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Abstracts

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2017 Abstracts

Alphabetical by last name of first author.

A

INTERDIGITATED GOLD ELECTRODES COATED WITH GRAPHENE QUANTUM DOTS FOR SENSING CIPROFLOXACIN ANTIBIOTIC

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Rochester Institue of Technology

Ciprofloxacin (CPFX) is a wide spectrum antibiotic that is used for controlling infections in humans and livestock and an indiscriminate usage of it has resulted in toxic agricultural run-off resulting in poor crop growth and environmental toxicity [1]. For taking adequate steps to control the usage, it is necessary to have an analytical method for rapid field measurements. While there are several laboratory methods available for its assay currently there is no portable sensor available in the market for CPFX determination. Herein we report the construction of a new sensor using an interdigitated gold electrodes (0.5 x0.5 cm) on alumina substrate (0.06 cm) providing the background for adsorption of graphene quantum dots (GQD)(5 nm to 50 nm); the electrode width and gap was kept at 0.025 cm. The magic material graphene discovered by Geim and Novoselov [2] led to many innovations in science and technology by providing large surface area with tunable optical and electronic properties [3]. The GQD contained on interdigitated gold electrodes was coated with ferric ion by dip coating. The sensor was kept in a closed chamber for testing its stability over a period of time. It was interfaced with RS232 for standard serial communication of data between digital multimeter and the computer for data acquisition. By calibrating the sensor in air and in various solutions of different concentrations of CPFX, the analyte concentration was determined. The resistance of the sensor in air was observed to be higher than the resistance of the sensor in different CPFX solutions indicating that the [Fe3+- 3CPFX-] complex has a good electrical conductivity. The electrochemical studies with differential pulse voltammetry showed that the ferric ion reduction occurs at GQD electrode Epc=0.31 V vs Saturated Calomel Electrode (SCE) with a peak width of 0.10 V. The interaction of ferric ion with CPFX results in the appearance of a new peak at Epc= 0.20 V. The reproducibility of the sensor was tested by repeating the measurements.

[1]. I.A. Sultan, J. Veterinar Sci Technology, 5, 2 (2014). 2. A.K. Geim and K.S. Novoselov, Nat. Mater., 6, 183–191 (2007). 3. Z. Protich , P. Wong, K.S.V. Santhanam , Journal of Power Sources 332, 337-344 (2016).

USING BIOINFORMATICS AND STRUCTURAL BIOLOGY TO BETTER UNDERSTAND SKIN DISEASE.

Sakina Ahmed, Dr. Martha Skerrett
Buffalo State College

In animals, adjacent cells are linked through several types of junctions including gap junctions. Gap junctions are regions where hundreds or thousands of intercellular channels allow ions, metabolites and other small molecules to move directly between cells. Gap junctions play important roles in homeostasis, cell signaling growth and development. In vertebrates six connexin's are arranged around a central pore that generally remains closed until it docks with a similar channel in an opposing cell.

Twenty-one different connexins are encoded in the human's genome and at least nine are expressed in skin. Little is known about the interactions that occur between these connexins or about their complex roles in skin development and function. Recent identification of connexin-linked hereditary skin diseases is leading to a better understanding of the normal function of connexins in skin. Recent studies have determined that patients with hereditary skin disorders may have mutations in connexins 31 (Cx26,

Cx30.3, Cx31). These mutations cause skin disorders such as erythrokeratodermia variabilis (EKV), severe thickening of skin. This project aims to use bioinformatics and structural models to identify regions of connexin proteins that are essential for gap junction function in skin. First, I plan to identify amino acids mutations associated with skin disease by carrying out an analysis of published literature. Once mutations have been identified, I will compare the structure of defective connexins to a normal connexin channel. This will be done using computer modeling involving an atomic level structural model for a gap junction channel composed of Cx31.

INVESTIGATING ELECTRICAL STIMULATION AS A THERAPEUTIC MODALITY FOR SMOOTH MUSCLE RECOVERY AFTER INJURY.

Jung Hyun Ahn, Samuel H. Pyo, Ransom H. Poythress
Houghton College

Despite its broad and varied use as a therapeutic modality in skeletal muscle recovery, the effects of electrical stimulation on other systems remain largely unknown. The efficacy of electrical stimulation in scratch wound healing assays was examined in cultured rat aortic smooth muscle. In addition, force-transduction measurements were used in conjunction with live tissue organ baths to explore real-time effects of electrical stimulation on amphibian smooth muscle in response to injury. Two, ten-minute treatments of AC current demonstrated a trend towards accelerated recovery times that did not reach significance in these trials. The effectiveness of muscle injury techniques was confirmed in a preliminary regard in the organ bath system.

DISTRIBUTED PHARMACEUTICAL ANALYSIS LABORATORY (DPAL) – METFORMIN ANALYZED VIA HPLC.

Maham Alamgir, Dr. Robyn E. Goacher
Niagara University

The Distributed Pharmaceutical Analysis Laboratory (DPAL) is a project focused on the analysis of drugs in Africa, to identify mis-labeled or mis-dosed drugs. Metformin is a drug that is widely used by individuals with Type-II diabetes. At Niagara University, we have worked to validate an HPLC method to determine whether metformin pills are dosed correctly, or whether there may be degraded products in the metformin. The steps taken to pass system suitability and validate this HPLC method will be discussed. A calibration curve was made with United States Pharmacopeia (USP)-grade metformin, which had high linearity up to 200 ppm metformin. Metformin was found to have a lower limit of detection of 0.3 ppm and a lower limit of quantification of 1 ppm. A spike recovery was done on as-received and baked metformin pills, and no matrix effects were found for those pill solutions. Next, under dosed, correctly dosed, and overdosed USP metformin solutions were prepared and were determined to have concentrations that were low by <2% error. With the USP-method approved by the DPAL project, pills from Africa were prepared and analyzed via HPLC. With the analytical lab students at Niagara University, 24 metformin tablets from Kenya were run against a calibration curve, 23 of which was found to be below 10% error, indicating correctly dosed 500mg pills. In the future, the goal is to continue analyzing metformin pills from Africa, and to analyze metformin related compounds, to see if any of the metformin pills have degradation products present.

THE EVOLUTION OF DOSAGE COMPENSATION: WHAT HAPPENS WHEN YOU HAVE TWO X CHROMOSOMES INSTEAD OF ONE.

Jacqueline Alexander, Jihye Lee, Barbara J. Meyer, Eric S. Haag, and Te-Wen Lo
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Dosage compensation is an essential process in heterogametic organisms where the number of X chromosomes differs between males (XO/XY) and females/hermaphrodites (XX). Dosage compensation

ensures that both sexes have equivalent levels of X-linked gene expression regardless of the number of X chromosomes present. This process is not highly conserved. Flies, mammals, and worms all use different mechanisms, therefore, it is necessary to examine more closely related species, such as C. elegans and C. briggsae, to better understand the evolution of dosage compensation. In C. elegans, dosage compensation is mediated by the developmental master switch gene xol-1. The function of xol-1 is conserved between C. elegans and C. briggsae. In both species, loss of xol-1 results in male-specific lethality and overexpression results in hermaphrodite specific lethality.

To further understand the evolution of xol-1 function, we are performing a C. briggsae xol-1 suppressor screen. C. briggsae xol-1 suppressors will be identified based on their ability to suppress the xol-1 male lethality phenotype. Currently, we are characterizing to newly identified suppressors. We anticipate that these suppressors will belong to one of two classes: (1) C. briggsae homologs of a known C. elegans dosage compensation pathway component or (2) novel suppressors. Novel suppressors will be further examined for a role in dosage compensation in both species. These data will not only further our understanding of C. briggsae dosage compensation but also provide insights into the evolution of dosage compensation.

BREAST TISSUE MORPHOLOGY IN A HUMAN CADAVER POPULATION.

Stacy Amico-Ruvio, Nicole McGuire, John Fischer, and Megan Gervasi
D'Youville College

Human breast tissue undergoes many dramatic changes throughout an individual's lifetime as one develops. At birth, male and female breast tissues appear histologically similar. However, during puberty the female breast tissue evolves into a fatty, glandular structure that is constantly changing throughout life to accommodate pregnancy, lactation, and eventually menopause. Later in life female breast tissue regresses resulting in a loss of glandular structure and appearing similar to its prepubescent form. In order to determine whether post-menopausal female breast tissue regresses to resemble male breast tissue, a small portion of breast tissue was removed from male cadavers and compared to breast tissue from post-menopausal female cadavers, ranging from 66-77 years of age. Qualitative analysis showed little difference in breast anatomy between the males and post-menopausal females, including adipose, connective tissue (CT), and fibrous connective tissue (FCT). In order to determine whether the loss of glandular structures in postmenopausal females increases as they age, we compared breast tissue samples from female cadavers aged 80-89 years to those aged 90-99 years. We saw little qualitative difference in anatomy between the two age groups.

FISH SURVEY OF LETCHWORTH STATE PARK

Steven Anderson, Alyson DeMerchant, Halie Smith, Annemarie Ranger, Rebecca Williams
Houghton College

Fish surveys are a means of gathering information about fish populations and the dynamics of fish communities, which can be used to develop plans for management or recovery programs, help identify critical habitats and assess general changes in fish distribution and abundance. Studies of the fish species residing in the Genesee River have been previously conducted but no information can be found specifically for the stretch of river running through Letchworth State Park. The goal of this study is to provide more complete data for both Letchworth State Park and the Genesee as a whole by using nets to catch and assess the fish species that can be found in this stretch. Hoop nets were set out overnight, collected the following afternoon and the fish inside were photographed and their species and length were recorded, and then released. Forty individual fish making up 8 fish species have been recorded so far: *Catostomus commersonii, Meiurus natalis, Amploplites rupestris, Lepomis gibbosus, Lepomis macrochirus, Pomoxis nigromaculatus, Pomoxis annularis,* and *Micropterus salmoides*. Among the 8

species identified, the most prevalent species has been the Black Crappie, *Pomoxis nigromaculatus*, with a total of 17 specimen. These findings are preliminary as the research is still ongoing; however, all of the species found so far were noted in the Atlas of Inland Fishes of New York volume 7 as fish species found in the Genesee River. Some fish that are present in the section of the Genesee River that flows through Letchworth might not be well represented in this survey due to migration and the season during which the survey was conducted. The efficacy of our fishing methods could also have been influenced by rainfall and the placement of the nets. Other methods of collecting fish such as electrofishing might be more effective in future studies due to the swiftness of the current and the interference of other animal species.

CHOLESTOSOME™ MEDIATED DELIVERY OF NUCLIEC ACIDS INTO MCF7 CELLS

S. Andres, M.Q. Irving, A. Kovacs, J. F. McArthur, J. Hughes, L. M. Mielnicki, M. P. McCourt
Niagara University

This laboratory has developed a neutral lipid based vesicle (the CholestosomeTM), that uses naturally occurring lipids to encapsulate and deliver a wide variety of substances, including fluorescein isothiocyanate (FITC) and other small molecules, vancomycin and other antibiotics, insulin and other peptides, IgG antibodies and other proteins as well as plasmid DNA and other nucleic acids. Previous work has shown Cholestosome-mediated delivery of FITC-labelled peptides into various mouse tissues (including brain) after oral administration. Cholestosomes can therefore potentially be used to orally deliver compounds for which intravenous administration is the only effective dosing route. Particularly exciting is the potential to orally deliver nucleic acid therapeutics. The present study reports preliminary work on the encapsulation and delivery of plasmid DNA encoding Green Fluorescent Protein (GFP), a molecule widely used as a co-transfection marker and to study protein interaction and localization. Successful transfection of this plasmid results in a cell that displays green fluorescence when excited with light of the appropriate wavelength. GFP was encapsulated and characterized for size as well as lipid and DNA content. It is believed that Cholestosome™ delivery of a variety of different molecules used in the treatment and diagnosis of cancer, muscular dystrophy, and neurodegenerative diseases, among others, is possible.

USE OF DRONES IN MONITORING THE EXTENT OF INVASIVE SPECIES IN THE FINGER LAKES.

