (CPCs) have been under study as a method of replacing autografting as a method of setting and repairing fractured, load-bearing bones. Hydroxyapatite (HA) is a calcium phosphate mineral and the primary mineral component of bone, and can help to facilitate osteoconduction in vivo. HA cements alone however lack the mechanical strength and porosity required for optimal cell attachment and durability. The addition of a commercially available dental cement has shown promise in improving mechanical strength, and naturally occurring polymers have shown promise in helping to improve porosity and the degradation of the cement as new bone is formed. In this project we examine the effects of the polysaccharide polymer chitosan and the protein polymer collagen on the strength and porosity of a hydroxyapatite and dental cement CPC using mechanical strength testing and imaging methods. The resulting tests show promise for chitosan and collagen infused HA/dental cements as bone cements, however concerns remain about the mechanical strength and future trials will focus on increasing the mechanical strength of the cement.

CAN SAMPLE COOLING IMPROVE THE SIGNAL FROM AN EPR MOUSE?

Amyria L. Kimble and Joseph P. Hornak.
Rochester Institute of Technology.

Electron paramagnetic resonance (EPR) spectroscopy is a valuable tool for studying materials with unpaired electrons. Unfortunately, conventional EPR is invasive for all but samples less than a few mm in width. Hence, the development of the EPR mobile universal surface explorer (MOUSE), a form of low frequency EPR (LFEPR) capable of non-invasively analyzing a 3 mm diameter region of any size object. This is perfect for studying objects with cultural heritage significance that are too valuable to be studied by conventional EPR. The tradeoff for this increased functionality is a smaller signal. Boltzmann statistics tell us that the EPR signal decreases as we lower the operating frequency from 9 GHz to 380 MHz. They also tell us that some of this signal loss may be recovered by cooling the sample. This study explores the feasibility of cooling paint on a canvas at the sampled region to improve the signal. Several 7mm diameter pellets of pigment in an acrylic binder were prepared and secured at the end of thin polyethylene tubes such that one side of the pellet was exposed and outside the tube. The exposed side of the pellet was placed against the EPR MOUSE and the tube was filled with liquid nitrogen. Although the temperature of liquid N2 is 77K, heat conduction from the MOUSE, surroundings, and MOUSE instability at extremely low temperatures limited the temperature to a minimum of 213 K. We observed up to a 34-fold increase in the LFEPR signal by this process. This improvement exceeds the 1.38 value predicted by Boltzmann statistics. Details of our experimental procedure, results and possible explanations, and future studies will be presented in the poster.

CBD, IT'S FOR THE BIRDS: EFFECT OF CBD ON EMBRYONIC DEVELOPMENT

Isabella Ciancio and Thomas Jensen. Wells College.

Over the last couple of decades, medical applications of the *Cannabis sativa L.* plant for pain relief and other ailments has increased significantly in popularity. The compound cannabidiol, also known more commonly as CBD, is the second-most abundant component of *Cannabis* and is known to have qualities that reduce pain and stress. Unlike THC, CBD does not produce euphoric or intoxicating effects and is considered a therapeutic agent of the *Cannabis* plant. The use of *Cannabis* during pregnancy has been correlated with harmful effects traced to its THC content. We propose that the effects of CBD would be significantly less harmful to a developing fetus than THC, due to the lack of narcotic effects. Furthermore, pregnant individuals are advised to find pain relief alternatives to over-the-counter pain relief, like NSAIDs, due to the effects this group of drugs has on prenatal development. We are investigating the potential developmental effects of CBD usage during pregnancy using a chicken embryo model system. The recommended human dose, as per manufacturer, is 1 mL CBD infused oil (41.3 mg per 1.18 mL COA) which is equivalent to a 0.5 mg/kg dose. We injected 50 microL CBD-infused oil into the air cell of day 3 chicken. The 50 microL dose is equivalent to 29.2 mg/kg for a 60 gr chicken egg. The treatment of embryos at day 3 (14% of incubation) and analysis at day 11 (52%) of incubation is comparable to approximately 5.9 weeks and 21.8 weeks of human gestation, with a treatment length covering 38% of embryonic development. The average body weight for no treatment was 5.3±0.4 gr, for control oil 5.0±0.6 gr, and for CBD oil-treated embryos 5.3±0.49 gr. The body lengths were 5.1±0.21 cm, 5.1±0.25 cm, and 5.2±0.3 cm, and the heart weights 0.055±0.017 gr, 0.058±0.014 gr, and 0.06±0.006 gr, respectively. We did not detect any significant difference between the no treatment, oil control or CBD for any of the measured categories ($p>0.05$). Although our study covered a significant proportion of incubation, it is difficult to directly compare developmental timing in model systems with such disparate incubation/gestation times between chickens and humans. However, this study does suggest that a one-time pharmacological dosing of CBD does not significantly impact embryonic body weight, length or heart weight.

CHARACTERIZATION OF N-OCTANOL RELATED ETHER ALCOHOLS.

Anthony Gonzalez and Dr. Markus Hoffmann. SUNY Brockport.

Polyethylene glycol (PEG) is a ubiquitous industrial polymer that is a byproduct of petroleum refinement. PEGs of lower molar weight are liquids that are nonhazardous, biodegradable, and environmentally benign and are therefore attractive as a green solvent. The intermolecular interactions of PEG include a rather complex interplay between inter- and intramolecular hydrogen bonding. This study focuses on n-octanol related ether alcohols where there is only one alcohol and one ether function present in the molecular structure. These molecules are thus simpler models of PEG. Specifically, we study the effect of the position of the ether group in the molecule on the physical properties density, viscosity, and self-diffusion, to establish correlations between structure, hydrogen bonding, and resulting physical properties. We also compare the effect of the presence of the ether moiety with n-octanol, which

does not possess an ether functionality. The ether alcohols were all denser than n-octanol by (75-100) kg/m3, less viscous by (1-4) mPa*s and more mobile by about (1-2) 10-10 m2/s at room temperature, respectively. Future work will simulate the molecular dynamics of these ether alcohols to help interpret the observed experimental trends on a molecular level.

CLUSTER B PERSONALITY DISORDER SYMPTOMS ARE DIFFERENTIALLY RELATED TO EMOTION REGULATION DIFFICULTIES.

Finn S. Cohen, Rebecca J. Houston, and Joseph S. Baschnagel. Rochester Institute of Technology.

Cluster B personality disorders are considered the "dramatic, erratic, or emotional" disorders. This category includes borderline, histrionic, narcissistic, and antisocial personality disorders. Despite the role of emotion regulation difficulties in these disorders, few studies have compared the different facets of emotion regulation in this population. Participants (N = 310) between the ages of 18 and 82 (M = 28.45; SD = 13.94; 54.5% female) were recruited to complete an online survey. The survey consisted of demographic questions, the Difficulties in Emotion Regulation Scale (DERS), and the Cluster B items from the Personality Diagnostic Questionnaire (PDQ). A multiple regression was conducted as a path analysis with the six subscales of the DERS regressed on levels of the PDQ scale scores to ascertain the relationship between different facets of emotion regulation and each of the Cluster B personality disorders. Difficulties controlling impulses was significantly associated with symptom scores for all four disorders. Lack of access to strategies was significantly associated with borderline personality disorder symptoms (BPD; $\beta = .44$, $p < .001$), and difficulty engaging in goal-directed behavior was significantly negatively associated with narcissistic personality disorder (NPD; $\beta = -.19$, $p = .014$). These unique associations may be attributed to the unique characteristics of these disorders, such as BPD's association with a cycle of dysregulation and NPD's characteristic preoccupation with success and achievement. These findings support evidence for treatments that enhance impulse control and highlight distinct aspects of emotion regulation that may represent additional intervention or treatment targets for these disorders.

COMPARATIVE ANNOTATION OF A REGION OF THE *DROSOPHILA KIKKAWAI* FOURTH CHROMOSOME (MULLER F ELEMENT)

Matthew Skerritt. SUNY Corning Community College.

The *Drosophila melanogaster* Muller F element (fourth chromosome) is a small, mostly heterochromatic region of the genome containing genes that, unexpectedly, are expressed at or near euchromatic levels. To better understand the regulation of genes operating in this environment, we have annotated a small region (contig 50) of the *D. kikkawai* Muller F element. This information will be used to compare and contrast the types and distributions of conserved regulatory regions for two specific genes found in *D. melanogaster* and *D. kikkawai*. The larger goal of the project is to compare the structure of the fourth chromosome in *D. melanogaster* to the four known *Drosophila* species (including *D. kikkawai*) with a highly expanded (~13X) F element in an effort to identify the factors responsible for such expansion.

COMPOSTING INITIATIVES IN ROCHESTER AND ALBANY NY METRO REGION PUBLIC SCHOOL DISTRICTS

Maddie Tlachac, Rodhy Vixamar, and Kaitlin Stack Whitney. Rochester Institute of Technology.

In the US, many kids are getting food provided by their schools, with 4.9 billion lunches provided per year by the National School Lunch Program. The World Wildlife Fund estimates that over 500 thousand tons of food waste are generated in schools every year in the US. This amounts to 18 thousand pounds of food waste for the average elementary school or almost 70 pounds per student per year. All that food waste contributes to enormous amounts of greenhouse gas emissions, exacerbating climate change. There are several ways to prevent and reduce food waste in schools and its impacts, such as composting. A recent report by ReFED and the Harvard Law School Food Law and Policy Clinic identified "Support Food Waste Reduction and Recovery Programs in Schools" as one of nine policy opportunities for local governments to reduce food waste. Over the past year, we have explored if and how public school districts across Rochester metro and Albany capital regions of New York are using composting to manage food scraps and waste. We collected publicly available data recording if each district currently had composting in cafeterias, whether they had composting in other parts of the school or other locations entirely, whether the composting was district-wide or pilots, and the number of students enrolled. Across the two metro regions in our study area, there are 145 public school districts. The Greater Rochester region has 53 districts serving a total of almost 141,000 students, and the Capitol District has 92 districts, with just over 155,000 students. Overall, we found 11 schools are partially composting or are composting in the school cafeteria with four in the Albany metro region and seven in the Rochester metro region. Our results provide a comprehensive survey to identify gaps within local

school districts relating to composting initiatives within the cafeteria as well as the entire district. There are many more steps that school districts and local governments within New York can take to address wasted food.

CY5 AND CY5.5 PROBES FOR IMAGING AND PHOTODYNAMIC THERAPY FOR BREAST CANCER.

Gabriella Redman. Rochester Institute of Technology.

The aim of our summer 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 goal involves synthesis of a dual-dye system for fluorescence guided surgery (FGS) and photodynamic therapy (PDT) of BrCa using a near infrared (NIR) dye and a photosensitizer (PS) dye, then coupling this dual modal dye system to a peptide called 18-4 that targets BrCa cells. The aim is to show, with Biology researchers, that 18-4 is an effective targeting system. The synthesis method is to use a modular "puzzle piece" approach to attach Cy5 and Cy5.5, which are Near IR dyes with properties ideal for CFM, to the targeting 18-4 peptide. Our hope is to show that good binding properties of the probe will lead to an effective agent for both imaging and therapy of BrCa.

DECREASING THE *par-1* EXPRESSION IN THE TOUCH RECEPTOR NEURONS OF *C. Elegans*.

Jade Greene. St. John Fisher University.