Joshua Andrews, Ileana Dumitriu, Ph.D., Peter Spacher, Ph.D.
Hobart and William Smith Colleges, Physics Department

With the recent commercialization of Drones in the United States, many affordable research applications can be explored. The prevalence of Harmful Algae Blooms (HABs) causes many issues to the local population. Standard water quality testing to determine the presence of HABs is often time consuming and expensive. Determining the algae concentration of the water through the use of drones, as a more cost effective method, and monitoring of invasive water chestnut in the Finger Lakes Region will be presented in the poster.

Do non-native Ants eat themselves to carrying capacity

Kazz Archibald, Robert Warren
State University of New York College at Buffalo

The Earth hosts a variety of ecological communities which hold their own distinct characteristics and species. Species native to their ecological communities generally do not surpass their carrying capacity, which is the amount of available resources that is provided by a particular habitat. Native species do not surpass their carrying capacity because of competition between members of their own species as well as

with other species, which can be seen as a series of checks and balances. Species that are not native to the environment (invasive species) may have a higher carrying capacity because they do not compete with themselves. Non-native species are often detrimental to their environment because their exponential population growth results in an over saturation of the environment and elimination of natural competitors. My research was designed to determine if Myrmica rubra, a species not native to Buffalo, was able to reach its carrying capacity. I collected multiple samples of M. rubra in order to test for a decline in their health which would be a direct result of exceeding carrying capacity. At the end of my research, I was able to gain notable insight on the population trends of M.rubra. The invasive ant populations grow quickly in Spring and appear to exceed carrying capacity by mid-Summer, as indicated by decreased size and health.

INFLUENCE OF ORAL PROBIOTICS ON THE ACCUMULATION OF ORAL PATHOGENS ON AN ARTIFICIAL SURFACE.

Irina Ardelean, Kristin Picardo
St. John Fisher College

The human oral microbiome is home to over 500 species of microorganisms, including the known pathogen *Staphylococcus aureus*. *S. aureus* is a gram-positive, facultative anaerobic bacteria that is responsible for many infections, including dental caries. It causes dental caries by forming biofilms, film-like aggregations that adhere to a surface, connected to an exopolymeric matrix (plaque). The biofilms enable the bacteria to communicate and gain metabolic advantages, which they use to make the mouth more acidic by metabolizing glucose into lactic acid, causing dental caries. Biofilms are disrupted by the mechanical brushing of teeth and ingredients like fluoride and triclosan. Oral probiotics are a new and innovative approach to dental care as they involve the placement of beneficial bacteria in the mouth to help regulate and improve oral health. In this experiment, a probiotic emulsion was made by dissolving colonies of probiotic bacteria cultured from commercially available probiotic tablets (EvoraPro) in water. The emulsion was tested using a Kirby Bauer assay to determine if it kills or inhibits the growth of *S. aureu*s. It was found that the emulsion inhibits the growth of S. aureus. The baseline biofilm formation of *S. aureus* with and without treatment of the emulsion was also determined using a Peg Lid Biofilm assay.

VALIDATION OF ANO1Δ7 TRANSGENIC ZEBRAFISH

Neslihan Ari, Alyssa Jim, Steven Byington, Sanya Jamal, Chelsi Salvatore, Adam Rich
The College at Brockport, SUNY

Anoctamin-1 codes for a transmembrane protein which functions as a Ca2+activated Cl- channel. When intracellular calcium levels rise, and when the membrane potential depolarizes, ANO1 becomes active, allowing passive influx and efflux of Chloride ions across the cell membrane. ANO1 is critically important for electrical pace-making activity of the Interstitial Cells of Cajal in the gastrointestinal (GI) tract and the regulation of GI motility. In order to better understand the role of Anoctamin-1 in the ICC, we created a transgenic Ano1 zebrafish (Ano1Δ7), using CRISPR genome editing technique, which is predicted to eliminate Ano1 expression and function. Our overall goal is to validate Ano1Δ7. To determine Ano1 loss of expression, we used immunohistochemistry (IHC) and fluorescence microscopy analysis of paraformaldehyde-fixed, paraffin embedded adult zebrafish sections. Preliminary experiments have shown ANO1 expression in Ano1Δ7's Interstitial Cells of Cajal. When compared to the wildtype zebrafish sections, Ano1 expression was sporadic. Further experiments are underway to verify this result, and to determine whether staining conditions contribute to sporadic Ano1 expression.

B

SYNERGY BETWEEN SIMULTANEOUS AND SEQUENTIALLY APPLIED LACCASE AND XYLANASE IN THE DEGRADATION OF WOOD INTO BIOFUELS

Zachary Augustyn, Dr. Robyn Goacher
Niagara University

With the ever-growing shortage of gasoline in today's modern industry, finding a fuel substitute is becoming increasingly important. A new field of research has opened with the interest of using plant-based materials as a new source of energy, in the form of cellulosic biofuels derived from wood. Polysaccharides in wood can be degraded into sugars, which can then be fermented into alcohol to be used as a fuel. A key portion of this research is to break down the lignin that sheaths the cellulose and hemicellulose and polysaccharides. This poster will discuss a study of the synergy between two particular enzymes – laccase (which degrades lignin) and xylanase (which degrades the hemicellulose termed xylan). Specifically, the aspect enzymes work together in the degradation process. This poster will show the relevant data for the analysis of enzyme-treated solid wood using several solid-sampling instruments (FTIR-ATR, TGA, and ToF-SIMS). The data was analyzed using principal component analysis (PCA) to identify trends in the treatments. This research has the potential to clarify one piece of the complex puzzle that is today's modern energy crisis.

B

INVESTIGATING THE IMPACT OF VARIOUS BISPHENOLS ON OBESITY IN DROSOPHILA MELANOGASTER.

Erik Baim, Edward Freeman
St. John Fisher College

Endocrine disrupting chemicals (EDCs) have become ubiquitous in the environment over the past 50 years. According to the Environmental Protection Agency (EPA) an EDC is "an exogenous agent that interferes with the synthesis, secretion, transport, metabolism, binding action, or elimination of natural blood-born hormones that are present in the body and are responsible for homeostasis, reproduction, and developmental processes." EDCs also act as obesogens: chemicals that induce adipocyte differentiation, alter energy storage mechanisms, change basal metabolic rate, and/or alter hunger and satiety (Dimanti-Kandarakis at al. 2009).

One category of EDC is the bisphenols. The most prominent bisphenol is Bisphenol A (BPA) but there are several other analogues such as BPF and BPS. These analogues differ at their substituents around their non aromatic carbon, causing researchers to question whether they can bind to similar receptors that BPA has been shown to bind such as estrogen receptors. BPA has been found in 95% of human urine samples as well as breast milk and adipocytes. Bisphenol exposure occurs through use of plastic containers, epoxy resins and various coatings & liners that leach these chemicals into food and water (Rochester & Bolden 2015). Minimal research has been done using analogs of bisphenols and Drosophila melanogaster. Drosophila is a powerful model organism due to its ease of maintenance, short life cycle and similarities to the human genome (Hales et al. 2015). We currently have some data related to the obesogenic properties of the bisphenols.

CARBENE LABELLING OF GAS PHASE PEPTIDE IONS: A NOVEL TECHNIQUE FOR STUDYING PROTEIN TOPOGRAPHY.

Gregory Ballard, Paul Martino
Houghton College

Proteins responsible for diseases such as Alzheimer's have proven difficult to study due to their tendency to not crystallize, making x-ray crystallography inadequate for studying their structure. This

talk outlines the testing of a new method for determining the topological structure of proteins using gas phase carbene labelling of peptide ions. The purpose of this research is to validate the usefulness of this method by testing it on the model proteins melittin and BBAT2. Melittin and BBAT2 were ionized in the gas phase by electrospray ionization using a repurposed mass spectrometer ESI unit. While in the gas phase, the peptides were reacted with carbene gas generated by the ultraviolet photolysis of diazirine gas. The mixture of labelled and unlabeled proteins was collected on a grounded target and then eluted from the target with solvent. The samples were then analyzed using a Thermo Finnigan LTQ mass spectrometer. The most promising samples were also sent to the University of Rochester for high resolution mass spectrometry analysis using a Thermo Fisher Q-Exactive mass spectrometer. Mass shifts consistent with carbene labelling were observed in the mass spectrum of labelled samples. Oxidation of sample was also observed. Reducing oxidation of peptide samples and improving the consistency of the electrospray ionization process are two areas where this method needs further refinement. High resolution data from UR will be presented and discussed to determine if this method of studying protein topography gives results consistent with the known structure of the model proteins used in this research.

INFORMATION CAPACITIES OF LINEAR TIME-INVARIANT BOSONIC CHANNELS WITH ADDITIVE GAUSSIAN NOISE

Bhaskar Roy Bardhan, Mohammed Raihan Hossain
SUNY Geneseo

The maximum rate at which classical information can be sent through a noisy communication channel under realistic circumstances has become highly relevant as the demand for greater data capacities in fiber-optic communication has increased. Quantum mechanical noise determines the overall capacity at which information can be sent within a quantum bosonic channel. We investigated the maximum rate at which classical information can be sent through a bosonic channel with additive Gaussian noise and Linear Time Invariant filters using fiber optic communication systems while transmitting information in long distance. We examined the entanglement assisted classical capacity, the maximum rate of communication for which classical bits can be sent through a channel with an unlimited amount of prior entanglement, as well as the private capacity, the maximum rate at which classical information can be sent through a channel while preventing the environment from gaining any information from the classical bits sent through the channel. These two types of capacities determine the maximum rate of communication that can be sent by using a channel multiple times. The capacities were determined both numerically and analytically for a single-pole filter as well as a fourth order Butterworth filter. We also determined the optimum photon allocation for a given power constraint of both information-carrying capacities.

FATTY ACID SIGNATURES OF PREY FISH FROM LAKE MICHIGAN

Nathan Barker, Sergiusz Czesny, Jacques Rinchard
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Lake Michigan has recently experienced large changes in chemistry and biological community composition resulting in food web structure alterations. To detect these alterations, fatty acid signatures (FAS) of nine prey species including alewife, round goby, bloater, deepwater sculpin, rainbow smelt, slimy sculpin, nine-spine stickleback, spottail shiner, and yellow perch were quantified. Fish were collected by federal, state, and tribal agencies throughout the lake and assigned to one of four quadrats: southwest, southeast, northwest and northeast. Belly flaps were sampled and analyzed for lipid and fatty acid composition. Non-metric multidimensional scaling plots demonstrated separation among

species (ANOSIM; R = 0.638; P<0.01), with the greatest difference between alewife and round goby (SIMPER; average dissimilarity = 26.78%). The major fatty acids responsible for the difference were 20:5n-3, 18:1n-9, 22:6n-3, and 16:1n-7. Spatial distribution of alewife and round goby did not affect their FAS significantly (ANOSIM; R = 0.073; P>0.05 and R = 0.085; P>0.05, respectively). These results indicate that alewife and round goby rely on distinct food sources that are spatially consistent throughout the lake.

REACTIONS TO ENRICHMENT OBJECTS IN CAPTIVE BELUGA WHALES (DELPHINAPTERUS LEUCAS)

Emily Began, Michael Noonan
Canisius College

Because beluga whales are large brained and long lived, it is important to provide them with mental stimulation when they are held in captivity. In an effort to assess the efficacy of one type enrichment, the reactions of fourteen captive beluga whales at Marineland of Canada to several different types of toys was assessed. Numerous exploratory and play behaviors directed at the enrichment objects were recorded, suggesting that these enrichment efforts were effective. Both solitary and social interactions with the objects were common, but the rates of their occurrences varied considerably with the nature of the object presented. Facilities that house belugas may be able to use the results of this study to determine what types of toys will be most effective in the future.

GROWTH OF SHEWANELLA ONEIDENSIS IN THE PRESENCE OF TOXIC METALS: A BASIS FOR SUSTAINABLE SEMICONDUCTING NANOPARTICLE BIOSYNTHESIS.

Alexis Bell, Sanela Lampa-Pastirk
Nazareth College

The growth of gram-negative, dissimilatory, metal-reducing bacterium *Shewanella oneidensis*(Shewanella) was studied in the presence of the Cd, Se, and Te cations anaerobically and under limited oxygen conditions. Under these conditions, Shewanella reduced metal cations through its unique mechanisms of extracellular electron transfer (EET). We show the effects of high concentrations of Cd, Se and Te using bacterium growth rates and expression of charge transfer species such as outer membrane cytochromes directly involved in EET. Our results demonstrate that Shewanella readily sustains growth in the presence of high concentrations of Na2SeO3 and Na2TeO3, but requires a longer adaptation period to concentrations of Cd cations higher than 0.1 mM. The hindered growth of Shewanella under these conditions can perhaps be caused by the high affinity for adsorption of Cd cations to bacterial cell walls. The utilization of toxic materials from the environment can be applied toward the biosynthesis of sought after semiconductor nanoparticles such as quantum dots. Despite its naturally high resistivity to toxic metals, Shewanella has not yet been utilized for biosynthesis of highly popular cadmium nopaticles (CdS, CdSe or CdTe). The research presented here demonstrates the first step of adaptation of Shewanella growth in the presence of the high concentrations of metals relevant for nanomaterial biosynthesis.

THE ECOLOGY OF ALPINE SNOWBANK COMMUNITIES OF MT. WASHINGTON, NH.

Kevin Berend, Kathryn Amatangelo
The College at Brockport - State University of New York

Alpine snowbank communities are rare, diverse ecosystems found in the Northeast only in sheltered sites above treeline. My work focuses on how the depth and duration of snowpack affects plant community composition and phenology at snowbank sites on Mt. Washington, NH. Variation in snowmelt timing affects soil temperature, and the subsequent emergence and flowering of snowbank plants. Statistical analyses exploring these relationships will be discussed in relation to plant community

metrics and other environmental variables (e.g., light, soil moisture). 2016 data show a consistent turnover in community composition across the snowmelt gradient, including an inverse relationship in both diversity and richness between vascular plants and lichens; no transition was evident in bryophytes. Second, two snowbank herbs, *Chamaepericlymenum canadense* (Bunchberry Dogwood) and *Clintonia borealis* (Bluebead Lily), were collected from both high- and low-elevation sources, and grown in a common garden. Variation in plant traits or phenology between populations may provide evidence for genetic differentiation and/or local adaptation, as well as the increased conservation status of alpine ecotypes. Alpine areas have been shown to be disproportionately affected by climate change, and snowbank communities in particular are threatened by altered precipitation patterns; they may act as sensitive indicators of change in the Northeast.

INHIBITION OF *BACILLUS SUBTILIS* CELL DIVISION BY THE SP01 BACTERIOPHAGE PEPTIDE GP56

Amit Bhambhani, Max Belfatto, Daniel P. Haeusser
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Bacterial cell division occurs via an assembly of the tubulin-homolog FtsZ and other downstream division proteins, thus creating a complex called the divisome. This allows for constrictive forces and septal wall synthesis, splitting the cell in two. Previous research identified gp56 peptide expressed by SP01 bacteriophage as an inhibitor of *Bacillus subtilis* cell division. Identification of its target protein in cell division can aid future antimicrobial drug research in devising a mechanism that halts cell division of pathogenic bacterial cells. Observation of division protein localization in the presence of gp56 was conducted using fluorescent microscopy. Assembly of the FtsZ ring was still observed, suggesting that the target protein localizes after Z ring formation. Localization of gp56 to FtsZ was observed in the presence of all division protein knockout strains except that of FtsL, narrowing the list of potential targets to FtsL, FtsW and DivIC. Two methods will allow for identification of a singular target, the first being the expression of a 6XHis-encoding fusion to gene 56 and purification of His-gp56 by cobalt chromatography, looking for co-purification of its unknown target. The second method is to look for gp56 interaction with a panel of potential division protein targets using a bacterial two-hybrid assay.

ANALYSIS OF SOUNDSCAPES AND VEGETATIVE DIVERSITY IN LETCHWORTH STATE PARK.

Abigail Bobbette, Jennifer Rowan, Kristina Hannam
SUNY Geneseo

The purpose of this study is to investigate variation in soundscape in three different habitat locations in Letchworth State Park, each with distinct vegetation. Of the 3 sites selected, 2 are plantation growth, site one dominated by Sugar Maple, Site 2 Evergreen, and Site 3 is characterized natural growth. Within each site, we conducted point-quarter transects to determine species diversity and composition, canopy cover, and ground cover. Site 3 was the most diverse according to a rank abundance curve, it also had a lower diameter at breast height, and point to plant measurements than the other 2 sites. The vegetation at the three sites are significantly different. We made 48 hour recordings at each site with a Wildlife Acoustics SM4+ recorder and analyzed recordings using the acoustic complexity index (ACI). With the ACI we categorized sound based on frequency and identify it as biophony, anthrophony, and geophony. We will present results illustrating differences among soundscapes at the different sites, and how soundscape parameters are associated with vegetation differences.

B

POPULATION GENETICS IN DAPHNIA TOWED FROM ROUND POND.

Dr. Kaitlin Bonner, Bartelli Sara, Cotugno Gabriella
St. John Fisher College

Daphnia, a group of cladocerans, play an important role in lake ecosystems. They are a group of water fleas that show evolution patterns and dynamics. They demonstrate a good foundation for evolution in general, due to their rapid changes. Not only are they a good model for general evolution, but also for host-parasite coevolution. Additionally, they play a major role in phytoplankton regulation, nutrient cycling, and energy flow in their systems. *Daphnia* can reproduce sexually or asexually; however, specific environmental conditions dictate which form they will use. During warmer months, *Daphnia* will reproduce asexually. Reproducing in this way will form an egg that hatches within the parent, which results in offspring that is a genetic clone of the parents. During cooler months, they will reproduce sexually. The change in reproduction seems to be triggered by an increased density of *Daphnia*. The succession of *Daphnia* is regular in lakes and freshwater bodies. While this turnover is regular, the drivers of this processes are not clear. *Daphnia* succession occurs when some event or happening changes the rate at which certain species are produced. Some of the possible drivers of this could be something as insignificant—to us—as a change in water movement. Parasitism in *Daphnia* causes a change in the different species of *Daphnia* at a given time. Looking specifically at reproduction and the role of parasitism, the turnover of *Daphnia* spp. in small bodies of water will be analyzed.

A NUTRITIONAL EXPLORATION OF COMMON BUCKTHORN FRUIT AND ITS VALUE FOR MIGTRATORY BIRDS.

Molly Border, Gretchen Horst, Susan Smith Pagano
Rochester Institute of Technology

Common buckthorn (*Rhamnus cathartica*) is a commonly occurring shrub that has naturalized throughout much of the northern US and southeastern Canada. After invasion the shrub rapidly dominates the understory and becomes established, and the fruits of the plant may be eaten and dispersed by birds and other vertebrates. Buckthorn may pose a threat to migrating birds where it outcompetes native shrubs if the quality of the fruit is inadequate for migratory fueling at critical stopover sites. We investigated the nutritional quality of common buckthorn fruit in Rochester, NY and compared key nutritional analytes relevant for migratory birds to those of native fruits in the area. We also examined the phenological development of fruit sugars in autumn, and regional variation in the fruit morphology and nutritional traits in different parts of its naturalized range. Results of the study will provide information about potential variation in the nutrition available to birds in areas where it buckthorn dominates the shrub community and may help to inform management of critical habitats for birds and other vertebrate populations.

MITIGATION OF ORGANIC WASTEWATER CONTAMINANTS FROM THE LAKE ONTARIO EMBAYMENT (MONROE COUNTY) VIA EMULSIONS AND BIOREMEDIATION TECHNOLOGIES.

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Organic and inorganic contaminants, which can be excreted from agricultural systems and wastewater treatment plants, negatively affect water quality in the Great Lakes region. Previous studies demonstrated that these contaminants can harm both humans and aquatic organisms through exposure and ingestion. Since water treatment technologies are currently ineffective at removing many of the pollutants, mitigation using emulsion-based bioremediation will be investigated for feasibility. Collaborators at Rochester Institute of Technology (RIT) create emulsions of tris (2-chlorophenyl) phosphate and gemfibrozil, which are the two organic contaminants commonly found in the Lake

Ontario embayment. This project identifies the bacterial species previously isolated from local waterways and develops bioassays to investigate bacterial ability to degrade emulsified pollutants.

INVESTIGATING POTENTIAL TRANSGENERATIONAL EFFECTS OF BISPHENOL A ON OBESITY IN Drosophila *melanogaster*.

Stephanie Brazell, Edward Freeman
St. John Fisher College

Endocrine Disrupting Chemicals (EDCs) interfere with hormone biosynthesis, metabolism and action which results in a deviation from normal homeostatic control. These chemicals can be found in the environment, food, and water due to their abundance in numerous consumer products. Bisphenols are one category of EDC with numerous member molecules such as Bisphenol A (BPA). Exposure to BPA occurs through the use of plastic containers/water bottles and the consumption of food stored in containers with BPA based liners and coatings (such as liners of metal food cans). Not surprisingly the most common bisphenol found in the environment is BPA. BPA has been reported to cause numerous defects in various types of animals (fish to mammal) under multiple exposure paradigms (embryonic, neonatal, adult). Of interest for this project are reports that indicate BPA is an obesogen in mammals. Obesogens are defined as EDCs that causes obesity by altering various components of the fat metabolism pathway such as increasing adipose tissue differentiation and eventual adipose tissue volume.

Fruit flies (*Drosophila melanogaster*) are commonly used as a research model to study human diseases and disorders. The fruit fly genome is known and comparisons to mammalian genomes reveal numerous orthologs suggesting the fruit fly model as useful for comparisons to vertebrates. There have been numerous reports evaluating the effects of disease and transgenerational effects, but none that have looked at obesity due to chemical exposures in fruit flies. Additionally, a few studies focusing on the obesogenic effects of EDCs on fruit flies have been reported, but none that have focused on bisphenols.

In previous, unpublished research our lab has shown an effect of BPA exposure, during fruit fly embryonic and larval development, on adipose tissue development. To further this research I will be testing to see if the effects of BPA are passed on from generation to generation, i.e. transgenerational. This transgenerational study will look at exposure to BPA (during development) in a parental generation to see if there is an effect present in subsequent generations that lack chemical exposure (F1 and F2 generations).

SWIMMING VELOCITY ANALYSIS IN *CHLAMYDOMONAS REINHARDTII*

Renae Bronakoski, Noveera Ahmed Ph.D.
St. John Fisher College

Eukaryotic cells use cilia and/or flagella to move, propel fluids, and/or sense their environment. In humans, motile cilia and/or flagella are typically found in the respiratory, nervous, and reproductive systems. If cells lose or do not produce these organelles this can lead to ciliopathies. *Chlamydomonas reinhardtii* is a bi-flagellated algae that is commonly used to study flagella and cilia in eukaryotic organisms. These organisms are significant in research fields because of the various ciliopathies that can arise in humans. C.reinhardtii can reabsorbs their flagella, this reabsorption only occurs prior to cell division based on their cell-cycle. The eukaryotic cilia/flagella contain the classic '9+2' microtubule doublet formation also called an axoneme, the bending action of this axoneme is how they can move. These microtubules use a variety of different proteins and other components to help this process. The major components we are focusing on are the outer-dynein arms and the inner-dynein arms. When flagella are present they can use these flagella to swim and move around their environment. In this

experiment, we are using a high-speed camera on top of a high-powered microscope to capture their swimming speeds. Using the videos taken and a software called ImageJ their swimming velocities can be calculated. The goal of this study is to develop a tool that can be used to characterize phenotypes of motility mutants. These novel mutants, being generated in the lab, would help to identify new proteins needed for flagellar movement or assembly. These proteins would likely play a role in human ciliopathies.

X-RAY PHOTOELECTRON SPECTROSCOPY FROM TITANIUM NANOPARTICLES ON METAL OXIDES.

Conner Brown, Michael Pierce
Rochester Institute of Technology

Producing effective catalytic surfaces is an ever-important part of energy production and storage. This study attempts to produce very chemically active surfaces through the deposition of Titanium on metal oxides. Titanium is annealed onto these metal oxides, and through the annealing process the surface de-wets into several layers of chemically active nanoparticles which are studied via x-ray photoelectron spectroscopy (XPS). So as to avoid oxidation, the deposition chamber and spectrometer are both under ultra-high vacuum (UHV), reaching pressures of 10-9 Torr. XPS provides crucial information about the chemical composition of the surface, and can also provide a depth profile of the chemical composition. As the x-rays interact with the electrons on the surface, there are emissions detected that are very sensitive to their constituent atoms. A precise categorization of the chemical properties of these materials will help us work towards creating more effective catalysts.