Cell polarity, essential for development and tissue organization, is regulated by the *par-1* gene in *Caenorhabditis elegans* and the MARKs genes in humans. In *C. elegans*, *par-1* directs asymmetric cell division and neuronal polarity, revealing fundamental polarity principles. Similarly, human MARKs kinases modulate microtubules crucial for neuronal and epithelial polarity. Does *par-1* play a role in the structure of touch receptor neurons? Is *par-1* required for *mec-18* localization? *C. elegans* underwent RNAi treatment to decrease the *par-1* expression. This decrease resulted in abnormal touch receptor neuron structure. Our results suggest that *par-1* plays a role in the polarity of the touch receptor neurons.

DETERMINING THE MECHANISTIC RELATIONSHIP BETWEEN KRSB AND RAP1 IN MEDIATING CELLULAR ADHESION IN *DICTYOSTELIUM DISCOIDEUM.*

Megan Arnold and Dr. Yulia Artemenko. SUNY Oswego.

Directed cell migration, for example in response to a chemoattractant, plays an important role in a variety of physiological and pathophysiological processes, including embryonic development and metastasis. In the social amoeba *Dictyostelium discoideum*, a commonly used model organism for the study of directed migration, kinase responsive to stress B (KrsB) was found to play an important role in regulating cell spreading and adhesion, which are critical for successful migration. Although the mechanism by which KrsB negatively regulates cellular adhesion is unknown, one possible mechanism may involve an interaction with another adhesion regulator, small GTPase Rap1. To determine if KrsB acts by inhibiting Rap1, we examined adhesion of wild-type and KrsB-null cells transformed with various RFP-tagged Rap1 constructs and an inducible plasmid containing GFP-tagged KrsB. Successful plasmid expression was confirmed using fluorescence microscopy. Quantification of adhesion and spreading in these cell lines is ongoing. Additionally, to investigate if KrsB alters Rap1 activity via phosphorylation, we are attempting to analyze changes in the electrophoretic mobility of Rap1 on an immunoblot in cells with modified KrsB expression following stimulation with a chemoattractant.

DIADENOSINE POLYPHOSPHATASES OF THE NUDIX HYDROLASE SUPERFAMILY IN *M. TUBERCULOSIS* AND *M. LEPRAE*

Andrew Seyler and Suzanne F. O'Handley. Rochester Institute of Technology.

M. tuberculosis contains 11 potential Nudix hydrolases, and we are characterizing these enzymes as potential novel antibiotic targets. The diadenosine polyphosphatases (ApnAases) / mRNA decapping enzymes are a family of enzymes within the Nudix hydrolase superfamily. In *M. tuberculosis* there is the primary Nudix ApnAase and the secondary Nudix ApnAase. There are also orthologs of these two ApnAases in M. leprae. The diadenosine polyphosphatases from *Legionella pneumophilia* and *Bartonella bacilliformis* have been found to be important in each pathogen's ability to invade its host cells. It is of interest to know whether these enzymes act in the same way in *M. tuberculosis* and *M. leprae*. If they are all found to be involved in invasiveness and thus in virulence, then these enzymes could be novel antibiotic targets. We have cloned and overexpressed each protein and have subcloned each into a HisTag vector to optimize purification. The *M. leprae* enzymes express too insolubly to purify and characterize, and thus we are working on increasing the expression of soluble protein so that we can study these enzymes as well; currently we know that they each have ApnAase activity. This research has been supported by an NIH AREA grant,

a CUR-Goldwater Scholars Faculty Mentor Award, an ASBMB undergraduate research award, and a RIT honors SURF.

DIVERSITY AND ANTIBIOTIC RESISTANCE OF BACTERIA ISOLATED FROM THE ROCHESTER, NY EMBAYMENT.

Brad O'Neill, Nate Taylor, and Dr. Maryann Herman. St. John Fisher University.

Bacterial diversity reveals information about the ecological community as well as ecological processes, epidemiology, and allows for the prediction of population shifts within the environment. Coincidently, antibiotic resistance is currently and has been a growing problem since the mid-1900s. This pressing issue leaves fewer options to treat bacterial diseases and leaves communities with stronger, more diverse bacteria to fight off. This study examined the diversity of bacteria in the Rochester (NY) waterways and investigated antibiotic resistance of *Acinetobacter* species, bacteria associated with nosocomial infections. Bacterial isolates were identified via PCR amplification and sequencing the 16S ribosomal DNA region. Resistance to six common antibiotics was assessed in *Acinetobacter* species using the Kirby-Bauer disk diffusion susceptibility test. Fifty-eight bacterial isolates were sequenced. *Acinetobacter* and *Pseudomonas* species were most common, representing 28% and 26% of the isolates, respectively. Of the fourteen *Acinetobacter* species tested, 86% were resistant to ampicillin. All isolates were either intermediate or resistant to erythromycin, and 86% were either intermediate or resistant to sulfamethoxazole. These results are part of an ongoing project mapping bacterial species distribution in Rochester waterways over a six-year period.

DYADIC FUNCTIONING INTERVENTIONS - INFLUENCING NEW PARENTS' LANGUAGE USE

Faith Valentine, Dr. Stephanie Godleski, and Emily Verdaasdonk. Rochester Institute of Technology.

First-time parents are prone to suffering from maladaptive relationship conflict after the birth of their child (Linville et al., 2017). In an effort to foster healthy relationships and child development, the Strong Family Foundations' intervention programs allow new parents to build communication and parenting skills, pre and postnatally. Couples are randomly assigned to one of two conditions. The intervention condition specifically has a strengths-based focus on working together. Previous work conducted by Starks and colleagues (2020) suggests that the promotion of healthy communication is bidirectional and that linguistic patterns can reveal evidence of dyadic functioning. Spanning 5 groups and both conditions, preliminary analyses of 12 couples' transcripts using LIWC-22 suggest that our interventions have been successful in encouraging equal contribution from partners in conversations about family and the transition into first-time parenthood. Parents in the intervention group also exhibit a decrease in self-focus and higher Language Style Matching scores.

EASTERN WHIP-POOR-WILL NEST SELECTION AND SURVIVAL IN NORTHERN NEW YORK.

Asch McDonnell, Kristen Malone, Jacob Straub, and Matt Palumbo. SUNY Brockport.

The Eastern Whip-poor-will (EWPWs: *Antrostomus vociferus*) is an IUCN Near Threatened species that has declined throughout its range. This decline is presumably due to loss of breeding habitat, so research into EWPW breeding ecology is essential for conserving their populations. EWPWs are challenging to count in widespread diurnal bird surveys, and research on individual habitat use and nesting is limited. Our research will address nest habitat preference and nest survival of EWPWs in northern New York through a telemetry-based study during the 2023 and 2024 breeding seasons. During the 2023 breeding season, we deployed VHF telemetry transmitters on 15 male EWPWs between mid-May and late June. We tracked each bird from the time of capture until early August, resulting in 12 - 23 points per bird (n = 264 locations) and an average home range size of 5.73 hectares. We located 14 nests with a naive nest success was 57.1 and a daily nest survival of 98.5%. We confirmed deer and opossums as nest predators. Eastern whip-poor-wills are a target species for conservation in New York, and our research will be valuable to informing future early successional forest management in the state.

EFFECT OF HABITAT CHARACTERISTICS ON LEAST BITTERN OCCUPANCY IN MISSOURI

Ryan McGinty, Dr. Kristen Malone, Dr. Lisa Webb, Dr. Arianne Messerman, Dr. Janet Haslerig, and Doreen Mengel. SUNY Brockport.

The Least Bittern is a species of secretive marsh bird that depends on wetland habitat throughout their lifecycle. Missouri has lost an estimated 87% of its wetlands over the past 200 years, leading to a decrease in the available habitat for wetland-dependent bird species. The Least Bitten is a species of conservation concern in Missouri, and is one of the few species of secretive marsh birds to breed in the state. The purpose of this project is to determine the effect of habitat characteristics and wetland management practices on Least Bittern site occupancy in Missouri. To accomplish this, we conducted call-playback surveys at 84 survey points

across 14 public wetlands throughout the state. We collected habitat data at every point, and included percent cover of tall emergent vegetation, short emergent vegetation, woody vegetation, dead standing vegetation, open water, and bare ground. For each wetland, we collected data on the management practices carried out in the previous 5 years. We used an analytical approach that estimated and accounted for low detection probability of Least Bitterns. We detected Least Bitterns at 18 survey points throughout the state. Least Bittern site occupancy was positively associated with percent cover of both tall emergent vegetation (effect size = 0.029, 95% CI = 0.004 – 0.061) and open water (effect size = 0.055, 95% CI = 0.018 – 0.098) and negatively associated with percent cover of both short emergent vegetation (effect size = -0.028, 95% CI = - 0.027 – -0.001) and bare ground (effect size = -0.047, 95% CI [-0.094, – -0.010]). We did not find an effect of woody vegetation or dead standing vegetation on Least Bittern occupancy. Our next steps include determining the effects of wetland management practices on Least Bittern site use. The decrease in wetlands throughout Missouri coupled with the current status of Least Bittern in the state, suggest that the few remaining wetlands are crucial for the persistence of Least Bittern within Missouri. The results of this project may help inform what type of habitat characteristics can be managed for within Missouri wetlands for the benefit of Least Bittern

EFFECTS OF VEGETATION CHARACTERISTICS AND TIME-SINCE MOWING ON NEST-SITE SELECTION AND NEST SURVIVAL OF SAVANNAH SPARROW (PASSERCULUS SANDWICHENSIS) IN WESTERN NEW YORK.

Hailey Mitchell and Dr. Kristen Malone. SUNY Brockport.

Since the 1970s grassland bird populations have been declining. The main causes of the decline include habitat loss and degradation. This decline has led to the need for more information on what habitat characteristics are needed for grassland birds to successfully breed and how management practices impact breeding success. Our objective was to determine the nesting habitat preferences of Savannah Sparrows (*Passerculus sandwichensis*) and how nest-site characteristics, along with mowing practices influence the probability that a nest will fledge young (nest survival). We conducted this study over an 8-week period at John White Wildlife Management Area in Basom, New York. We searched for Savannah Sparrow nests using behavioral cues and monitored them every 2-3 days to determine nest fate. Vegetation characteristics at each nest along with a corresponding random point were measured. We also gathered data on the history of mowing practices at each field within our study site. We found and monitored 21 Savannah Sparrow nests. Using logistic regression, we found that nest visibility within a 1-meter radius of the nest was a significant factor in nest-site selection (**=** -0.12583, 95% CI [0.7861674, 0.9889889]). Vegetation height, litter depth and vertical vegetation density did not influence nest-site selection. The probability that a nest survived a single day was 0.951 (95% CI [0.911, 0.980]). Vertical vegetation density at 5-meters from the nest had a significant positive effect on nest survival (μ = 1.303, 95% CI [0.243, 2.734]). Our next steps include analyzing how mowing data along with plant species, percent switchgrass and distance to edge effects nest-site selection and survival. The results we find could be used to help managers create high quality habitat for Savannah Sparrows.

EFFORTS TO RESTORE A ONCE THRIVING POPULATION OF NORTHERN SUNFISH (*LEPOMIS PELTASTES*) TO TONAWANDA CREEK, NEW YORK.

Reece Lenz, James Haynes, and Matthew Altenritter. SUNY Brockport.

Northern Sunfish (*Lepomis peltastes*) were once a thriving species of sunfish in Western New York. However, by 2009, this species was declared extirpated in the region. The goal of this research project was to pilot an effort to reestablish this species in one of its last known locations, Tonawanda Creek located just east of Buffalo, NY. 3,109 Northern Sunfish were collected from the Randolph Fish Hatchery maintained by the New York Department of Environmental Conservation, marked with a small fin clip, and stocked into different locations in the lower portion of Tonawanda Creek on May 30th and May 31st of 2023. Afterward, we searched for stocked individuals using boat and backpack electrofishing once in mid-July and again at the end of September. Previously stocked Northern Sunfish were successfully caught during both recapture attempts near the original stocking locations. This indicates that stocking was successful, and that Northern Sunfish are surviving in Tonawanda Creek at least over the short-term. Next steps include follow-up surveys for stocked individuals in the spring of 2024 to assess longer-term survival and the overall efficacy of stocking as a method to reintroduce this once thriving species in Western New York.

EVALUATION OF A qPCR BASED ASSAY TO DETERMINE AGE BY RELATIVE TELOMERE LENGTH

Justine Simms, Madison Lawley, and Thomas Jensen. Wells College.

In conservation, captive propagation, and zoological breeding programs, life expectancy, stress, and age are significant factors to consider when choosing breeding or release candidates. However, these are factors that are often difficult to determine, especially if animals are wild-caught or part of *in situ* studies. Previous research using various techniques has shown that relative telomere length or rate of telomere loss can be correlated to both life expectancy, stress, and age. However, for a method to be useful to the conservation community, methods must be standardized, cheap, easy to perform, and compatible across a broad range of taxonomic groups. Due to this requirement of universality across taxonomic groups, we are evaluating the use of the highly conserved 18S as a universal reference primer together with the previously published telomere qPCR primers Telg and Telc (Cawthon, RM. 2009). We are currently evaluating whether the universal RTL qPCR assay can differentiate age groups in several mammalian taxonomic groups, including Rodentia (porcupine), Didelphidae (opossum), and Carnivora (domestic dog).

EXAMINATION OF THE ROLE OF THE GLYCOCALYX IN SHEAR FLOW-INDUCED MIGRATION OF *DICTYOSTELIUM DISCOIDEUM*.

Juziyana Fortuna, Valeriia Tarallo, and Yulia Artemenko. SUNY Oswego.

Cell migration guided by mechanical cues such as shear flow has not been thoroughly studied, even though shear forces affect various cells in the human body, including cells of the immune system and cancer cells that escape the primary tumor. Social amoeba *Dictyostelium discoideum* is an excellent model organism for studying directed cell motility, including in response to shear flow. Although shear forces activate the same signal transduction network as chemoattractants, it is unclear how cells initially sense mechanical stimuli. Integrins have been implicated in mechanosensation; however, immune cells do not always require integrins for migration and *D. discoideum* lacks integrins, suggesting that other adhesion mediators may be involved in sensing and transmitting mechanical cues in cells that exhibit amoeboid-type motility. Since *D. discoideum* glycocalyx is involved in non-specific adhesion of these cells to the substrate, we hypothesized that the glycocalyx is involved in the cells' ability to respond to mechanical cues. Given the mannose-rich composition of *D. discoideum* glycocalyx, we used mannose to interfere with the glycocalyx-substrate interaction. Addition of mannose changed the morphology of the cells, making them more circular and less spread compared to controls, and reduced random migration. Despite the morphological changes, actin polymerization in response to acute stimulation with shear flow was comparable to control cells. When exposed to shear flow continuously, mannose-treated cells migrated slower, but were able to orient against the flow similarly to controls. To further test the hypothesis, we treated cells with α-mannosidase to disrupt the glycocalyx by enzymatic degradation. Similarly, to the observations with mannose, acute mechanical stimulation assays showed no significant changes in actin polymerization in α- mannosidase-treated cells compared to controls. These findings suggest that disruption of the glycocalyx in *D. discoideum* does not block the cells' ability to respond to shear flow under the conditions used in this study. The possibility that changes in glycocalyx composition may affect the sensitivity to sub-saturating mechanical stimuli remains to be examined.

FUNCTIONAL CHARACTERIZATION OF PROTEIN STRUCTURE 2O14

Gregg Holliday and Julia R. Koeppe. SUNY Oswego.

Over 3800 structures in the Protein Data Bank (PDB) have unknown function. The Biochemistry Authentic Scientific Inquiry Lab (BASIL) curriculum uses authentic inquiry to teach students to use structural bioinformatics tools to compare these structures to known enzymes and predict a function. We have predicted that the protein structure with PDB ID 2O14 has esterase or lipase function after performing both global and local structure alignments to identify similar structures in the PDB. The local structure alignments also identified amino acids that match the Ser-His-Asp active site motif of serine hydrolases. Sequence alignment data from BLAST and InterPRO provide additional support for categorizing structure 2O14 as an esterase or lipase. After expressing and purifying the 2O14 protein using standard wet-lab biochemistry techniques, we performed kinetic assays using chromogenic substrates to test for esterase activity. Our testing confirms that 2O14 shows significant esterase activity in hydrolyzing both p-nitrophenyl acetate and p-nitrophenyl butyrate. We will be using site-directed mutagenesis to confirm the location of the active site. This project has been supported in part by NSF IUSE and 2141908.

GROUP SIZE INFLUENCES THE PROBABILITIES OF CHOOSING A FOOD RESOURCE IN THE COMMON ROUGH WOODLOUSE.

Paul Shipman, Evelyn Andersen, Alexis Chiang, Marissa Giuntoli, Keith Grant, Isabel Hanick-Herman, Owen Hunter, Izzy Moyer, Aneesh Nallani, Sylvan Taylor, Emma Thompson, Mira Thompson, Sioana Vimahi, Omai Ya, and Hannah Zarum. Rochester Institute of Technology.

We studied the influences of group size on the behavior of the common rough woodlouse, *Porcellio scaber*, using a series of binary choice experiments. This species of isopod is a widely distributed cosmopolitan crustacean, an important decomposer in terrestrial ecosystems, and exhibits gregarious social behavior. In previous work by other researchers, this species has been reported to form aggregates in binary choice experiments for shelters at densities above 10. It has been hypothesized that these aggregations form due to a quorum response. Here, we studied the probabilities of isopods choosing a food resource (absent shelter) in a series of replicated experiments above and below the hypothesized quorum threshold at 1, 2, 5, 10, 15, and 20 isopods. Using Bayesian inference with a prior probability set at 50% along with linear regression, we observed a significant positive relationship between increasing group sizes and the posterior probabilities of isopods choosing the food resource below densities of 15. At densities above 10, we found reduced probabilities of isopods choosing the food resource. Our research supports the quorum threshold hypothesis for aggregation reported in previous research, and suggests that this species may exhibit independent behavior until a quorum threshold is met.

IDENTIFYING HISTORICALLY COLLECTED LARVAL COREGONINES TO SPECIES USING A REDESIGNED GENETIC ASSAY.

Collin Atwood, Joe Sweeney, Morgan Bulger, Preston Fuerbacher, Kayelah Brown, Dr. Nick Sard, and Dr. Jim McKenna. SUNY Oswego.

Native coregonines are integral planktavores in the Great Lakes ecosystem. Accordingly, efforts to reestablish these fishes contributes to the ecosystem's stability and resilience. Cisco (*Coregonus artedi*) and Lake Whitefish (*Coregonus clupeaformis*) were once abundant coregonines in the Great Lakes. However, over the 1900s both species declined in population size due to overfishing and competition with the non-native fishes. In the context of ongoing restoration efforts, larval coregonine species identification is necessary to better understand the factors that affect recruitment. Yet, phenotypic plasticity makes it difficult to visually differentiate Cisco and Lake whitefish at the larval stage. To address this impediment, a Polymerase Chain Reaction Restriction Fragment Length Polymorphism (PCR-RFLP) assay that identifies each species was developed in 2018. Among historical samples collected in Chaumont Bay, Lake Ontario, PCR-RFLP results indicated low amplification success with the original assay. We modified the assay by increasing the amount of template, MgCl2 concentration, and the number of PCR cycles. These changes moderately increased (39.2% ± 23%) amplification success, and thus the ability to correctly infer species. Despite the modifications to the original assay, a high proportion (60.8% ± 22.8%) of larval coregonines remained unidentified. Preliminary data indicate a redesigned, shorter (202 base pair) assay improved amplification success. The redesigned assay will enable the evaluation of a multi-decade larval coregonine time series so that climatic-related factors affecting coregonine population dynamics can be studied, and thus used to conserve these imperiled species.

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

vanLieshout, C.A., Wrobel, S.E., 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. Populations of the woodland salamanders have become fragmented due to human development. Here we assess the effect of habitat fragmentation in the salamander populations along the Niagara Gorge on the effective population size. We will amplify microsatellite loci from historical (2008) and current DNA extracted from salamander tail samples in a larger, intact population and a smaller fragmented population. We analyze the microsatellites by MetaPhor agarose gel electrophoresis after PCR and clean up with previously optimized PCR primers. Historical and current sequences show loss of microsatellite alleles in the two populations after the short ten-year period. Additional samples and loci will be needed to demonstrate the effect of fragmentation over a short period. This work will provide us with future insight on

the effects of fragmentation in other (endangered) salamander populations

IMPACT OF TRAFFIC NOISE ON GREEN FROG VOCALIZATION PATTERNS.

Micah Hosley. SUNY Geneseo.

The impacts of anthropogenic activity, including noise pollution, have been linked to a global decrease in amphibian species. Understanding how animals respond and adapt to human-created background noise can help us better manage noise as a threat. Male frogs produce species-specific vocalizations at breeding sites to attract mates. We are asking: can frogs adjust their calling behavior to avoid masking traffic noise? To answer this, we are examining the behavioral calling responses of green frogs (*Hylarana erythraea*), a common New York species, to traffic noise. Our first challenge was to define traffic noise. We developed novel criteria for defining the presence of traffic noise based on the waveform from our recordings. We are assessing acoustic recordings collected in 2019 from three known frog breeding sites in the Genesee Valley along I-390. We analyzed recordings from 9 pm, shortly after sunset in, May and June, at permanent ponds near the I390 where traffic noise was present in the recording. Using spectrograms and waveforms in Raven Pro, we measured the time between frogs' calls and the beginning or end of traffic noise, also noting whether they called during traffic noise. We will present preliminary data on the relationship between traffic noise and green frog calling at the beginning of May 2019 and the entire month of June 2019.

IMPACTS OF EMERALD ASH BORER INVASION ON METHANE EMISSIONS FROM TREE STEMS.

Ethan Potter and Carmody McCalley. Rochester Institute of Technology.

The emerald ash borer has had large impacts on forested wetlands in the Great Lakes region. These wetlands are potentially large sources of the greenhouse gas methane (CH4) and this project helps address how the emerald ash borer invasion has impacted methane emissions from these ecosystems. Measurements focused on CH4 emissions from living and dead trees within forested wetlands with emerald ash borer induced tree mortality. Semi-rigid flux chambers were built and deployed on tree stems to quantify CH4 fluxes. Measurements were taken from dead ash trees, living silver maple trees, and living ash trees at 2 depressional forested wetland sites (located at RIT and Lehigh). The results of measuring methane emissions from alive and dead trees provides insight into the pathways and mechanisms of CH4 production and emissions. I hypothesized that ash borers will decrease methane emissions within wooded wetlands due to less effective transport of CH4 through dead trees as well as lower rates of CH4 production in soils due to less carbon substrate from root exudates. The results support lower methane emissions from dead tree stems within these emerald ash borer-affected wetlands. These findings suggest that the emerald ash borer invasion will decrease methane emissions from tree stems within impacted forests.

IN VITRO CYTOTOXICITY OF BISMUTH NANOPARTICLES

Ryanne Carr, Thomas O'Connor, Morgan Singleton, Katherine Chrisbacher, Zachery Thierman, Mary Elizabeth Kane, Molly Roesch, Kenneth Reed, and Gary R. Skuse. Rochester Institute of Technology.