RATES OF BROWN-HEADED COWBIRD PARASITISM AND FLEDGING SUCCESS DEPEND ON SIZE OF HOST SPECIES.

W.P. Brown
Keuka College

Brown-headed cowbirds (*Molothrush ater*) – obligate brood parasites – have laid eggs in the nests of over 200 bird species. Although the generally negative effect of parasitism on the reproductive success of these host species is well studied, examining variability in the success of brown-headed cowbirds as a function of host characteristics remains an area of inquiry. Here, differences in nest parasitism rates and cowbird fledging rates as a function of the mass of host species were examined; mass might indicate host competitive abilities. Rates of cowbird parasitism and rates of cowbird fledging success among eastern forest bird species (n = 70 species examined) were derived mainly from the Birds of North America species accounts. Cowbird parasitism and cowbird fledging rates as a function of mass of host species were examined with logistic regression. There was a quadratic relationship between parasitism rates and host mass, with a peak near 34 grams (22% of nests parasitized). There was also a quadratic relationship between cowbird fledging success rates and host mass, with a peak near 18 grams (29% of cowbird eggs fledged). In short, despite greater parasitism rates among host species of approximately the same size (mass) as cowbirds, cowbird fledging success was greatest among hosts of smaller body sizes.

A METHODICAL ANYLYSIS FOR PURIFYING PRIMARY CILIA FROM DIFFERENTIATING 3T3-L1 PRE-ADIPOCYTES.

Tameciah N. Browne, Brett Henderson, Laurie B. Cook
The College at Brockport, SUNY

Obesity has become a leading health crisis in Western society. Understanding the development of fat cell precursors can lead to a pharmaceutical target for inhibiting the accumulation of excess fat tissue. The melanin-concentrating hormone receptor 1 (MCHR1) is a G protein-coupled receptor found

in the plasma membrane of adipose cells. Our lab has recently identified the MCH signaling pathway as a potential regulator of adipose tissue development. During differentiation, 3T3-L1 pre adipocytes produce a transient primary cilium, to which MCHR1 migrates, before returning to the plasma membrane. We hypothesize that MCH signaling is altered during ciliary localization. The Aim of this project was to develop a procedure to isolate purified primary cilia from 3T3-L1 cells on Day 2 of a 10-Day differentiation protocol. First, a calcium shock method was attempted unsuccessfully which lead to modifying salt concentration and utilizing carbon dioxide/oxygen gas ratio to keep the critical salt in solution. Next, a shear force method was attempted, resulting in cellular lost and undetectable protein yield. Next, we utilized a discontinuous and continuous sucrose gradient to concentrate the proteins yield for Western blot analysis. Multiple ciliary and non-ciliary markers are being used to identify the ciliary protein fraction(s). Next, we will use fluorescence microscopy for visual conformation of cilia detachment. Our overall experimental goal is to identify the proteins that MCHR1 interacts with in the primary cilium via mass spectroscopy.

CHANGES IN FREQUENCY, CALL LENGTH, AND NOTE INTERVALS IN WINTER VOCALIZATIONS OF SPECIES EXPOSED TO VARYING LEVELS OF ANTHROPOGENIC NOISE.

Leeann Bruetsch, Kayla Schum, Dr. Kristina Hannam
SUNY Geneseo

Birds vocalize for many reasons, including communication of potential threats, behavioral cues, and alerting others to new food sources. Local species are found across a range of habitats from natural to those highly impacted by humans. One of the primary ways humans impact local environments and communicating birds is through anthropogenic noise. Effects of anthropogenic noise on winter behaviors and vocalizations have not been studied intensively, but we predict changes in song and call characteristics depending on exposure to anthropogenic noise. This investigation of winter vocalizations and behavior focused on Black-capped Chickadees and American Goldfinches. We used five study sites, two at the Roemer Arboretum, one at the GVC Island Preserve, and two at different residential areas. Each research site was close to a road and had a bird feeder set up for a week before recordings were performed. Audio recordings of feeding site vocalizations were done at hour-long intervals for each site, once during the morning (between 6 am - 10 am) and once during the afternoon (between 12 pm - 5 pm). Observers noted species identity and behavior during recordings. We analyzed each recording using Raven Pro software to measure maximum frequency, minimum frequency of each vocalization, and the total length of the call and the intervals between notes of that call and between different calls. We will report on differences between species, between sites, and relationship of vocalization characteristics to anthropogenic noise.

THE ROLE OF INTEGRIN α1β1 (VLA-1) IN CD8+ T CELL MOTILITY.

Patrick Buckley, Emma Reilly, Ph.D., David Topham, Ph.D.
State University of New York College at Geneseo, University of Rochester

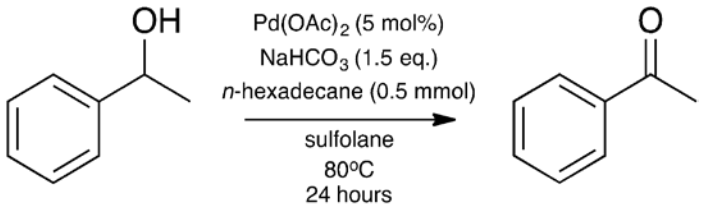
Cytotoxic $CD8^+$ T cells must localize to the infected airway before interacting with influenza-infected epithelial cells. Despite the importance of this outcome, determinants of T cell motility in the lungs and other peripheral organs are poorly understood. Although it is known that long-term persistence of local memory cells in the airway after influenza infection requires the collagen IV-binding integrin VLA-1, the mechanism(s) of its effects have not yet been fully characterized. We hypothesized that VLA-1 promotes increased motility through the traction generated by transient ligand-binding. To test this, VLA-1 wild type (WT) or knock out (KO) virus-specific T cells, harvested from mice at different time points after infection, were plated on slides coated with collagen IV and imaged using time-lapse fluorescence microscopy. Factors of motility, such as speed and straightness, were quantified with cell-tracking

software to assess what type of signal VLA-1 provides. Analysis of the observed motility patterns showed that VLA-1 KO T cells have a substantial decrease in adherence and migration when compared to WT control cells, suggesting that VLA-1 facilitates both adherence to and migration along collagen IV. Understanding the molecular regulators of T cell motility in peripheral organs are especially relevant for enabling the creation of vaccines that can form local memory and provide long-term protection against heterosubtypic infections.

ALLADIUM CATALYZED OXIDATION REACTIONS, USING SULFOLANE AS A GREEN SOLVENT

Eliza Burdick-Risser, Frances Quigley and Karen E. Torraca
Houghton College

Oxidation of alcohols to carbonyls is a common reaction used in the synthesis of complex molecules since carbonyls are versatile reactants for making carbon-carbon bonds. Although many oxidation methods exist in organic chemistry, the majority of the methods use toxic or hazardous reagents. Many of these methods also use stoichiometric amounts of heavy metals and generate significant waste. The focus of our research was the development of a green method for the oxidation of alcohols to ketones. Key goals focused on a process that was reproducible as well as scalable, since the most environmental impact would be achieved by implementation of the oxidation at large-scale. To develop the method, 1-phenylethanol was used as a model compound for oxidation using palladium catalysis. Reaction conditions were screened exploring the use of various solvents with additives. Sulfolane produced the best results, and provided reproducible data with high percent yields.



FULLERENE EXPOSURE INCREASES BLUEGILL PREDATION ON DAPHNIA PULEX.

Emily Bush, Truc-Nhi Do, George Rogalskyj, Elizabeth Moore, Sandra Connelly, Callie Babbitt, Christy Tyler
Rochester Institute of Technology

Since the discovery of Fullerene (C60) in 1985, these “buckyball”-shaped carbon nanomaterials have been incorporated into numerous products, including solar cells, batteries, and cosmetics, due to their unique properties. With this increasing use in consumer products comes an increased risk of environmental exposure, especially to aquatic ecosystems. Our previous work with these materials demonstrated that when Daphnia sp. are exposed to fullerenes, the fullerene aggregates in the carapace and results in a darkened appearance. This coloration eliminates their transparency in water column and may lead to higher visibility to predators and greater mortality. D. pulex were exposed to 7 mg/L of three forms of fullerene (C60, C70, and PCBM) or no fullerene (control) for three weeks. Individual L. macrochirus were then isolated in small aquaria and offered similar numbers of unexposed and fullerene-exposed D. pulex. The time to consumption was measured for each D. pulex. The results showed that L. macrochirus select exposed Daphnia sooner and in higher quantities than the control group. Thus, exposure to fullerene increases the risk of predation by visual predators. By observing

disparities in predation risk, we may better understand of the potential threat of fullerenes across trophic levels and inform policy to protect aquatic resources.

BREEDING BIOLOGY OF RED-WINGED BLACKBIRDS (AGELAIUS PHOENICEUS) IN STORMWATER RETENTION PONDS ON THE COLLEGE AT BROCKPORT CAMPUS.

Abigail Butler
The College at Brockport

Red-winged Blackbirds (*Agelaius phoeniceus*) often breed in stormwater retention ponds. I studied the breeding biology of the species in seven small retention ponds at the College at Brockport, to evaluate their breeding success in a created habitat relative to data from studies in natural habitats. I also determined how habitat characteristics affect the breeding biology of Red-winged Blackbirds. The College at Brockport population had harem sizes with up to four females per male and an average clutch size of 3.7 eggs per nest. I found 47 nests, at least four of which were second nestings. Larger ponds had more male territories, with greater numbers of females within these territories. The nesting season lasted from 26 April 2017 and I continued my study until 12 July 2017. The apparent nest success was 78.3%, with relatively low rates of predation. In similar studies, apparent nest success ranged from 20-70% (Weatherhead 1977, Grandmaison 2007). Predation rates from this study were 13.0% while other studies found predation rates up from 27-53%. There was no significant difference in distance from nest to pond edge or open water, water depth, vegetation height, and vegetation density between successful and unsuccessful nests. Based on my results the retention ponds provide good breeding habitat for Red-winged Blackbirds.

DOES BIOFILM NUTRIENT RECYCLING MATTER AT THE ECOSYSTEM SCALE?

Maria Butler, Mansi Chhina, Michelle Baskins, and Jonathan O'Brien
Canisius College

Our goal was to determine if mature biofilms in creeks are capable of recycling their nutrients, or if they obtain their nutrients from the environment. We separately released pulses of nitrate, phosphate, and ammonium to measure uptake rates from stream water. We then compared this to the activities of microbial enzymes involved in nutrient recycling. We found that uptake N and P from the stream water was orders of magnitude lower than enzyme activity, suggesting that nutrient recycling was critically important for biofilms at the ecosystem scale.

ISOLATION OF GLYCOSYL HYDROLASES TOWARDS GOAL OF UNIVERSAL BLOOD

Mia Byrd, Elaine Militello, Rafay Tariq, Mark Gallo, Ph.D.
Niagara University

Glycosyl hydrolases, as their name implies, are enzymes able to remove sugars. Sugars found on the surface of blood are responsible for their antigenic properties noted with A, B, and O type blood. It follows that removal of sugars should produce a "universal blood." The trisaccharides on the surface of blood contain a terminal moiety of either an N-acetylgalactosamine linked in an alpha 1,3-configuration to fucose for A type blood or galactose linked in a similar manner to fucose for B type blood. Many bacteria have glycosyl hydrolases as a means to break down complex carbohydrate polymers. Several groups have identified enzymes with activities against the sugar residues on blood however none are of sufficient catalytic activity to be commercially viable. This research will isolate enzymes from novel groups of bacteria in hopes of identifying enzymes with greater activity and specificity for the removal of sugars from blood.