The purpose of this study was to examine the in vitro cytotoxicity of diamagnetic bismuth nanoparticles in cancerous and non-cancerous cells. The ability to magnetically steer nanoparticles to specific sites within an organism ensures precise chemotherapeutic drug delivery. The selective chemotherapeutic agent, MKT-077, has been found to have an apoptotic effect on cancerous cells while maintaining non-cancerous cell viability. The successful synthesis of stable bismuth nanoparticles at a diameter of 5-10 nm in conjunction with MKT-077 as a selective chemotherapeutic agent exhibits favorable in vitro cytotoxicity towards cancerous cells. The non-cancerous control cell line used was CV1, Green African Monkey fibroblasts, while the cancerous cell lines included A459, human lung adenocarcinoma and T24, human bladder transitional cell carcinoma. Cell culture was performed with MEM, DMEM, and McCoy's media respectively, and maintained at 37°C and 5% CO2. After twenty-four hours, each cell line was treated with increasing concentrations of bismuth nanoparticles. Cytotoxicity was measured by a MTT cell viability assay at 1, 6, and 12-hour time points. A negative control consisting of a vehicular matrix lacking nanoparticles was used to ensure that bismuth cytotoxicity was solely observed. Our results suggest that at a concentration of 53.6 μM and 6-hour incubation of nanoparticle exposure, minimal differentiation occurred among cell death with nanoparticles versus the vehicular matrix control. These findings demonstrate that the bismuth nanoparticle system has minimal impact on cell viability, thereby supporting the notion that MKT-077 alone is responsible for the cytotoxicity. This suggests that if used in a therapeutic setting, these nanoparticles pose little to no risk of cytotoxicity to the patient.

IN VITRO INVESTIGATION OF MKT-077, A HIGHLY SELECTIVE CHEMOTHERAPEUTIC DYE

Morgan Singleton, Ryanne Carr, Katherine Chrisbacher, Thomas O'Connor, and Zachary Thierman. Rochester Institute of Technology.

Many current chemotherapeutic treatment options do not reliably distinguish between cancerous and non-cancerous cells while interfering with the process of DNA replication, thereby resulting in adverse side effects. The need for a selective chemotherapeutic agent is evident and would allow the immune system to be invigorated and reliably target cancerous cells, thus decreasing off-target health effects. The goal of this research is to characterize a selective chemotherapeutic treatment that promotes apoptosis in cancerous cells while sparing non-cancerous cells. This work focuses on MKT-077, a rhodacyanine dye, as a potentially selective chemotherapeutic agent. Cells were cultured in DMEM, MEM, or McCoy's media and maintained at 37 degrees Celsius and 5% CO2. Twenty-four hours after seeding, cells were treated with increasing concentrations of MKT-077. Trends were measured by counting cells at 1, 3, 6, 9, 12, 16, 20 and 24 hours. The cancerous cell lines used include PA1, an ovarian teratocarcinoma, T24, urinary bladder transitional cells, and A549, a lung adenocarcinoma line. Non-cancerous control lines include mouse fibroblast NIH 3T3 and African green monkey kidney fibroblast CV-1 cells. Our results demonstrated that when the cancerous cell lines were treated with MKT-077 a dramatic increase in cell death occurred over the span of 24 hours. In contrast, the control non-cancerous cells demonstrated low cell death and even achieved minimal growth over the same time period. These findings support our hypothesis that MKT-077 is a strong potential candidate for a highly selective chemotherapeutic agent in cultured cells, as it has demonstrated the ability to selectively promote apoptosis in cancerous cells while sparing non-cancerous cells.

INCREASED COLON PERMEABILITY PRECEDES SPLEEN INFLAMMATION DURING DSS-INDUCED ULCERATIVE COLITIS IN MICE.

Alaa Abdullah Al-Shalchi and Bernardo Ortega. SUNY Brockport.

Ulcerative colitis (UC) is an inflammatory disease of the colon. Studies on UC are often performed using mice treated with Dextran Sodium Sulfate (DSS), which induces permeability in the colon and spleen inflammation. Here we investigate the relation between increased colon permeability and spleen inflammation by looking at the evolution of both disease factors at different stages. Mice were treated for 1 to 6 days with 2% DSS in order to induce mild UC. At the end of this treatment, in order to assess intestinal permeability, mice were oral-gavaged FitC dextran, sacrificed after 4 hour and plasma was collected. We discovered that whereas spleen enlargement was evident on day 4, colon permeability increased already on day 3. Future research on the impact of various bacterial species in spleen inflammation should concentrate on the initial days (D3-D4) of DSS treatment.

INTRA AND INTERSPECIFIC COMPETITION VIA ALLELOPATHY AMONG NATIVE AND NON-NATIVE FLORA.

Mimi Byrne and Dr. Robert Warren. SUNY Buffalo State University.

Plant interspecific competition using chemicals (allelopathy) is common in natural systems. Plants can suppress competitor growth and inhibit seed germination by releasing allelochemicals. Plants also may compete intraspecifically, including their own progeny, via allelochemicals (autotoxicity). Allelochemicals are emitted through plant residues, leachation of living leaf tissue or debris, and rot exudates. Non-native species appear to gain a competitive advantage against native species by bringing novel allelochemicals to the invaded landscape. Non-native species may also succeed through decreased intraspecific competition leading to non-native species developing dense monocultures that overrun native plants. Non-native bottlenecking during introduction results in low genetic diversity that can allow non-natives to mitigate their own allelochemicals. It is unknown what the variation of allelopathic suppression looks like between and among native and non-native species. To assess this, we created two experiments. A greenhouse investigation of intra- and interspecific allelopathic competition between 2 native, non-native genetically related pairs and a laboratory experiment investigating intraspecific variation in the allelopathic effects of 2 field collected native, non-native genetically related pairs. I hypothesize that, if non-native plants limit native plants more than themselves, then I expect greater interspecific effects in the allelopathic greenhouse competition experiment. In addition, if non-native plants have less intraspecific genetic variation than native plants, then I expect less variation in non-native allelopathic effects than native plants in the allelopathy field experiment.

INVESTIGATING A POTENTIAL NULL ALLELE AFFECTING AN ASSAY USED TO IDENTIFY LARVAL COREGONINE SPECIES.

R. Gallagher and N. Sard. SUNY Oswego.

Coregonus artedi (Cisco) and *C. clupeaformis* (Lake whitefish) are important planktivores in the Great Lakes food webs. Due to a variety of factors including, overfishing, habitat degradation, and competition and predation from invasive species, Cisco and Lake whitefish populations declined throughout the 1900s. Both species are currently the focus of re-establishment and restoration efforts in Lake Ontario. Restoration efforts require accurate species identification to study factors associated with recruitment. Yet, morphological similarities make it difficult to accurately distinguish between the two species at the larval stage. Amplification of a mitochondrial locus using the polymerase chain reaction (PCR), and a restriction fragment length polymorphism (RFLP) visualized via gel electrophoresis has been used as a more reliable species identification method. Preliminary work by collaborators has suggested that Lake whitefish samples may fail to amplify the locus at higher rates than Cisco. We hypothesize that this is due to mutations in the primer binding region for Lake whitefish - creating a null allele. Primer-BLAST was used to evaluate sequences of this region for both species. We found Lake whitefish had three nucleotide mismatches at the reverse primer site as compared to two mismatches in Cisco, which supports this hypothesis. Additional predictions associated with amplification rates of two different established PCR protocols and analysis of variation at primer sites via Sanger sequencing will be used to test our hypothesis further.

INVESTIGATING APOPTOTIC EFFECTS OF A RHODOCYANINE DYE ON CANCER CELLS.

Katherine Chrisbacher, Dr. Gary Skuse, Dr. Kenneth Reed, Ryanne Carr, Thomas O'Connor, and Morgan Singleton. Rochester Institute of Technology.

Many chemotherapeutic treatments generally target rapid DNA replication in an attempt to kill cancer cells, but dividing healthy cells are harmed as well. This consequence results in the undesirable side effects commonly associated with chemotherapy. MKT-077, a rhodacyanine dye, selectively targets cancer cells *in vitro* while leaving healthy cells relatively unharmed. The mechanism behind this selectivity is unknown, but it is hypothesized that the dye interacts with heat shock protein 70 (hsp70), a suppressor of apoptosis which is often upregulated in cancer cells. This apoptotic suppression allows for the cancer cells to continue replicating and contributing to tumor growth. The dye's interaction may inhibit hsp70, causing the cancer cells to undergo apoptosis. Healthy cells are relatively unaffected due to their lack of hsp70 upregulation. To test this hypothesis, we assessed treated and untreated cells with an *in situ* TUNEL assay to identify apoptotic cells. Our preliminary findings indicate that MKT-077 selectively induces apoptosis in treated cancer cells.

INVESTIGATING BIRD PLUMAGE COLORATION USING REFLECTANCE SPECTROSCOPY

Lauren Walter, Todd Pagano, and Susan Smith Pagano. Rochester Institute of Technology.

The diverse array of colors displayed by avian plumage is the result of a variety of pigments and feather nanostructures. The source of pigments is often from the foods that the birds eat (and the metabolism of those pigment molecules). Plumage color patterns can be characterized through reflectance spectroscopy, which can help give clues as to the nature of the pigment responsible for the coloring. Using non-invasive fiber optic-based spectroscopy in the visible wavelength range, we measured the reflectance of plumage from preserved, whole-bird specimens representing a variety of passerine and non-passerine families. Our data reveal spectral characteristics of carotenoid-like pigments, particularly for yellow and orange birds. In the future, we hope to continue refining our methods and investigate the reflectance spectra of food sources that might be responsible for the plumage coloration.

INVESTIGATING SUGAR SOURCES USED FOR *SACCHAROMYCES CEREVISIAE* GROWTH TO IMPROVE TOXIC METAL UPTAKE POTENTIAL

Daniel Adelman and Lindsay Burwell. Wells College.

Saccharomyces cerevisiae (Baker's yeast) has been used as a bioremediation tool for toxic metals. In these experiments, yeast takes up the toxic metals, and the yeast cells are isolated, removing the metals from the solution. The amount of metal uptake by yeast depends on how much metal a yeast cell obtains before it reaches toxic levels. At toxic levels, metal triggers oxidative pathways in the cell, leading to the development of reactive oxygen species (ROS) and oxidative stress. Mitochondria are one of the main sites of ROS production. This project hypothesized that altering sugars used for energy production, which are known to have different impacts on mitochondrial density within the cells, will cause alterations in yeast growth. Both dextrose and raffinose were used in this experiment. Dextrose is known to repress mitochondrial biogenesis and shift yeast metabolism to fermentation pathways. This repression is not seen in yeast growing in raffinose. Therefore, it was

hypothesized that yeast cells would be more sensitive to copper-dependent oxidative stress in raffinose strains than in dextrose. Preliminary data show that yeast growth in the presence of copper was greater in dextrose than in raffinose. This result supports the hypothesis that lower mitochondrial density will help yeast survive metal toxicity. Future research will involve isolating the cells under these conditions and measuring oxidative status, mitochondrial activity, and copper uptake.

INVESTIGATIONS OF CU(I)-CENTERED PHOTOSENSITIZERS

Tyler Ziobro and Thomas M. Brown. SUNY Oswego.