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GLUCOSE METABOLISM IN THE ANOCTAMIN 1 TRANSGENIC ZEBRAFISH

Bianca Camillaci, Gabriella Mercurio, Kaitlyn Niedermeier, Ryan Peters, Paola Severino, Adam Rich.
The College at Brockport, SUNY

Anoctamin 1 (ANO1) is a CaCC with a role in insulin secretion in both humans and mice, however, ANO1 function in zebrafish is unknown. We suspect that ANO1 involvement in insulin secretion in zebrafish will be similar. To examine the physiological role of ANO1 we developed a transgenic zebrafish, ANO1 Δ7, that is predicted to show complete loss of ANO1 function. Our overall objective is to validate this transgenic animal. To do this we will examine the role of ANO1 on blood glucose homeostasis. We will be collecting blood from ANO1 Δ7 zebrafish, fasted and postprandial, and compare that to the blood glucose levels of wildtype zebrafish and pharmacologically inhibited ANO1 zebrafish, both fasting and postprandial. We anticipate that ANO1 Δ7 transgenic zebrafish will be unable to lower their postprandial blood glucose levels as efficiently as the wild types. Preliminary data shows blood glucose levels to be 54mg/dl in fasted wild type zebrafish and 80mg/dl postprandial. We expect fasting glucose levels in the pharmacologically inhibited and ANO1 transgenic fish to be similar to fasted wild type, and postprandial blood glucose levels to be significantly lower than the wild type postprandial. These data would be consistent with an ANO1 role in insulin secretion, and would show loss of Ano1 function in transgenic zebrafish. Our next step is to measure blood glucose levels on zebrafish that have ANO1 inhibition via benzbromarone.

ARROWS IN BIOLOGY: POINTING TO CONFUSION FOR LEARNERS

Jordan J. Cardenas, Dina L. Newman, L. Kate Wrights
Rochester Institute of Technology

Our research seeks to unpack the phenomenon of representational competence by exploring how arrow symbols are used in introductory biology textbook figures. Initial analysis of figures in an introductory biology textbook revealed little correlation between arrow style and meaning attributed to style. A more focused study of 86 figures second textbook showed the same pattern of inconsistency among the 230 arrows. Interviews with undergraduates (N=14) confirmed that arrows in selected textbook figures caused confusion and failed to convey the original intention of the illustrators. In addition, an online survey was conducted in which subjects were asked to infer meaning of different styles of arrows in the absence of context. Few arrow styles had intrinsic meaning to participants, and Illustrators did not always use those arrows for the meanings expected by students. Thus, certain styles of arrows triggered confusion and/or incorrect conceptual ideas. We argue that illustrators should be more clear and consistent when using arrow symbols, and instructors should work to help students better understand the use of these symbols in representations. We have begun to seek standardized arrow symbols or alternative symbols altogether to represent certain conceptual ideas in textbook figures.

PHOTOCATALYTIC HYDROGEN PRODUCTION USING BIOMOLECULAR CATALYSTS.

Saikat Chakraborty, Banu Kandemir, Rebeckah Burke, Todd D. Krauss, Kara L. Bren
University of Rochester

A carbon-free alternative to fossil fuels is hydrogen, produced from water in a light-driven reaction. Our approach to solar hydrogen production draws inspiration both from nature's ability to store energy through photosynthesis and from the activity of hydrogenases. Substantial success has been achieved in catalyzing the hydrogen evolution reaction with coordination complexes in the presence of sacrificial electron donors and photosensitizers in the form or organic dyes or metal complexes. The Bren lab has developed metalloprotein and metallopeptide-based catalysts, which have the added benefits of water

solubility, activity at moderate pH values, and the potential for engineering second-sphere interactions with the active site. With $[Ru(bpy)_3]^{2+}$ as a photosensitizer and ascorbic acid as an electron donor, a cobalt-tripeptide (CoGGH) catalyst is shown to reduce protons from water near neutral pH with turnover numbers (TONs relative to CoGGH) exceeding 1000. In addition, a cobalt-porphyrin peptide complex (CoMP11-Ac) is demonstrated to produce H_2 from both pH 4.5 and pH 7.0 buffered solutions containing $[Ru(bpy)_3]^{2+}$ and ascorbic acid with TONs (relative to catalyst) greater than 1500. Employing CdSe quantum dots with capping ligands like glutathione for water-solubility as sensitizers results in 80,000 TONs (relative to CoMP11-Ac catalyst) for H_2 evolution from water at pH 4.5. Ongoing efforts are toward improving performance and longevity, and understanding the mechanistic pathways of the photocatalytic cycle.

TWO YEARS OF INVASIVE CATTAIL MANAGEMENT VIA MANUAL REMOVAL.

Sarita Charap, Stephanie Facchine, Joe McCarthy, Alexander Steiner, Faith Page, Eric Hellquist
State University of New York Oswego

Management of native and invasive cattails (*Typha* spp.) can be important for maintaining wetland habitat structure. Dead Typha biomass decomposes slowly and accumulates creating mulch that inhibits native flora. For the last two years, we have worked in a peatland that is a critical site for the New York State endangered Bog Buckmoth (Hemileuca sp. 1) whose primary larval food source is *Menyanthes trifoliata* (Bog Buckbean). Menyanthes habitat is being colonized by *Typha angustifolia* and *T*. x *glauca*. Due to the invasive nature of Typha at the site, land managers initiated a control program to help preserve habitat for the Bog Buckmoth and its primary forage. Our objective was to determine the most effective time of year to mitigate Typha colonization by manual removal. A split plot design was established to determine how cutting Typha in Spring (n=12) and Fall (n=12) may influence the success of Typha management. Over two field seasons, removing living and dead Typha resulted in a reduction of Typha on the fen mat. One of the most important results of Typha management has been the removal of biomass from the fen mat during harvests. Our preliminary results suggest that dedicated management of Typha by removing biomass from the mat in the spring or fall can help maintain habitat structure for conservation purposes.

GREEN MACHINES: DO RIVER BIOFILMS LEARN TO RECYCLE AS THEY AGE?

Mansi Chhina, Sophia Miracle, and Jonathan O'Brien
Canisius College

Recent research suggests that larger, more developed biofilms are able to rely on internal nutrient recycling, rather than external sources, to account for a large portion of their metabolic needs. We grew aquatic biofilms under laboratory conditions to examine the tradeoffs between externally nutrient uptake and internal nutrient recycling that occur as biofilm mature. We measured biofilm growth, metabolism (photosynthesis and respiration), nutrient uptake and enzyme activities over 2.5 months of incubation. We found that nitrate and N recycling are equally important to supply the nutrient requirement of growing biofilms at early and middle stages of development. At late stages, internal cycling of N becomes more important than nitrate as a source of N to meet the metabolic needs of algae within the biofilm. These results have implications for our understanding of nutrient retention in rivers and prevention of nutrient transport to downstream water bodies.

THE POLLINATION BIOLOGY OF *SCAEVOLA PLUMIERI* IN VIEQUES, PUERTO RICO ISLAND.

Ngawang Chime
Ithaca college

Scaevola plumieri is a coastal shrub (Goodeniaceae family), native to Indo Atlantic and it is considered an endangered species in Cayman Islands. On the other hand, *Scaevola taccada* is native to Indo Pacific and

was introduced to the Caribbean in the 1970s. We are trying to understand why *S.plumieri* is surviving poorly while its sister species, *S.taccada* is having a better survival rate. We are interested in documenting pollinator visitations in both S. plumieri and S. taccada in Vieques Island (Puerto Rico). The visitation rate was calculated by dividing number of pollinators on each flower over several 15 minute time periods. Observational data including both the identification and frequency of different insect visitors suggests that the native *S.plumieri* attracts a greater diversity of pollinators than does *S.taccada*, and additionally, *S. plumieri* attracts native species whereas S. taccada attracts generalist pollinators. The key pollinators for both *S.taccada* and *S.plumieri* are *Centris decolorata, Centris lanipes, Apis mellifera, Xylocopa mordax,* and *Campsomeris trifasciata*. Three years of data concludes that in both 2015 and 2016, the pollinator visitation rate for *S.plumieri* was higher than *S.taccada* while for 2017 data, pollinator visitation rate for *S.taccada* was higher. Patterns of pollinator visitation are variable by year and may be affected by rainfall patterns.

MODELING THE BIOPHYSICS OF TRANSPORT OF CARGOS IN CROWDED CELLULAR ENVIRONMENTS

Kevin Ching, Moumita Das
Rochester Institute of Technology

Inside cells, intracellular cargoes (such as vesicles) are transported by molecular motors to their correct locations via an active motion on microtubule laments and a passive Brownian motion. During transportation, the motor-cargo complex have to navigate in the crowded and confiding environment due to the surrounding biopolymer networks. In order to understand the role of confinement on such intracellular transport, we developed and study a simple model consisting of motors (carrying a cargo), a microtubule on which the motors can walk, and different types of confinement.

CONSUMER ADAPTATION MEDIATES TOP-DOWN REGULATION OF ECOSYSTEMS ACROSS A PRODUCTIVITY GRADIENT.

Michael F. Chislock, Alan E. Wilson, Ash Abebe, Orlando Sarnelle
The College at Brockport, Auburn University, Michigan State University

Humans have artificially enhanced the productivity of aquatic ecosystems on a global scale by increasing nutrient loading. While the consequences of eutrophication are well-known, most studies tend to examine short-term responses relative to the time scales of heritable adaptive change. Thus, the potential role of adaptation by organisms in stabilizing the response of ecological systems to such perturbations is largely unknown. We tested the hypothesis that adaptation by a generalist consumer (*Daphnia pulicaria*) to toxic prey (cyanobacteria) mediates the response of lake ecosystems to nutrient enrichment. Using a manipulative field experiment in limnocorrals, we examined the interactive effects of nutrient enrichment and consumer genotype (sensitive vs. tolerant to toxic prey) on algal abundance and species composition. We then tested theoretical predictions of how the magnitude of consumer effects should vary with productivity by conducting simultaneous mesocosm experiments across 11 ponds that spanned a large gradient in total phosphorus. Sensitive and tolerant D. pulicaria genotypes had comparable effects on algal biomass under ambient (unfertilized) conditions. In contrast, tolerant genotypes resulted in a greater than 80% reduction in algal biomass versus no effect of sensitive genotypes under fertilized conditions, relative to the no Daphnia control. The interactive effects of fertilization and Daphnia genotype on algal biomass were mediated by the positive response of the invasive and toxic cyanobacterium Cylindrospermopsis raciborskii and an associated cyanotoxin (saxitoxin) to nutrient enrichment. Our results demonstrate that organismal adaptations should be considered for understanding and predicting ecosystem-level responses to anthropogenic environmental perturbations.

EFFECTS OF MACROMOLECULAR CROWDING ON ENZYME KINETICS.

Charmaine Bing Bing Chung and Jasmine Jackson Professor Kristin Slade
Hobart and William Smith Colleges

Previous understanding of enzyme kinetics was based on experiments conducted under dilute conditions. However, these conditions do not accurately represent the more realistic crowded intracellular environment of the cell, which contains a substantially large total concentration (300-400g/L) of various macromolecules such as proteins, carbohydrates and ribosomes. High concentrations of macromolecules reduce the volume of solvent available for other molecules in the solution. This exclusion of volume increases the effective concentrations of all molecules, which could potentially impact the behavior of enzymes. To study theses potential consequences, the Michaelis-Menten kinetics of yeast alcohol dehydrogenase (YADH) and citrate synthase were monitored under crowded conditions. Assays were performed in the presence and absence of high concentrations of synthetic polymers such as polyethylene glycol (PEG) and dextran. Surprisingly, synthetic polymers impeded citrate synthase catalysis less than their small-molecule counterparts. For YADH kinetics, the effects from crowding differed for the forward and reverse reaction. Furthermore, the presence of the small molecule ethylene glycol increased the Km value of YADH between 3-5 fold, while larger crowding agents had little to no effect. These results indicate that high concentrations of small molecules play just as much if not more of an effect than macromolecules on enzyme kinetics in a cell.

SALVAGE PALEONTOLOGY - SILURIAN ROCKS OF UPSTATE NEW YORK

Samuel J. Ciurca, Jr.

Across upstate New York occur numerous localities rich in Silurian fossils, however there are many strata that are only rarely accessible and some with no known natural outcroppings. For many years, I have paid particular attention to a few important sites, reclaiming whatever I could paleontologically and stratigraphically. Being at the right place at the right time allowed for the recovery of unusual fossils, including new species (some of which still remain undescribed). Some of the more significant retrievals are described below.

Maplewood Shale, Driving Park Bridge, Rochester, New York

Total reconstruction of the Driving Park Bridge (Rochester, New York - 1989) resulted in hundreds of tons of Silurian rock strata being blasted into the river gorge below. One unit, the green Malewood Shale, is noteworthy because it decomposes rapidly at first sign of weathering (e.g. rain). Since so little was known about the fossil fauna contained in this shale, I decided to examine as much as I could. This resulted in a collection of rare crinoids, brachiopods, a possible phyllocarid and eurypterid remains. It is expected that some of the fossils are new to science (i.e. new species) and therefore the collection is expected to be reposited in the collections of the Yale Peabody Museum of Natural History (YPM).

Medusaegraptus Biota, Goad Island Formation, Lockport Group, Gasport Quarry, Gasport, New York

Trilobites (some possibly new), crinoids, unusual plants and many other types of fossils were recovered from a section of about 4.0 meters of the Goat Island Fm. interpreted by Ruedemann (1925, "Some Silurian Faunas of New York") as interreef strata within the dolomitic Goat Island Fm. It is intended to reposit all specimens to the Yale Peabody Museum.

Pittsford Member (black shale) of the Vernon Formation, Pittsford, New York

Hundreds of specimens were retrieved from construction sites around Pittsford and much of this material has already been donated to YPM and recently, the Tastings Collection was reposited in the

Museum of the Earth, Ithaca, N.Y. Some new research, based on the collections, has already been published. For example, and for the first time, the internal stratigraphy of the eurypterid-bearing beds was worked out and is described in: "Pterygotids (Chelicerata; Eurypterida) from the Silurian Vernon Formation of New York, Samuel J. Ciurca, Jr. and O. Erik Tetlie, J. Paleontology 81(4), 2007, pp. 725-736,

HEAVY CHALCOGENORHODAMINE DYES FOR VISIBLE-LIGHT-DRIVEN PHOTOREDOX TRANSFORMATIONS.

Jennifer Clark, Dr. Michael Detty
University at Buffalo, The State University of New York

Photocatalysis uses organic dyes or transition metal complexes to preform single-electron-transfer processes with a substrate upon irradiation. Organic dyes have been employed to a limited extent in photoredox catalysis, while ruthenium(II) and iridium(III) complexes have been extensively studied. There are several properties of organic dyes that make them advantageous over transition metal complexes. Organic dyes are less toxic, more cost effective, and have improved photophysical properties, such as higher extinction coefficients and increased absorption in the visible region, making them a more practical option versus transition metal complexes.

The Aza-Henry reaction, a carbon-carbon coupling reaction between a nitroalkane and an amine yielding a β-amino nitroalkane, was studied using heavy chalcogenorhodamine dyes as photocatalysts. Replacing the oxygen heteroatom with sulfur or selenium increases intersystem crossing to the triplet state as a result of the heavy atom effect. The longer-lived triplet excited state increases the probability of electron transfer over the course of the reaction, thus improving yields in known reactions and the ability to catalyze less traditional routes in organic synthesis.

CONCENTRATIONS OF HEAVY METALS AND BACTERIAL COMMUNITIES IN BOTTLED AND TAP WATER.

Emily Cooley, Jacqueline Epp, Abigail Leahey, C. Eric Hellquist
State University of New York Oswego

Water is a commodity and also an essential resource for survival. Water is a common, meaning that it is not owned by anybody, but it can be controlled by private entities. Bottled water consumption has been increasing in locations where clean drinkable tap water is available at very little to no cost. Bottled water is marketed as pure and healthy. In response to this claim, studies have been conducted that compared bottled water to tap water. In particular, contaminants, such as heavy metals and bacterial communities, have been examined. Some studies indicate that bottled water has higher concentrations of heavy metals than tap water. In addition, evidence shows that bacterial contamination is greater in bottled water sources. We used an Inductively Coupled Plasma Mass Spectrometer (ICPMS) to assess heavy metals (Ar, Cd, Pb, Ni, Ag, Sb, Zn, Cr, Co, Ba, Be, and Cu) and Biolog Ecoplates to characterize bacterial communities in various brands of bottled water (Dasani, Poland Springs and SUNY Oswego) and in tap water collected from locations originating from Ontario Lake and Cayuga Lake. Commercial bottlers claim that bottled water should have less heavy metals and bacterial contaminants than tap water. However, other sources predict that tap water and bottled water will be of similar quality with regard to heavy metals and bacterial diversity. Initial analysis using Biolog Ecoplates shows a lack of bacterial growth in both bottled and tap water, which supports our prediction.

EFFECT OF DIFFERENT MAGNESIUM SUPPLEMENTS ON MOUSE MAGNESIUM BALANCE

Tricia Cooke, Conner Kobus, Christopher Carlson, Gabriela Mercurio, Taylor Thompson, Bernardo Ortega
The College at Brockport

Hypomagnesemia is a common electrolyte disorder usually treated with different commercially available magnesium supplements, including magnesium oxide, magnesium citrate or magnesium chloride. These

supplements have different chemical composition and bioavailability, and therefore may differ in their efficiency to maintain magnesium status, and to influence the bacterial flora of the gastrointestinal track. Here we analyze the effect of magnesium citrate, one of the most common supplements, on the magnesium metabolism of mice. We show that magnesium citrate was efficiently absorbed, but then eliminated due to exaggerated magnesium excretion in urine, resulting in mild hypomagnesemia. Thus, when compared to magnesium oxide, magnesium citrate was clearly an inferior dietary supplement for mice, despite its greater bioavailability.

RATES OF AGGRESSION IN CAPTIVE BELUGA WHALES FOLLOWING POOL MERGERS

Jay Cooney, Michael Noonan
Canisius College

Beluga whales (*Delphinapterus leucas*) inhabit remote Arctic waters near the edges of polar ice. Because of this very little is known about their social behavior. To help address this need, the goal of the present study was to investigate the rates of inter-whale agonistic behavior in captivity. In particular, the rates of aggression and the spatial distribution of the whales were assessed under the conditions of a closed and opened gate that connects two pools. The results are suggestive of a fission-fusion social structure in which the choice to increase distance from other individuals potentially enhances individual welfare.

Investigating the Potential Impact of Bisphenol F on Zebrafish (*Danio rerio*) Larval Swimming Behavior.

Meghan Connor, Edward Freeman
St. John Fisher College

The widespread use of endocrine disrupting chemicals (EDCs) has been a source of concern because of their various effects on the endocrine system. These effects include metabolic disorders, complications in reproductive health, hormone-related cancers, and neurodevelopmental disorders. Of particular concern is Bisphenol A (BPA), a synthetic compound commonly found in consumer products such as water bottles, thermal receipt paper, and epoxy resins used in the packaging of processed foods. Previous studies have shown that BPA can mimic estrogen through a variety of mechanisms and thus elicit an endocrine response. Some manufacturers have responded by removing BPA from their products; however studies using the replacement compound Bisphenol S have reported it to be just as, if not more, dangerous.

The use of zebrafish (*Danio rerio*) larvae as a model organism is ideal due to the ease of rearing, relatively short developmental period, and their genetic similarity to humans. As a model organism, zebrafish allow for the effects of bisphenol exposure to be rapidly quantified through a simple behavioral assay. In studies concerning bisphenol exposure, the use of zebrafish has demonstrated reproductive, developmental, endocrine and behavioral effects. One such study by Kinch et al. found that larval Bisphenol A and Bisphenol S exposure within a specific 24-48 hour window lead to precocious neurogenesis in the hypothalamus and consequent hyperactive behaviors, as well as suggesting the mechanism through which bisphenols act. The study of Bisphenol F, yet another endocrine disruptor that has become a replacement for BPA in consumer products, is highly important to public safety.

PRESENCE OF Allorhizobium vitis IN THE GUT OF WILD HOUSE SPARROWS (*Passer domesiticus*) SAMPLED FROM FINGER LAKES VINEYARDS.

Luciana Cursino, Rory Doremus, and William Brown
Keuka College

We investigated the hypothesis that *Allorhizobium vitis,* the causing agent of Crown Gall of grapevines, was present in the gut of House Sparrows (*Passer domesticus*) foraging in vineyards of the Finger Lakes

region of New York State. House Sparrows (n=7) were collected near vineyards and stored at -80C prior to dissection. Feathers were scrubbed with 70% ethanol and transported to a biosafety level II cabinet. The entire GI tract was removed from each bird and the contents from esophagus to cloaca were sampled using sterile cotton swabs moistened in phosphate-buffered saline and inoculated for presence of the bacteria in RS media. All RS media plates (selective to *A. vitis*) were incubated for 4 weeks at 28°C. 30% of samples were positive for *A. vitis* and molecular-based confirmatory experiments are underway. No causal relationship has yet been established between wild House Sparrows and the spread of Crown Gall disease.

***Gallus gallus domesticus* (BANTAMS) AS AN EXPERIMENTAL MODEL TO STUDY LONG-TERM SURVIVAL OF Allorhizobium vitis ON THE FEET OF AVIAN SPECIES.**

Luciana Cursino[1], Rory Doremus[1], Paulo Cursino-Santos[2], Barbara Demjanec[1] and William Brown[1]
[1] Keuka College 2 ICCS consulting Ltd.

We investigated the ability *Allorhizobium vitis* the causing agent of crown gall of grapevines, to survive for long periods of time on the feet and nails bantams chicks (*Gallus gallus domesticus*). The feet of one-week-old bantams were surface sterilized (30s 2% sodium hypochlorite, 30s 70% ethanol, 2x 60s water). Feet of birds in the treatment group were immersed in a buffer solution of *A. vitis* ($1x10^8$ CFU/ml) for 2 min (n=8), while feet of birds in the control group were immersed in buffer solution for 2 min (n=4). Treatment and control groups were caged separately and swabbed for the presence of the bacteria in RS media at time 0, and weekly until 13 weeks post inoculation (wpi). All RS media plates (selective to *A. vitis)* were incubated for 4 weeks at 28°C. End point- PCR was used to confirm the presence of *A. vitis*. The experiment was repeated three times. At 0 wpi we were able to recover $1x10^8$ CFU/ml and the amount of bacteria decreased over time to 10^7 CFU/ml (3 wpi); 10^5 CFU/ml (6 wpi); 10^4 CFU/ml (8 wpi), 10^3 CFU/ml (10-13 wpi). Our results show that *A. vitis* can survive in the feet and nails of bantams making this species an accessible and inexpensive experimental model to access the long-term survival of bacterial phytopathogens on the feet of avian species.

***in planta* DETECTION OF *Curtobacterium sp.* BIOCONTROL STRAIN BY MOLECULAR TECHNIQUES**

Luciana Cursino, Amanda Magilton
Keuka College

It is expected that for a biocontrol strain to be successful it must be similar enough to resident strains and occupy identical ecological sites. To detect of *Curtobacterium sp.* strain ER2/2 (an endophytic strain of oranges) *in planta* this bacteria's 16SRNA (unpublished data) was used to generate end-point pcr and real time- PCR primers that amplified a region around 200bp. *Curtobacterium sp.* strain ER2/2 were inoculated on 10-day-old healthy bean plants (*Phaseolus vulgaris cv. Red* n=12), with $1x10^6$ CFU/ml of bacteria, while control plants were buffer inoculated (n=12). Plants were kept in the growth chamber at 25ºC, 47 % relative humidity (RH) and a 12 h photoperiod for 20 days. Plant DNA was extracted using Power Plant DNA Isolation Kit (MoBio). DNA of all plants was used on downstream end-point PCR. Our data shows that 55% percent of the samples were positive for the presence *Curtobacterium sp.* strain ER2/2. While control plants did not have the bacteria DNA. Real time- PCR assays are underway, but the ability of the potential biocontrol strain to survive, multiple and reside inside of bean plants is a great advantage. Our future goal is to use this strain as a biocontrol against pathogenic strains of *Curtobacterium sp.* in beans.

D

SPIRANTHES OVALIS VAR. EROSTELLATA - A NATIVE ORCHID NEW TO NEW YORK.

Steven Daniel, Anne Johnson
Monroe Community College, Botanical Consultant

We report *Spiranthes ovalis* var. *erostellata* (Orchidaceae) for the first time in New York State. First collected in 2015 and originally misidentified, it was rediscovered at the same site in 2017 and correct identification confirmed. This finding expands its known range by over 500 km to the north and by nearly 700 km to the east. This late-flowering native species was discovered in a disturbed habitat, and may be overlooked in other locations. Is this species truly rare, or could it be hiding in plain sight?

ASSESSMENT OF TWO VERNAL POOLS IN AURORA, NY, FALL 2017.