Much of the technology we use on a daily basis emits light from a screen in order to display images and relay information. This light comes predominantly from the electron movement, relaxation and subsequent photon emission during metal-ligand charge transfer (MLCT) in a metal-centered photosensitizer. The photon emitted by a photosensitizer is characteristic to the structure of the discrete complex and can be tuned by 'decorating' a desired metal center with various functionalized organic ligands. Late-transition metals such as Ru and Ir provide excellent electronic frameworks for such complexes due to their innate triplet harvesting ability. However, the natural abundance of some of these metals is low enough to raise both economic and environmental concerns. A viable alternative to these other expensive transition metals is the use of Cu. Specifically, Cu(I) complexes have been shown to be capable of serving as photosensitizers in step with their electronic nature. This project serves to highlight the design, synthesis and characterization of a small library of Cu(I)-centered coordinated compounds for electrochemical analysis in the prospect of use as metal-centered photosensitizers in light-emitting electrochemical cells (LEEC's).

IRON-NITROGEN CYCLING WITHIN DEVIL'S BATHTUB, A FERRUGINOUS MEROMICTIC LAKE.

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

Meromictic lakes are rare, permanently stratified water bodies with distinct thermal and chemical layering with the ability to be modern analogs for Proterozoic water columns. Our study site, Devil's Bathtub (DBT), Rochester, NY, is a small, meromictic lake with anoxic and iron-rich (ferruginous) bottom waters. DBT is protected by a mature forest and glacial eskers, which reduce physical forcing partially explains the lake's stratification. Preliminary data from DBT indicates high nitrite, nitrate, and ammonia levels in the monimolimnion. Ammonia is expected to be high due to nitrite reduction, however the nitrate and nitrite levels are unexpected and currently unexplained. We sampled water from DBT and a nearby lake to analyze microbial communities as well as attempt to explain the unusual nitrogen levels, finding that some microbes perform feammox. Feammox is a metabolism combining oxidation of ammonia and reduction of Fe(III). We use a combination of 16 rRNA sequencing along with chemical and physical lake properties for examining seasonal changes in depth profiles. We hypothesize microbes performing feammox are present, leading to increased nitrate and nitrite amounts. As DBT is an analog for early Earth's oceans, feammox metabolism is useful to help us understand the correlation of iron and nitrogen cycles before the Great Oxidation Event. Overall, the physicochemical and microbial community structure within Devil's Bathtub provide a unique opportunity to study complex interactions between iron, carbon, nitrogen, and sulfur cycles, with a potential connection to the Proterozoic era.

LENGTH REGULATION OF FLAGELLA CHLAMYDOMONAS

Abigail Wojehowski. Rochester Institute of Technology.

Chlamydomonas reinhardtii, a single-celled algae, uses its two equal-sized, microtubule-based structure called flagella for motility. Experiments have revealed that when one flagellum is severed, the other retracts until they reach equal lengths, after which they grow together. The cellular mechanisms that enable this response are not well understood. Here, we develop mathematical models to study the growth dynamics of flagella for a variety of severing experiments. Assembly and maintenance of flagella requires a microtubule-based transport system known as intraflagellar transport (IFT). During IFT, proteins destined for incorporation into or removal from a flagellum are carried along microtubules via IFT particles. We consider the role of depolymerizers that are carried by IFT particles to the flagellum tip, along with protein synthesis and find that it recapitulates the response of Chlamydomonas to severing experiments. This work aims to broaden our understanding of how different mechanisms can work together to maintain organelle size

LOCAL GRASSLAND CRICKETS USE ACOUSTIC PARTITIONING TO AVOID CALL COMPETITION.

Dr. Kristina Hannam, Émilie Fallows, Sophia Macaluso, and Bryan Armpriest. SUNY Geneseo.

Recent assessments of insect populations suggest significant decline in diversity and abundance across the globe. Species diversity and abundance is

influenced by the number of available niches, and for calling species, those niches include temporal and frequency components of acoustic space. One non-invasive way to sample insect populations is to record acoustic signals used by these animals, and we can use these recordings to assess competition for acoustic space. Acoustic recordings gathered from a quiet local grassland from July through September of 2022 were analyzed to determine if the previously determined most abundant ground cricket species, Sphagnum Ground Cricket (*Neonemobius palustris*), Carolina Ground Cricket (*Eunembius carolinus*), and the Striped Ground Cricket (*Allonemobius fasciatus*), use frequency or call timing differences to avoid call masking with respect to one another, an advantageous behavior for effective interspecies communication. We used Raven Pro software to analyze the first two minutes of acoustic data for five Mondays during the calling season between 3:00 P.M. and 12:00 A.M. EST, recording call abundance and peak frequency for each species. We found evidence that the Sphagnum Ground Cricket uses frequency partitioning to avoid acoustic competition with the other two species, and that the Carolina and Striped Ground Crickets use temporal partitioning across the 3:00 P.M. to 12:00 A.M. period to avoid masking each other. Now, we are analyzing recordings from another quiet grassland site to see if the same findings can be reported, while looking forward to analyzing a grassland site exposed to frequent anthropogenic noise in order to determine if humans are impeding the ability of crickets to communicate with one another.

MAGNIFICENT MUONS: MEASURING THEIR LIFETIME AND FLUX.

William Foox, James Sarver, and Timur Piskiner. Hobart and William Smith Colleges.

Muons are a byproduct of cosmic rays colliding with the atmosphere, creating subatomic particles that undergo spontaneous decay. But why are muons magnificent? Muons are 200 times more massive as electrons and move at near-light speeds; they are subjected to Einstein's theory of relativity, thereby providing a level of elegance for particle physics and having practical applications in many different disciplines such as: archeology, meteorology, and tomography. Firstly, we investigate the variations in muon flux, as we change the shielding of the muon detector. The muons' incidence area on the detector was changed by shielding portions of the Geiger tubes with various materials. Secondly, we built a random number generator (RNG) based on the unpredictable behavior of the muon. Comparisons with existing pseudo-random number generators are conducted to evaluate the Geiger-based RNG's efficacy and uniqueness in generating truly random sequences. This poster presents data from both experiments.

MODULATING ANTIOXIDANT DEFENSE SYSTEM IN PLANTS WITH NITRIC OXIDE DEPENDENT MODIFICATIONS.

Kayla Filiatrault and Lindsay Burwell. Wells College.

Global warming has caused a decrease in arable land while the world population is increasing. This creates huge challenges in producing enough food to feed the world population. Efforts are being made to improve the ability of crops to survive in hostile environments to secure our precious food supply. One approach involves developing new crop varieties that can withstand this stress using GMOs and selective plant breeding. However, this approach takes a lot of time. Another approach is to learn how to alter a plant's biochemistry to turn on protective enzymes, such as glutathione peroxidase. Previous work has shown that Cys-SNO treatment of *Arabidopsis thaliana* improved its ability to grow under salt stress and activated another enzyme in the antioxidant pathway, ascorbate peroxidase. The work from this project has found that glutathione peroxidase is activated in a nitric oxide-dependent manner using an S-nitrosothiol molecule, Cys-SNO. Future work will investigate if this activation also helps plants deal with other stressors, such as pH, and determine if there are conditions where small S-nitrosothiol can be increased under stress conditions to protect plants. The chemical mechanism behind the nitric oxide-dependent protein modification leading to activation will also be investigated.

MOLECULAR DIET ASSESSMENT OF DAPHNIA GALEATA IN THE LOWER NIAGARA RIVER.

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

Zooplankton play an integral role in freshwater and marine nutrient cycling due to their consumption of phytoplankton, the primary source of nitrogen and carbon in these ecosystems. These nutrients are moved up the food chain linking fish and other larger organisms to the primary producers. The Niagara River is a freshwater strait connecting Lake Erie and Lake Ontario. The zooplankton of the river are primarily a product of the eastern basin of Lake Erie, with abundance decreased by the stress of the turbulence of the river flow and falls. By looking at dietary preference, this will help us understand further impacts on the food chain. Here, we examine zooplankton and water samples taken in the lower Niagara River over eight weeks from July to August 2023 and assess dietary preference in *Daphnia galeata* using molecular techniques. DNA was

extracted from whole organisms using a modified protocol with a Qiagen DNeasy blood and tissue kit and the 16S rDNA (V3-V4) region was amplified using techniques developed in previous laboratory experiments. Using Illumina MiSeq Next-Gen sequencing, we will demonstrate the diet preference of *D. galeata* against the phytoplankton communities in the water column. As this work is expanded, we will clarify trophic interactions and nutrient cycling in the Niagara River and eastern Lake Erie. Future work will include diet analysis and abundance of additional samples and zooplankton taxa in the Niagara River

MOLECULAR IMAGING PROBES FOR FLUORESCENT IMAGING AND PHOTODYNAMIC THERAPY OF BREAST CANCER

Micah Hrubec. Rochester Institute of Technology.

The first goal of this summer research was to synthesize a targeted molecular imaging agent (TMIA) for the fluorescent imaging of breast cancer (BrCa). The second goal was to combine a similar TMIA with a molecularly targeted photosensitizer (MTPS) to produce a TMIA-MTPS for the purpose of combined fluorescent imaging and photodynamic therapy (PDT). The ultimate goal is to develop an intravenous agent that can both visualize and guide surgery while also adding the PS payload to kill BrCa cells using PDT in a singular intraoperative procedure. In addition to guiding the surgery, in which the cancer can be removed with precision, PDT applied in the surgical cavity will selectively treat microscopic residual tumors with minimal side effects, reducing reoccurrence of the cancer, thus helping to solve the “re-lumpectomy epidemic”.

MOLECULAR SEXING OF EASTERN SCREECH OWLS AND MAGNOLIA WARBLERS USING FEATHER DNA

Lilly Travers, Gabriella Orfanides, and Susan Smith Pagano. Rochester Institute of Technology.

In bird species that are monomorphic, males and females cannot be distinguished by plumage differences making identification of biological sex challenging. In species including owls and other birds, measurement of size metrics, accompanied by confirmation of biological sex using molecular means has the promise of providing a useful tool in the field or for museum studies. Molecular sexing of birds involves Polymerase Chain Reaction (PCR) to amplify CHD (chromo helicase DNA binding) genes located on the W and Z chromosomes in birds (female ZW, male ZZ). This can be done using blood samples where DNA is extracted from nucleated red blood cells; however, extraction of DNA from feathers may provide a more feasible alternative. This study aimed to develop a protocol for extracting DNA from feathers and then test the viability of the technique for producing reliable molecular sexing, with the Eastern Screech Owl (*Megascops asio*) as the primary focal species. Feather samples were collected from owls by a collaborating raptor biologist, along with morphometric measurements on the birds. Magnolia Warblers (*Setophaga magnolia*) were included as a representative songbird species because non-breeding females and males can be challenging to distinguish in the field. Warbler feathers were collected at the Braddock Bay Bird Observatory and birds were scored on several plumage metrics. Feathers were extracted and PCR was performed using previously acquired 2550F/2718R primers. Once molecular sex is established we will correlate with different size or plumage metrics to determine their utility for distinguishing sex in the field.

MOLECULARLY TARGETED PROBES FOR PHOTODYNAMIC THERAPY AND IMAGING OF BREAST CANCER

Cameron Keene. Rochester Institute of Technology.

Abstract not received.

MONITORING THE PREVALENCE OF TWO GLOBAL AMPHIBIAN PATHOGENS IN OSWEGO COUNTY.

Grace Cordone, Anica Sampson, Joy Zientara, Susan Hammerly, Jennifer Olori, and Nicholas Sard. SUNY Oswego.

Infectious diseases like chytridiomycosis and ranavirosis are significant contributors to global amphibian population declines. *Batrachochytrium dendrobatidis* (Bd) is a zoospore-producing fungus that causes chytridiomycosis, which infects the skin and interferes with the amphibian ability to breathe through permeable skin. Similarly, ranavirus (Rv) infections can cause skin ulcers or internal bleeding in amphibians by infecting their organs. To learn more about the interactions between these diseases and local amphibian populations, SUNY Oswego has conducted a long-term assessment of Bd and Rv at various locations in Oswego County, New York that has been ongoing for more than a decade. For initial sampling, amphibians have been swabbed for Bd on their hands, thighs, feet, and abdomen while tissue has been collected for Rv by clipping a toe or a tail. Since 2018, more than 600 samples have been collected, for a total of 1958 samples total over the project’s duration. DNA is currently being extracted from these samples so that the presence of each disease can be tested for by using a polymerase chain reaction assay. To date, most work has focused on extracting DNA from tissue samples to test for Rv infections. The prevalence of Rv varies considerably among species tested (range: 0 - 50%).

In future work, we expect to extract remaining unprocessed samples up to 2023 and test for both Bd and Rv using positive controls to determine its prevalence and effect on the Oswego Country amphibian populations.

OBSERVING THE MUON WITH GEIGER COUNTERS: ATMOSPHERIC CONDITIONS AND INCIDENCE ANGLE.

Owen Hotaling and Emily Binder. Hobart and William Smith Colleges

Muons originate from cosmic rays. When cosmic rays collide with particles in Earth's atmosphere, such as nitrogen and oxygen, they ultimately fragment into muons. These muons travel fast, close to the speed of light, and arrive at Earth's surface at various angles. The quantity of muons that reach Earth's surface is directly dependent on the conditions in the atmosphere. When the air in the atmosphere is of a higher temperature and lower density, more muons are created, and vice versa. The variations in incidence angles are not only dependent on a muon's trajectory after a collision event but are also due to differences in Earth's magnetic field. The incoming muon flux will be recorded by a pair of Geiger counters coupled in coincidence. In-situ air temperature, pressure, and humidity data will also be recorded in an effort to find correlations between incoming muon flux and weather conditions on the ground. Muon flux data will be presented in this poster. Detecting muons in coincidence will help us determine if the application of Geiger counters can be expanded to not only detect muons, but measure their angle of incidence. Furthermore, by measuring the flux of incoming muons one can gain a picture of how they are affected by atmospheric conditions, thus potentially allowing for more accurate weather predictions.

PATTERNS IN THE PHYSIOLOGICAL CONDITION OF MIGRATING THRUSHES

Jessenia Salto, April Soule, Gabriella Orfanides, and Susan Smith Pagano. Rochester Institute of Technology.

Migration is a demanding time for birds, and intermittent pauses at stopover sites allow birds to rest and refuel on their migratory journeys. Stopover habitat along the south shore of Lake Ontario may be especially important for songbirds; thus, understanding physiological patterns of birds at lakeshore sites could prove essential from a conservation perspective. In this study, we sampled Swainson's Thrushes (*Catharus ustulatus*), Gray-Cheeked Thrushes (*Catharus minimus*) and Hermit Thrushes (*Catharus guttatus*) at Braddock Bay Bird Observatory (Hilton, NY) during spring and fall migration and measured robust physiological metrics in the birds. We used plasma metabolite profiling to assess refueling tendencies in the birds, and leukocyte counts were derived as a measure of immunological condition. We analyzed these metrics with respect to migration season, molecular sex, and a scaled mass index to assess seasonal/sex-related patterns and the dependence of physiological variables on body condition. Results provide insight into the physiological condition of songbirds on the south shore of Lake Ontario and biological factors that may drive variation in stopover physiology.

PHOSPHOPEPTIDE ENRICHMENT OPTIMIZATION FOR PHOSPHOPROTEOMICS STUDIES USING A SACCHARAMYCES CEREVISIAE ALZHEIMER'S DISEASE MODEL.

Abigail Wheeler, Emma Ryan, Kara Dawson, and Paul Martino. Houghton University.

Phosphoproteomics is important for the study of signaling cascades in biochemistry. Our interest is in the errant phosphorylation schemes of the protein tau associated with Alzheimer's disease (AD), known as hyperphosphorylation and how repositioned cancer medications might target errant kinases in these schemes. Working with a genetically altered strain of *Saccharomyces cerevisiae* engineered to have human tau protein (the 2N4R isoform) that demonstrates analogous tau pathology found in AD patients, we identified the need for an effective approach to enrich phosphorylated tryptic peptides from cell lysate for later quantitative phosphoproteomics workup. Since phosphorylated peptides are more hydrophilic then their non-phosphorylated counterparts, ion suppression and early reverse-phase elution plague their analysis by liquid chromatography mass spectrometry (LCMS). Phosphopeptide enrichment greatly facilitates LCMS analysis. Here we describe a methodological comparison that was performed in order to ascertain the effectiveness of removal of carboxylate groups via methyl esterification prior to metal-affinity precipitation enrichment of trypsin generated phosphopeptides from the majority of non-phosphopeptides found in a typical sample. Because it is a readily available source and inexpensive, we chose to use bovine α-casein to generate tryptic phosphopeptides to perform our comparison study. Presented will be an evaluation of a comparison between enrichment of phosphopeptides after methyl esterification versus without esterification (i.e. as free carboxylates) using a standard metal-affinity magnetic bead enrichment procedure (Cube Biotech, Monheim, Germany).

PHOSPHOROTHIOATE MODIFICATION AND DND OPERON IN ACIDITHIOBACILLUS THIOOXIDANS.

O'Bryan, C.J., and Marnocha, C. L. Niagara University.

The Iroquois National Wildlife Refuge is a wetland environment found in Basom, New York. The refuge sits between the limestone Onondaga Escarpment and the dolomite Lockport Escarpment. This promotes an environment that has produced acidic and sulfur-rich springs in the refuge. *Acidithiobacillus* is a sulfur-oxidizing bacteria that thrives in acidic environments, making the springs of the refuge an ideal habitat. We have isolated several strains of *A. thiooxidans* from the springs; interestingly, two of these strains encode for a family of proteins known as the dnd operon. The operon is involved in a process known as DNA phosphorothioate modification which replaces non-bridging oxygen atoms in their DNA backbone with a sulfur atom. Phosphorothioate modification has three main functions including antioxidation, defense against microbes foreign DNA, and inhibiting viral replication. Although phosphorothioate modification provides benefits for microorganisms, the dnd operon is found to be distributed to a limited number of microorganisms, many of which share little ancestral history. We hypothesize that our *Acidithiobacillus* isolates obtained the dnd operon through horizontal gene transfer, since we know of no other members of the Acidithiobacillia that encode for these genes. DNA phosphorothioation can have negative effects in addition to its positive functions, which further limits its distribution and retention. Understanding the mechanism in which microorganisms obtain and retain the dnd operon can be useful for biomedical and industrial applications

POST-MORTEM REPRODUCTION: USING GERMLINE STEM CELL TRANSFER TO SAVE ENDANGERED SPECIES

April Washburn and Thomas Jensen. Wells College.

Germline stem cell (GSC) transfer is a unique technique that allows us to increase the reproductive lifespan of an individual post-mortem, by transferring GSCs to a domestic host. This technique could have a significant impact on conservation because it allows for germplasm rescue of under-represented genetically valuable individuals, thereby increasing genetic diversity. We are currently using quail as a model system to develop this technique for endangered species management. In addition, when successful, this method will be incorporated into the passenger pigeon de-extinction project using genetically edited band tailed pigeon germ cells. Previous studies have shown that transferred GSCs can produce functional gametes within the host gonad leading to donor-derived offspring. Our study includes collection of transgenic embryonic quail GSCs followed by transfer to host embryos at the embryonic stage when the endogenous GSCs are migrating to the gonadal ridge. We isolated germline stem cells from Dendra2 transgenic quail embryos followed by transfer to stage 16-17 host chicken or wild-type quail embryos. We verified successful transfer by visualizing Dendra2 donor-derived GSCs using fluorescent microscopy and by PCR detection of the Dendra2 transgene. We are currently developing a method to quantify the number of donor-derived GSCs that have colonized the host gonad using qPCR to determine the relative amount of Dendra2 DNA. This method will allow us to compare the effect of injection volumes, cell counts and other variables on donor-derived cell colonization success within the host gonad.

PREPARATION AND ANALYSIS OF COMPLEMENT PROTEINS C3 AND CFH.

Debora Win, Amanda Streeter, and Dr. Julia R. Koeppe. SUNY Oswego.

The complement system is composed of various plasma proteins that work together to regulate mammalian innate immunity. These proteins interact in regulative harmony to combat foreign pathogens by inducing an inflammatory immune response. Dysregulation of these pathways can lead to inflammatory disorders; understanding the way the different proteins interact is crucial. To do this, we purified both C3 (activating protein) and CFH (regulatory protein) using anion exchange chromatography and size exclusion chromatography (SEC), and analyzed the samples using surface plasmon resonance (SPR). The SPR experimental data were fit to a 1-to-1 binding model, and a binding constant, KD, of 0.0602 μM was obtained.

PROTEIN GLYCOSYLATION MUTANTS OF *PSEUDOMONAS AERUGINOSA* SHOW ALTERED SUSCEPTIBILITY TO ANTIBIOTICS COMPARED TO WILD TYPE STRAINS.

Lorelei Robinson and Stefan Schulze. 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 proteins such as efflux pumps, or enzymes that inactivate antibiotics. The functions of proteins can be affected by post-translational modifications such as protein glycosylation. That means that the disruption of protein glycosylation pathways could

lead to changes in the susceptibility to antibiotics. Utilizing multiple protein glycosylation pathway mutants in *Pseudomonas aeruginosa* for the genes tfpW, orfN, and fgtA, comparative antibiotic susceptibility assays were performed to determine the impact of these mutations. 96 well plate assays of the bacteria with increasing concentrations of antibiotics were used to quantify susceptibility by measuring optical density at 600 nm over 24 hours. The growth curves were compared to determine minimum inhibitory concentrations for each antibiotic and strain. In addition, disk diffusion assays were used to test the effects of various antibiotics. These assays revealed differences in responses of the mutants to certain antibiotics. For example, the fgtA transposon mutant showed a higher susceptibility to ampicillin compared with the wild type. In addition, the orfN transposon mutant and the tfpW knockout mutant showed a lower susceptibility to chloramphenicol than the corresponding wild type. Since chloramphenicol and ampicillin have different mechanisms of action, these results indicate that distinct protein glycosylation pathways differently affect cellular processes related to antibiotic resistance. Our work thereby sets the stage for follow-up analyses that could identify specific glycoproteins and the mechanisms in which they 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

QUANTIFYING THE EFFECTS OF *FALLOPIA JAPONICA* ALLELOPATHY ON NATIVE PLANT GROWTH.

Adam Graziano and Dr. Kathryn Amatangelo. SUNY Brockport.

Biological invasions are one of the leading causes of decreasing biodiversity around the world. Invasive plants disrupt native ecosystems through physical inhibition, resource exploitation, and belowground interactions. Some invaders release chemicals that inhibit the growth of surrounding natives, a process called allelopathy. Japanese knotweed (*Fallopia japonica*) is an invasive plant known to produce several potentially allelopathic compounds, though concentrations vary across populations. Research assessing the allelopathic potential of Japanese knotweed populations in western New York is lacking. The goal of my study was to determine the isolated effects of knotweed allelopathy on native plant growth. I conducted a manipulative experiment on two native test species, swamp milkweed (*Asclepias incarnata*) and jumpseed (*Persicaria virginiana*). Control plants were potted in soil collected from a forested area free from knotweed. Plants in the first treatment were planted in control soil and treated with an aqueous solution percolated through Japanese knotweed donor pots. Plants in the second treatment were potted in soil collected from under knotweed. Each treatment had ten replicates of each species. I measured the height of all test plants weekly and above and belowground biomass of plants was measured after eight weeks of growth. I found no effect of treatment on growth nor total biomass for either species. My results suggest that, when isolated, the effects of knotweed allelopathy do not affect native plant growth, rather it is likely the combination of several factors that yield successful invasions.