Shania Dauphinais, Niamh O'Leary
Wells College

A variety of amphibians rely on vernal pools for breeding, hatcheries and habitat. Many other organisms benefit from vernal pools for drinking water, food, and habitat. The significance of vernal pools in ecosystems led me to examine the characteristics of two vernal pools on the Wells College campus in fall 2017. To determine the water quality of both pools I tested pH, dissolved oxygen content, nitrogen and alkalinity. I observed animal use by setting up trail cameras, identifying tracks, visual observations and examining water samples under a microscope. I documented soil color and texture. The average water pH for both areas was 7.5 and the alkalinity was 110 ppm CaCO3 with zero nitrogen present. The bigger vernal pool had an average of 11mg/L dissolved oxygen, whereas the smaller pool had an average of 9mg/L. At both vernal pools I observed deer, frogs, crickets and pill bugs. At the small pool I identified raccoons, damselflies, fairy shrimp and seed shrimp. At the bigger pool, I found a water mite and copepods in the water. The soil color was grey which means that the area is poorly drained with low organic matter. The soil also contains some clay. Overall, both areas are used by many organisms. Further research is ongoing to determine the environmental parameters.

MCH TREATMENT MAY DECREASE OVERALL MCHR1 LEVELS IN CILIATED AND FULLY DIFFERENTIATED 3T3-L1 CELLS.

Iesha DeLesline, Dr. Laurie Cook
The College at Brockport, SUNY

MCHR1 is a G-protein coupled receptor embedded the plasma membrane of preadipocytes in most mammals. MCH is the ligand that binds with MCHR1, causing a cascade of signaling pathways crucial for the regulation of intercellular processes. The MCH-MCHR1 complex plays a role in appetite regulation by stimulating feelings of hunger and satiety. 3T3-L1 mouse embryonic preadipocyte stem cells are used as a model to study adipocyte differentiation and homeostasis. In lab, 3T3-L1 cells are cultured and differentiation is controlled over a 10 to 14 day period. It has been previously observed that on Day 2 of the differentiation protocol, 3T3-L1 cells grow a single cilium that remains for 24 hours, not reappearing again during the remainder of differentiation or in adipocyte cell life. The cilium is thought to serve as a sensor necessary for cell communication and development. MCHR1 activity is hypothesized to be regulated by phosphorylation. We sought to determine if MCHR1 is phosphorylated with MCH treatment, and if MCHR1 is degraded with MCH treatment in ciliated (Day 2) and un-ciliated (Day 10) cells. MCH was exposed to ciliated and unciliated cells up to 1 hr. Cell lysates were probed with antibodies to MCHR1 via Western Blot. We observed MCHR1 protein in both types of cells, however the total MCHR1 protein in fully-differentiated cells was considerably less than differentiating cells, with no evidence of phosphorylation. Also, there was a slight decrease in overall MCHR1 levels with increasing

MCH treatment time. Further experiments will be necessary to confirm these conclusions, suggesting that MCHR1 protein levels are suppressed in adipocytes.

DETERMINING THE REQUIREMENT OF ANOCTAMIN 1 IN RHEOTAXIS USING ZEBRAFISH LARVAE.

Meghan Denny, Emily Amato, Seth Kirnie, Jessica Mayer, Adam Rich
The College at Brockport, SUNY

Zebrafish have been used as a model organism to understand fundamental systems of the body and the expression and functions of anoctamin 1 (Ano1). Ano1 is a transmembrane calcium-activated chloride channel involved in transepithelial ion transport, control of neuronal excitability, nociception, and phototransduction among other functions. Rheotaxis is a reflex performed by fish to swim upstream as they align themselves into the flow. Neuromasts are mechanoreceptors involved in the lateralis system that assist the zebrafish in communicating with and sensing their surrounding environment. Ano1 is assumed to have a functional role in these neuromasts and may play a role in rheotaxis. The objective of this experiment is to perform a rheotaxis assay with zebrafish larvae to understand the requirement of Ano1 for the behavioral display of rheotaxis. Rheotaxis has been observed in 5dpf and 7dpf wild-type zebrafish larvae in an assembled flume chamber. In the same apparatus, Ano1 transgenic zebrafish, and wild-type zebrafish treated with an Ano1 blocker, were also tested for a display of rheotaxis. Images were taken for each group of tested zebrafish larvae in a flowing and still E2 medium. These images were analyzed for zebrafish upstream alignment from 0°. It is predicted that the majority of zebrafish lacking expression of Ano1 will not display rheotaxis. Using a rheotaxis assay, to determine the behavior expressed by zebrafish, will determine the presence of functional Ano1 in transgenic zebrafish and requirement of Ano1 for rheotaxis.

INVESTIGATING THE ALLELOPATHIC EFFECTS OF PALE SWALLOWWORT (*CYNANCHUM ROSSICUM*) ON THE GROWTH SUCCESS OF COMMON MILKWEED (*ASCLEPIAS SYRIACA*) AND PALE SWALLOWWORT.

Jessica DeToy, Dr. Kathryn Amatangelo
The College at Brockport, State University of New York

Invasive species have become an increasingly persistent ecological problem in our area. The rising success of invasive species in out-competing native plants seriously threatens both biodiversity and ecosystem functionality. One mechanism that makes invasive plants successful is through allelopathy, which is the stimulatory and inhibitory negative effects on other plants through the release of chemical compounds. The invasive vine, pale swallowwort (*Cynanchum rossicum*) may change the growth situation in favor of itself by releasing the allelochemical glycoside vincetoxin. Thus far, little research has been conducted to examine the direct effects of swallowwort allelopathy on the growth of native plants. To accomplish this, soil containing remains of swallowwort was collected, and the native species *Asclepias syriaca* (common milkweed) and swallowwort were planted in this soil type and compared. It was hypothesized that the growth of milkweed would be limited by the swallowwort soil due to allelopathy and that swallowwort growing in soil containing remains of swallowwort would thrive. Analysis of growth data indicated that there were no significant differences in the success of swallowwort growing in both soil types and that milkweed growing in swallowwort soil was significantly smaller than milkweed planted in the control soil. This suggested that soil type had a limited impact on swallowwort growth, supporting observations that swallowwort is currently found growing in a variety of soil types, and that allelopathy in some soil types may affect the growth of milkweed and improve the overall competitive ability of swallowwort.

ROLE OF CONFINEMENT ON TWO-STATE TRANSPORT OF A MOTOR-DRIVEN CARGO IN CYTOSKELETAL NETWORKS

Supravat dey, Kevin Ching, Moumita Das
Rochester Institute of Technology

Inside cells, cargos such as vesicles and organelles are transported by molecular motors to their correct locations via active motion on microtubule tracks and passive, Brownian diffusion. During the transportation of cargos, motor-cargo complexes (MCC) navigate the confining and crowded environment of the cytoskeletal network. Motivated by this, we study a minimal two-state model

of motor-driven cargo transport in confinement and predict transport properties that can be tested in experiments. We assume that the motion of the motor is directly affected by the entropic barrier due to confinement when it is in the passive, unbound state, but not in the active, bound state. Confinement can further modulate the motor's binding kinetics. We construct a lattice model based

on a Fokker Planck description of the two-state system and study it using a kinetic Monte Carlo method. We compute transport properties such as the average velocity and the effective diffusivity of the MCC. For constant binding and unbinding rates, we find that introducing confinement effectively enhances the unbinding rate and thereby reduces the motor processivity, leading to smaller effective diffusivity and average velocity. For spatially varying binding rates that depend on confinement, the average velocity is further reduced when the average binding rate is equal to the constant binding rate without confinement.

MEASURING APOPTOSIS IN HELA CERVICAL CANCER CELLS AND CAL-27 ORAL CANCER CELLS FOLLOWING TREATMENT WITH CURCUMIN AND PHOTODYNAMIC THERAPY

Christian Domin, Dr. Robert Greene
Niagara University

In current research, HeLa cells and CAL-27 are induced to undergo apoptosis after treatment with curcumin, which is derived from the spice turmeric. This spice has been used as an anti-oxidant, an analgesic, and an anti-inflammatory medicine for centuries. Recently, curcumin has been shown to have anticancer properties due to its effect on biological pathways involved in cell-cycle regulation, oncogene expression, apoptosis and metastasis. Curcumin inhibits cellular signaling pathways that have key roles in cancer progression1. Treatment of HeLa cervical cancer cells and CAL-27 oral cancer cells with increasing concentrations of curcumin showed induction of apoptosis. When combined with photodynamic therapy, cytotoxicity against HeLa but not CAL-27 cells was demonstrated. Fluorescence microscopy and flow cytometry were used to determine apoptosis. Results showed that induction of apoptosis and increasing concentrations of curcumin were positively correlated, suggesting that curcumin could improve the treatment of oral cancer, and that combined treatment with curcumin and photodynamic therapy could improve the treatment of cervical cancer.

A New Modeling Activity for Comprehensive PCR Instruction

Callie Donahue, Ashley Adair
Rochester Institute of Technology

The Polymerase Chain Reaction (PCR) is a fundamental laboratory technique that allows for the amplification of many copies of a desired DNA target sequence. Despite its prevalence, undergraduate students often have poor comprehension about the underlying molecular mechanisms of PCR and the components necessary to carry out the process. To help students combat these common conceptual difficulties, we crafted an interactive modeling activity that focuses on the major steps of PCR; denaturation of the template, annealing of primers and extension of primers. In this lesson, students

engage with a hands-on modeling activity to simulate three rounds of PCR and answer conceptual questions to maximize learning. Results from pre-post testing (n=33) and group interview data suggests the interactive PCR model-based activity helps students comprehend the underlying molecular interactions that drive PCR and helps them understand how PCR relates to the field of biology.

POTENTIAL EUTROPHICATION OF BUCK POND, GREECE, NY? A TROPHIC PROFILING AND WATER QUALITY TO ADDRESS THE CONCERNS OF THE LOCAL COMMUNITY.

Faith Downes, Ivan Gergi, Jacob Murphy, Gannon Connors, Sarah Izzo, Emiliee Hyde, Brooke Zeller, Nini Doan-Nguyen, Rachael Pacella, Jessica Losee, Sabrina Joseph, Dani Painter, Ashley Harford, Barsha Biswa, Jack Wessel, Alyssa Merrill, Julia Widmer, Rachael Pacella, Jessica Losee, Sabrina Joseph, Dani Painter, Ashley Harford, Barsha Biswa, Jack Wessel, Alyssa Merrill, Julia Widmer, Rachael Moyles, Padmini Das, David Giacherio, Stephanie Zamule
Nazareth College

The appearance in the summer of large algal blooms caused local residents near Buck Pond in Greece, NY to express concern over water quality of the pond. Nutrient (Nitrogen(N) and Phosphorus(P)) pollution from point and nonpoint sources is a concern for such bodies of water, since the excess nutrients can potentially result in eutrophication. Our current efforts are focused on analyzing the water quality and determining the trophic profiles, thereby addressing concerns of the community. We sampled water at various sites in the pond, and used electrochemical probes and spectrophotometric analyses to determine concentrations of nitrate, phosphorus, ammonium, chloride, turbidity, and dissolved oxygen; as well as pH and electrical conductivity levels. This trophic profiling analysis indicated that the water quality parameters do not exceed NYSDEC precautionary levels. Relatively low levels of nutrients in the water could be connected to the presence of large areas of cattails surrounding the pond, possibly absorbing nutrients. These data reaffirm the nutrient removing capabilities of the cattail species, which are widely reported in literature. Currently, a proposal to remove the existing cattails is being discussed with the community to enhance the aesthetics. However, our investigation indicates that the removal of cattails, which are currently working as a natural filter, will likely increase the potential of eutrophication. Ongoing experiments in our laboratory are investigating the types of algae and cyanobacteria in Buck Pond. We will continue to monitor the water and work with the local community on this and other potential water quality issues.

THE DEVELOPMENT OF A BIOADHESION-RESISTANT SELF-ASSEMBLED SCAFFOLD FOR THE CHEMICAL ATTACHMENT OF ENZYMES TO GOLD SURFACES.