RADIOGRAPHIC CANDLING: A NEW METHOD TO EVALUATE EMBRYO SURVIVAL IN SPECKLED OR THICK SHELLED EGGS

Annie Hyde and Thomas Jensen. Wells College.

Egg candling is essential to managing bird egg incubation, as it allows us to determine embryo growth, survival, and position within the egg. However, in birds that have dark, mottled, or thick shells, embryos are difficult to distinguish using a traditional light candler. Radiographs are often used at the end of incubation to ascertain position during hatch of valuable chicks. We therefore decided to evaluate the practicality of using radiographs earlier in incubation to “candle” thick-shelled eggs. Depending on when the bones become detectable by radiographs during development, this technique could be a useful new tool to monitor embryo development and mortality in thick-shelled eggs. Our results showed that bone development was first detectable by radiographic analysis by day 12.5 to 13 (stages 38-39). This timeframe is within the early part of the rapid bone mineralization process that occurs from day 10 through 17 (stages 36-43) as shown by extensive Alizarin red staining of the long bones (Thompson et al 1989). Using radiographic candling, incubation managers will be able to detect and monitor growth of embryos in thick-shelled eggs from stages 38-39. This technique could significantly impact conservation of birds with thick or mottled shells. Due to the potential harm, we envision radiographs would be used at stage 39 to confirm the presence of an embryo, followed by a second radiograph several stages later to confirm continual growth and/or hatch position. Minimizing the number of radiographs minimizes potential harm to the embryo’s health and germline. Actual detection will greatly depend on equipment resolution and operator experience as the early bones were difficult to detect. Inexperienced interpreters may find difficulty in determining what is bone and what are shell calcium specks on a radiograph. We found that embryos in

speckled or thick shelled eggs were readily detectable using radiographic candling by stage 38-39.

REMOVAL OF POLLUTANTS FROM WATER BY ADSORPTION TO CARBON-BASED SURFACES

Maameyaa Asiamah, Amadou Diallo, L. James Macisco, Reginald E. Rogers, and Todd Pagano. Rochester Institute of Technology.

Pollutants found in natural water systems are environmental and health concerns- and finding ways to remove them from water would be very beneficial. The purpose of this study is to determine whether different carbon-based surfaces can adsorb, and thus remove, the pollutant molecules from water. In particular, it is important to study how molecules adsorb in the presence of Humic Acid (HA), which is found in most natural water systems. In this study, we used fluorescence spectroscopy to examine the removal of pollutants and/or HA by carbon-based surfaces over time. We used strategic wavelengths for excitation and emission with special probe equipment to monitor competition between the pollutant and HA for adsorption sites. Our findings indicate surface adsorption could be a good technique for removing pollutants from water, but natural HAs can complicate the adsorption processes. Future studies will examine other types of pollutant molecules and carbon-based surfaces to test removal efficiencies.

RESOURCE SELECTION AND HABITAT USE OF AMERICAN WOODCOCK (*SCOLOPAX MINOR*) IN NEW YORK STATE

Kayleigh Filkins, Dr. Jacob Straub, and Josh Stiller. SUNY Brockport.

The American woodcock (*Scolopax minor*) is a migratory upland gamebird found across the Midwest and Eastern United States. This project evaluates habitat preferences and resource selection of migratory and breeding woodcock in New York State and is a collaboration with the Eastern Woodcock Migration Research Cooperative. Since 2017, there have been 568 unique woodcock captured and marked with satellite transmitters across 14 states and 3 Canadian provinces. We established a 50km buffer around the NY state border-- 300 woodcock have at least one point tagged within that buffer. From 2022-2023, 20 additional transmitters were deployed on males and females in New York State. Here, we evaluate the strengths and weaknesses of two different models: a traditional Resource Selection Function (RSF), and an Integrated Step Selection Function (iSSF). We compared these two methods using a subsample of the overall project data. The RSF used 5 birds with a total of 513 locations (171 used, 342 random points). The random points in the RSF were more evenly distributed across the area. The iSSF used these same 5 birds, however after data filtering only 3 birds remained. For the iSSF, 748 points were used (68 used, 679 random points). These random points were clumped around woodcock used points, as they were based specifically on previously calculated step length and turning angles. The RSF indicated woodcock had no selection preference selection for any land cover type as selection coefficients had a wide confidence interval. The iSSF indicated woodcock selected against mixed forest, open water, emergent wetland, and evergreen forest and selection coefficients had narrow confidence intervals. In summary, whereas the RSF will consider a larger portion of the landscape and uses a larger number of used points the model coefficients were less precise. The iSSF was more precise and yielded results for a smaller sample size, but it excluded entire data sets from individual birds. Woodcock are a target species for the New York Department of Environmental Conservation Young Forest Initiative Strategic Plan; therefore, our project results will inform management of early successional habitats.

SCREENING CLINICALLY APPROVED MEDICATIONS TO TREAT TWO INDICATIONS OF ALZHEIMER'S DISEASE—A TWO BIRDS WITH ONE STONE APPROACH.

Kara Dawson, Abigail Wheeler, Emma Ryan, and Paul Martino. Houghton University.

Alzheimer's disease (AD) has two associated hallmark pathologies—amyloid-beta plaque formation, and tau pathology (or neurofibrillary tangle deposit formation). Recent FDA approvals for amyloid-beta clearing immunotherapies are successful at removal of amyloid-beta and are disease modifying, though they come with a high financial burden due to associated ARIA and imaging requirements. With blood testing for AD makers at the cusp of FDA approval, having safe and inexpensive amyloid-beta and neurofibrillary tangle reducing medications available is needed. In an attempt to screen clinically approved drugs to treat both amyloid-beta pathology and tau hyperphosphorylation pathology, a complete list of clinically approved kinase inhibitors was obtained and docking simulations using AutoDock Vina v1.2 (Scripps Institute, La Jolla, CA) were performed onto an NMR solved soluble monomeric amyloid-beta (1-42) peptide (PDBid: 6SZF). Our assumption is that some clinically approved kinase inhibitors likely will inhibit hyperphosphorylation of tau reducing neurofibrillary tangle formation. To further evaluate the potential of kinase inhibitors that through docking simulations, have the highest simulated binding

energies, an *in-vitro* thioflavin T assay was performed to measure fluorometrically the inhibition of amyloid-beta aggregation. Amyloid-beta aggregation is an early step in amyloid-beta plaque formation. Of the fifteen kinase inhibitors having the highest docking scores, fourteen of them demonstrated inhibition activity towards amyloid-beta aggregation.

SEARCHING FOR STRONG GRAVITATIONAL LENSES IN DESI SPECTRA

Delaney Cummins, Segev BenZvi, and Xinyi Chen. University of Rochester

Strong gravitational lensing systems are typically observed in imaging surveys via rings, multiple images, or other visual effects affecting the source galaxy. However, we expect to see 5 to 10 times more strong lensing systems with Einstein radii smaller than the resolution of most imaging surveys. These systems may be found using spectroscopy, and their detection would dramatically increase the number of known lensing systems, improving our chances to perform time-delay cosmography and other cosmologically significant studies. We train a vision transformer (ViT) and a convolutional neural network (CNN) to find strong lensing systems in DESI spectra. The ViT and the CNN displayed similar levels of performance on this problem, classifying lenses and non-lenses with >85% accuracy.

SHIVANET: SHIFT VARIANT IMAGE DECONVOLUTION USING DEEP LEARNING

Arnab Ghosh and Dr. Grover Swartzlander. Rochester Institute of Technology.

Image Deconvolution is a well-studied problem that seeks to restore the original sharp image from a blurry image formed in the imaging system. The Point Spread function (PSF) of a particular system can be used to infer the original sharp image given the blurred image. However, such a problem is usually simplified by making the shift invariant assumption over the field of view (FOV). Realistic systems are shift variant; the point spread function of the optical system is dependent on the position of object point from the principal axis. For example, asymmetrical lenses can cause space variant aberration. In this paper, we first simulate our space-variant aberrations by generating PSFs using Seidel Aberration polynomial and use a space variant forward blur model to generate our shift variant blurred image pairs. We then introduce, ShiVaNet. It is a two-stage architecture that builds upon the Learnable Wiener Deconvolution concept by introducing Simplified Channel Attention and Transpose Attention to improve the performance of the module. We also device a novel UNet refinement block by fusing a ConvNext-V2 block with Channel Attention and couple with Transposed Attention. Our model performs better than state-of-the-art restoration models by a factor of 0.2dB.

SIMULTANEOUS EXPRESSION OF PHOTOSYNTHETIC GENES IN SYNECHOCOCCUS FROM A EUXINIC, MEROMICTIC LAKE.

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Environmental conditions in meromictic lakes, which consist of permanently stratified layers, can change dramatically across very small vertical scales. As a result, microbes that live in these water columns must be versatile in order to deal with varying availability of oxygen, sulfide, and light levels at their preferred locations in the water column. Cyanobacteria, in particular, must be versatile because sulfide, found in euxinic meromictic lakes, is a poison of oxygenic photosynthesis (oxyP), specifically photosystem II. Some cyanobacteria have evolved to detoxify sulfide by using it to carry out anoxygenic photosynthesis (anoxyP) using an enzyme called sulfide:quinone oxidoreductase (gene: sqr) to pass electrons to the photosynthetic electron transport chain. Previous work on our *Synechococcus* isolate from Fayetteville Green Lake (Fayetteville, NY; FGL) has shown that the strain constitutively expresses sqr, even when not in the presence of sulfide. What is currently unclear is whether the FGL *Synechococcus* can simultaneously perform oxyP and anoxyP. To determine this, we will use psbA as our marker gene for oxyP in cyanobacteria. The psbA gene encodes the D1 protein, which is a core component of photosystem II (PSII), a key protein complex involved in the light-dependent reactions of photosynthesis. The ability to simultaneously perform oxyP and anoxyP in the presence of sulfide would indicate a photosystem II that is more resilient against sulfide toxicity. Given its habitat, we expect FGL *Synechococcus* to have a sulfide-tolerant PSII and therefore be capable of simultaneous oxyP and anoxyP in the presence of sulfide

SKULL ROOF MICROANATOMY OF FROGS REVEALED BY HIGH RESOLUTION CT DATA

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The study of adaptations made possible through convergent evolution allows for further insight into the similarities and differences these analogous species hold while maintaining no recent phylogenetic relation. The skull roofs of tetrapods can share similar phenotypic traits in terms of cranial bone microstructure, specifically that of the nasal,

premaxilla, frontal, and parietal bones. Past studies on squamates have conveyed that those cranial modifications have a relation to the burrowing lifestyles of a variety of species. We predict that a burrowing lifestyle in amphibians will be a similar factor in shaping skull roof thickness and compactness. Through the utilization of CT scanning, the aforementioned cranial bones of eight species of anurans were segmented and isolated from the rest of the skull in 3D Slicer. The isolated structure was then measured for bone thickness and compactness using FIJI. Preliminary results from *Ascaphus* (the aquatic sister taxon to all other frogs) included thicknesses ranging up to 2.4mm, slightly lower than those we previously found for salamanders [2.78mm-3.02mm] on average. The average compactness for *Ascaphus* [0.98mm] was high and mirrored that of the salamanders. Based on the preliminary results, there is little evidence that the cranial microanatomy of amphibians is linked to burrowing, and it could instead be related to size or mode of growth; more evidence is necessary to come to a conclusion.

SPECTROFLUOROMETRIC ANALYSIS OF RHODAMINE B IN COSMETICS PRODUCTS AFTER SOLID PHASE EXTRACTION.

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Rhodamine B is a synthetic dye that has found wide applicability in industries such as textiles, paper, paints, porcelain, and leather. Toxicity issues associated with Rhodamine B has made it prohibited as a food additive. Long-term use and contact with Rhodamine B could cause cancer and birth defects. This work describes a simple solid phase extraction method for separation, pre-concentration and subsequent spectrofluorometric detection of rhodamine B in several cosmetic samples at 576 nm (λex, 556 nm). Cosmetic samples such as lipsticks, eyebrows, glitter and highlighters were analyzed qualitatively to determine the presence of Rhodamine B. Results showed that three of the samples had rhodamine B. The results of qualitative and quantitative analysis of Rhodamine B found in the three cosmetic samples will be presented. The spectrofluorometric method validation results for linearity, range, limit of detection and limit of quantitation will be reported.

STRUCTURAL AND THERMAL CHARACTERIZATION OF BIODEGRADABLE FILMS BASED ON BLENDS OF POLYLACTIC ACID, POLYBUTYLENE ADIPATE-CO-TEREPHTHALATE, AND POLYCAPROLACTONE WITH CORN THERMOPLASTIC STARCH.

Kunal Burarak. Rochester Institute of Technology.

Abstract not received.

SURVEY OF EMERALD ASH BORER INFESTATIONS AND DISPERSAL OF INTRODUCED PARASITOIDS IN OSWEGO, NY

Danielle Marichal. SUNY Oswego.

The Emerald Ash Borer, *Agrilus planipennis* Fairmare (Buprestidae), is an Asian beetle species accidentally introduced to the U.S. in the early 2000s. Since their introduction to Michigan, they have proliferated at an alarming rate, and currently have radiated into 36 states, killing millions of ash trees. Biocontrol is the practice of introducing natural enemies of invasive species to affected areas in order to control their population. Eight introductions of 3 species of parasitoid wasps that are natural enemies of *A. planipennis* were performed at Rice Creek Field Station in Oswego, NY, in 2022. One aim of my research is to monitor the establishment and proliferation of these wasps several km outside of their introduction site by building and setting up traps on infested ash trees. The second aim of my research is to survey ash trees in Rice Creek, in order to set groundwork for the continued monitoring of EAB on site and provide measurements of parasitoid success in coming years.

THEORY OF MIND AND SCHIZOTYPY: THE INDEPENDENT CONTRIBUTION OF CHILD MALTREATMENT

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Previous studies have reported impairments in theory of mind (ToM), or the ability to understand others' mental states, among individuals with schizotypal traits (Jahshan & Sergi, 2007; Gooding & Pflum, 2011). Impairments in ToM have also been documented among individuals with histories of child maltreatment (CM) (Germine et al., 2015; Nazarov et al., 2014). Studies have identified significant associations between CM and schizotypal symptoms (Berenbaum et al., 2003, 2008). Additionally, research has shown that individuals with schizotypy experience considerable social and interpersonal difficulties (Aghvinian and Sergi, 2018). However, there is insufficient evidence regarding the relationships between CM, ToM, social functioning, and schizotypy, and in particular, the degree to which CM may significantly predict poor ToM ability above and beyond that of schizotypy. This is surprising given the high rates of CM found among individuals with schizophrenia spectrum disorders. The aim of the present study was to examine associations between these variables, as well as the independent contribution of CM on ToM ability after accounting for the variance explained by schizotypy symptoms.

TO PINCE OR NOT TO PINCE? EXPLORING AN NNN PINCER LIGAND

Cheyenne Titus and Thomas M. Brown. SUNY Oswego.

Metallophilic interactions are unusual attractive interactions found between closed-shell metal ions which are often accompanied by unique photophysical properties. A trimetallic complex containing gold and copper ions has recently been reported to demonstrate vapochromic sensing abilities based upon “on-off” metallophilic interactions. The solvent deficient system is non-emissive however, when exposed to nitrogen gas that has been saturated with methanol, the species emits green upon excitation. This complex was supported by neutral N-heterocyclic carbene ligands resulting in a complex cation with counter anions. To circumvent the need for counter anions, an anionic N-heterocyclic carbene mimic, based on a pyrrole backbone, is proposed to study a system capable of “on-off” metallophilicity. The design, synthesis, and characterization of an NNN pincer-type ligand containing pendant pyrazyl arms and subsequent coordination to zinc is described. To probe the possible coordination motifs of the NNN ligand, the stoichiometry of the ligand to metal was varied which resulted in complexes exhibiting unique photophysical properties. An in depth look at the ligand synthesis and its characterization will be explored followed by an investigation of the resulting zinc complexes.

USING HIDDEN MARKOV MOVEMENT MODELS TO DELINEATE MIGRATION METRICS OF MALLARDS (ANAS PLATYRHYNCHOS) IN THE ATLANTIC FLYWAY.

D. Sparks, J. Straub, J. Stiller, M. Weegman, C. Waldrep, J. Coluccy, and K. Duren. SUNY Brockport.

The mallard (*Anas platyrhynchos*) is the most common duck in the world. However, the breeding population in eastern Canada and the northeastern United States declined by 26% (r2 = 0.97) from 1999-2019. The population of breeding mallards in the northeastern US is declining rapidly (-36% over the past 20 years, r2 = 0.98), while the population in eastern Canada and Maine remains relatively stable (-5%, r2 = 0.07). Significant evidence to support one or more causes of population decline is lacking. We initiated a multi-year (2022-2026) study to capture female mallards then affix ≤20g Ornitela GPS/GSM communication transmitters to better understand demographic rates, migration chronology, and habitat use differences. We will compare mallards that breed in Canada and Maine and those that breed in the Atlantic Flyway Breeding Waterfowl Survey area throughout the annual cycle. In year one, we marked 338 mallards in January - March of 2022 from New Brunswick to South Carolina. We plan to mark >750 over the next three years. Results forthcoming include migration and breeding movement distances, departure dates, estimated number of nest attempts, and seasonal survival. We will compare these variables relative to age and location of breeding range (i.e., US vs. Canada). Results and parameters from these preliminary analyses will inform larger project objectives related to building a comprehensive picture of the full annual cycle for mallards in eastern North America. Understanding demographic rates of eastern mallards and potential differences between populations in eastern Canada and eastern U.S. is imperative for managers to effectively model population dynamics and subsequent harvest strategies.

USING METAGENOMICS TO COMPARE VIRAL DIVERSITY IN THE CHEMOCLINES OF A FERRUGINOUS AND EUXINIC LAKE.

Kiedrowski A.K., Edwards, W.J., and Marnocha, C.L. Niagara University.

Bacteriophages play a crucial role in aquatic ecosystems due to their ability to alter the functioning of the bacteria present. In addition, by lysing host cells, they contribute to the carbon cycle throughout the water column. However, the precise contribution of phages to the coupling of the carbon cycle between the mixolimnion and the monimolimnion in meromictic lakes remains unclear. Meromictic lakes are permanently stratified bodies of water with an oxygenated layer that mixes (mixolimnion) and an anoxic, reduced layer (monimolimnion) beneath the chemocline. Our lab works at two meromictic lakes: the iron-rich, or ferruginous, Devil’s Bathtub (DBT; Mendon Ponds Park, Rochester, New York) and the sulfur-rich, or euxinic, Fayetteville Green Lake (FGL; Syracuse, New York). To better understand the contribution of phages to carbon cycling in these environments, we conducted metagenomic sequencing of viral samples from the chemocline of each lake. We detected numerous cyanobacteria and cyanophages in both lakes with a rapid decrease in abundance of cyanophages uncoupled from the decline in cyanobacteria with depth. This suggests that phages are lysing cyanobacteria in oxic waters and releasing cell contents (including DNA) to the anoxic waters below. Continued study of bacteriophages in these two model ecosystems will enhance our understanding of carbon cycling and the vital role of phages in meromictic lakes.

VALENCED ATTENTIONAL BIASED AND EMOTION REGULATION

Michael McTighe. Rochester Institute of Technology.

Attentional processes or concentration of mental faculties is a vast area of research in the cognitive sciences that is complicated by an abundance of other variables. Evidence overwhelming suggests that exogenous attention is biased toward emotional stimuli. Prevailing theories suggest that positive emotions can improve attentional processes (broaden and build), and that a participant's emotional state can lead people to better attend to congruent information (emotion congruence). Systems associated with emotion regulation overlap with processes related to biased attention. This study seeks to further explore the theories of broaden and build, and emotion congruence, while also exploring how emotion regulation influences various types of attentional biases. Participants were randomly assigned to a positive, negative, or neutral emotion induction procedure which was followed by a modified emotional cuing paradigm. Self-report and psychophysiological data were collected to assess emotion regulation capabilities. There was no support for the theory of broaden and build or emotion congruence. However, higher levels of self-report and psychophysiological measures of emotion regulation were related to attentional biases to positive stimuli. Limitations with stimuli presentation time and emotion induction procedures may explain failures to replicate previous research, and future investigation should explore how training in emotion regulation strategies can be used to improve areas of cognition that can be associated with psychopathology.

VALIDATION OF A MONOCHROME MULTIPLEX qPCR ASSAY TO DETERMINE RELATIVE TELOMERE LENGTH USING UNIVERSAL TELOMERE AND 18S PRIMERS IN MAMMALS

Madison Lawley, Justine Simms, and Thomas Jensen. Wells College.

Telomeres are highly conserved regions of nucleotide repeats (TTAGGG) found at the ends of eukaryotic chromosomes, which prevent chromosome damage during cell division. Because telomere length has previously been shown to be related to age, life expectancy, chronic stress and disease, and migration success, we are interested in developing a simple method to determine relative telomere length. A cheap and universal method to detect RTL across broad taxonomic groups could have a significant impact on zoo and conservation breeding, including reintroduction programs. A previously published study demonstrated the feasibility of using a simple monochrome multiplex qPCR (MMqPCR) assay to evaluate relative telomere length (RTL; Cawthon, RM. 2009). However, as the Cawthon study focused on validating the assay for human use, the reference gene primer sets were specific to the human albumin and beta-globin genes and would therefore not be useful for use in animal conservation programs. For the RTL MMqPCR assay to be practical, both the telomere and the reference gene primers must be universal and amplify across a broad range of taxonomic groups. We are currently validating the universality of an 18S primer set that would allow for simultaneous amplification of both the telomere and the reference gene using an MMqPCR assay. MMqPCR requires that the concentration of the target DNA is significantly higher than that of the reference gene. We detected delta Ct values ranging from -2.13 (mink), -2.11 to -2.72 (porcupine), -6.55 (grey squirrel), -4.74 to -5.79 (opossum), and -2.89 (beaver). This technique can potentially be an important tool for captive management of animals in zoos and reintroduction programs.

VIRAL VECTOR MEDIATED GENE ACTIVATION IN C. ELEGANS

Sydney Purcell. Rochester Institute of Technology.

Caenorhabditis elegans is a model organism for gene discovery and pathway analysis. However, no high-throughput methods to achieve targeted gene overexpression in *C. elegans* has been established. We are developing a viral vector-based assay utilizing recombinant VSV to guide RNA into transgenic *C. elegans* that express CRISPRa machinery. This method will enable large scale genetic screens based on targeted gene overexpression. We plan to use this high-throughput screen to understand viral host interactions related to aging and host innate immune response.