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Wells College, Samford University

This ongoing project, when fully completed might be used to reduce the amount of Endocrine Disrupting Compounds (EDCs) getting into the environment through waste-water and killing off fish populations. The ongoing goal of this portion of the project is to create a non-fouling surface film that will disallow nonspecific adsorption of an azide-labeled lignolytic enzyme (laccase). It is necessary that this laccase be bound to a bioadhesion-resistant surface in a way such that it retained its enzymatic activity. A non-fouling surface film was constructed layer by layer via self-assembly methods, where the first layer, 11-mercaptoundecylamine (MUAM), acts as a linking agent between the gold substrate and the outer, bioadhesion resistant, hydroxyl triethyleneglycol succinimidyl carboxymethyl ester (HO-PEG-NHS) layer. The hydrophilic nature of the outer PEGylated surface was expected to prohibit nonspecific adsorption of biomaterials. Data obtained by surface Infrared Reflection-Absorption Spectroscopy (IRRAS) indicates the creation of a well-organized and compact MUAM linking layer with exposed free amine groups for further binding. Preliminary IRRAS data, obtained after exposure of the MUAM film to HO-PEG-NHS,

suggests that attachment of the outer PEGylated layer has occurred. Surface IRRAS results for the formation of both layers will be presented and discussed.

E

PRODUCTION OF A SYMMETRICAL KETONE VIA NUCLEOPHILIC CARBONYLATION OF AN ARYLCOPPER.
Jennifer A. Ebert, Dr. Gregory Ebert
SUNY Buffalo State

The use of nucleophilic reagents to incorporate carbonyl groups into molecules is widely seen in organic synthesis. One method is to utilize organometallics to yield acyl anions. In 1972, Jeffery Schwartz published a paper demonstrating the carbonylation of alkylcopper reagents, but did not discuss any study including phenylcopper, complexed or otherwise. This study reports the production of the symmetrical ketone benzophenone by a similar approach. Various phenylcopper reagents were reacted with carbon monoxide, first at 0°C for an hour, then increasing the temperature to 60°C for an additional hour, followed by an aqueous acid quench. This method produced yields comparable to the yields of Schwartz's carbonylation of alkylcopper reagents.

LIGHT INDUCED CHEMICAL DEGRADATION AND STRUCTURAL POROSITY OBSERVED IN CH3NH3PbI3 SINGLE CRYSTALS.
Benjamin Ecker, Congcong Wang, Yongli Gao
University of Rochester

The family of hybrid organic inorganic perovskite (HOIP) materials have recently been the focus of considerable research efforts, chiefly due to their potential use as the active layer in a new generational solar cell but also due to their other remarkable optoelectronic properties. One of the main hurdles preventing the HOIP solar cells from wide spread commercialization is their long term operational stability issues, and their intrinsic stability under solar illumination has lately come in to question. Here we present our investigation on the light induced degradation of CH3NH3PbBr3 perovskite single crystals, where high quality crystals were illuminated by a blue semiconductor laser for a fixed time period. In-situ¬ X-ray photoemission spectroscopy (XPS) measurements were performed after each exposure, substantial chemical degradation was observed and a new spectral component appeared in the Pb core level spectra. The crystal's surface transformed from a brilliant translucent orange to a dull metallic silver color after the full illumination, and the surface's morphological changes were investigated with a scanning electron microscope (SEM) and with microscopic trenches milled by a focused ion beam (FIB). Large voids approximately 1-3 µm down into the material were seen in the FIB milled trenches of the light illuminated region. Additional chemical and structural changes were investigated with a transmission electron microscope (TEM) on a thin vertical slice of the illuminated region which was lifted out by FIB milling. A diffusion based model is then put forward to explain the light induced material and structural degradation.

IDENTIFYING NOVEL COMPONENTS OF FIBROBLAST GROWTH FACTOR RECEPTOR SIGNALING
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Fibroblast Growth Factor Receptors (FGFRs) are a type of receptor tyrosine kinase (RTK) that phosphorylate precise tyrosine residues. In *C. elegans*, the EGL-15 FGFR is imperative for sex myoblast migration and fluid homeostasis. Defects in the processes mediated by the *C. elegans* EGL-15 FGFR result in striking phenotypes that can be used to discover components of the EGL-15 signaling pathway. For example, hyperactivation of EGL-15 results in the excessive accumulation of clear fluid within the

worm's body (the Clr phenotype). The isolation of suppressor of Clr (*soc*) mutants has led to the identification of many of the core components of EGL-15 signaling. A previous *soc* screen identified the SEM-5 adaptor protein that links RTK activation to the activation of the RAS/MAPK pathway.

An *egl-15* mutation, *n1457* (a truncation mutation), that eliminates the known SEM-5 binding sites (Y1009 and Y1087) on EGL-15 does not confer a Soc phenotype indicating that a key component that links activated EGL-15 to SEM-5 has yet to be identified. To identify these missing components, we conducted a modified, "enhancer" *soc* screen in an *egl-15(n1457)* background. Using CRISPR/Cas9, we are introducing mutations in the known SEM-5 binding sites (Y1009 and Y1087) to determine if the Soc phenotype in newly identified genes is solely dependent on these binding sites. We are also using RNAi to verify the identity of a novel *soc* gene, *cca-1*. Additional genetic analyses and whole-genome sequencing will be used to identify the molecular identities of additional suppressors identified in our enhancer screen.

CAPTURE OF NANOPARTICLES USING ULTRA-THIN MICROFLUIDICS AND MEMBRANES

Anthony Emanuel, Fernado Ontiveros, James McGrath
St. John Fisher College

Microfluidics, a growing field of study due to its potential for multiple applications is the manipulation and study of fluids at a micro-scale level. Science has a good understanding of how fluid mechanics work on a large scale, but at smaller scales the physics are slightly different. Here we used microfluidic devices made from laminating pre cut polyethylene terephthalate layers (PETL) together to form channels. Within the past few months we have designed and built ultrathin microfluidic devices that incorporate nanoporous silicone membranes. This is a novel device that is low cost and allows for rapid iterations in design. These devices are used to capture particles on a nano-scale such as viruses and exosomes using a dialysis system. The nanoporous membranes contain pores that are approximately 60 nanometers in diameter with a depth of about 50-75 nm. Using a tangential flow system in the microfluidic device helped to stabilize the flow inside the channels. Having a dialysis system within the device allows for the through flow of liquid through the membrane so the virus particles can be captured within the membrane pores. After particle capture, the membranes are removed from the microfluidic device and imaged using scanning and transmission electron microscopes. Given that the membranes are ultra-thin and do not need a carbon grid for support, the particles can be better observed than using current imaging techniques. The ability to capture particles of this size in a contained and continuous flow system will allow us to study them in different ways than in the past. The device may also be used in clinical settings for particle capture and detection. This will allow for future advancements in diagnostic research and nanotechnology.

F

CLIMATE CHANGE AND ENDANGERED MUTUALISMS: THE IMPACT OF INCREASED TEMPERATURES ON POLLINATOR ACTIVITY.

Stephanie Facchine
State University of New York Oswego

Global temperature rise over the next century, coupled with more frequent extreme heat events, will likely impact ecological mutualisms. Increased temperatures may alter the daily patterns and timing of insect foraging activity, which may cause decreased plant and pollinator reproductive output. Plant-pollinator mutualisms involving rare taxa in extreme habitats are of particular concern. One such mutualism is that between federally threatened *Cirsium pitcheri* (Pitcher's thistle) and its bumblebee

pollinators (*Bombus* spp.). *Cirsium pitcheri* is endemic to the shorelines of the upper Great Lakes and relies on pollination events for reproduction. I asked if temperature varies during parts of the day when bumblebee pollinators are most active and if bumblebee visitation varied due to changes in temperature, if any. I monitored pollinator visitation for seven weeks during the growing season of *C. pitcheri* at Sturgeon Bay dunes in Wilderness State Park, Michigan. Temperature and bee visitation on average did not vary during my observation period (1000-1600) but other factors may have been at play (e.g. availability of flower heads). I also investigated the impact of extreme heat on bumblebee motor function in the lab. I exposed three bumblebee species to a series of increased temperatures and recorded the average critical thermal maximum. All three bumblebee species responded similarly to extreme heat, losing motor function at around 41°C. We anticipate more frequent extreme heat events based on climate change predictions. The impact of increased temperatures may be particularly severe in certain habitats for important yet sensitive pollinators and rare, keystone plants.

VEGETATION HEIGHT INFLUENCES NEST BOX PREFERENCE AND PRODUCTIVITY OF EASTERN BLUEBIRDS (*Sialia sialis*).

Zac Falconer, Oscar Pecci Perez, Andie Graham
SUNY Brockport

The Eastern Bluebird (*Sialia sialis*) is a secondary cavity nester found in open habitats throughout the Eastern United States. In addition to building nests in tree cavities, Bluebirds also nest in artificial nest boxes. We designed a study to determine the nest box preference of Bluebirds by using two box styles, Audubon and Peterson. We also assessed productivity of Bluebirds based on box type. Our study was conducted at The College at Brockport SUNY campus from April until August 2017. We paired one Audubon and one Peterson nest box at 20 sites around campus in areas with suitable Bluebird habitat, for a total of 40 boxes. Boxes were monitored weekly using guidelines designated by the North American Bluebird Society. To determine nest box preference, we used a Chi-square Test for Association and found no significant difference between box styles ($x2 = 1.21$, $df = 1$, $p = 0.31$). We quantified nest box productivity by the number of nests that fledged young. A Wilcoxon Signed Rank Test showed no significant difference in box productivity ($W = 1.5$, $p = 0.59$). Vegetation data collected at each site showed that 54% of selected boxes and 67% of successful boxes had vegetation < 0.5 m tall. These results suggest that Bluebirds do not prefer one box style over the other and that nest success is not determinant on the type of box nested in. However, vegetation height is an important factor in Bluebird nest box selection and success.

ISOLATION FO BACTERIOPHAGE FROM *STAPHYLOCCOCCUS* SPECIES

Janelle Fancher, Maria Kajdasz, Isaac Cowan Shania van Nuland, Mark Gallo, Ph.D.
Niagara University

Pathogenic *Staphylococcus* strains that are antibiotic resistant can cause infections that are difficult to treat. The use of bacteriophage in treatment of *Staphylococcus aureus* infection has been proposed as a possible alternative to antibiotics. Isolation and identification of new bacteriophage is an exciting area of research that may yield novel treatments for infections that have been challenging to eliminate by traditional means. One previously unexplored source of *Staph* and their corresponding phage are strains associated with wild animals. In this study, *Staph* were isolated from white tail deer, *Odocoileus virginianus*. The resulting bacteria were analyzed for the presence of lytic phage that were active against RN4220, a permissive strain of *S. aureus*.

The genomes of available *Staphylococcus* strains will be analyzed for the presence of previously unidentified, and unexpressed bacteriophage. This will be done to facilitate the production of a

phylogenetic tree and also give a window into the strains of phage that have not been encountered by clinical strains of *Staph,* and hence naïve hosts for any viruses that we isolate. The investigators will also use knowledge of known *Staph* phage to probe the bacterial strains isolated from deer to see how widespread particular viruses are in the environment. PCR will be performed using consensus primers to known genes in viral genomes to identify the presence of these phage.

MACROINVERTEBRATE COMMUNITIES ASSOCIATED WITH THREE AQUATIC PLANT SPECIES (*TRAPA NATANS, ELODEA CANADENSIS,* AND *VALLISNERIA AMERICANA*).

MacKenzie Fanciulli, Lindsey Keller
SUNY Brockport

Aquatic plants are structurally diverse. This variation in morphology influences the habitat quality available to macroinvertebrate communities. *Elodea canadensis* is fully submerged and has dense, whorled leaves. *Trapa natans* is a floating, semi-submerged plant with a larger, lobe leafed structure that forms dense beds on the water's surface. *Vallisneria americana* is submerged with elongate flattened leaf blades. We predicted that the different morphologies of these species would contribute to different assemblages of invertebrate communities. Eight samples of each aquatic plant species were collected from sites in Oswego, NY. The biomass of each plant sample was recorded in addition to the density and identity of macroinvertebrates washed from the plant biomass. We hypothesized that (i) the density of macroinvertebrates would differ across plant species with different morphology and (ii) that the macroinvertebrate communities will differ between invasive and native plant species. We that the density and species richness of invertebrate communities would be much lower for invasive *Trapa natans* than the three native species. Across all samples, introduced *T. . natans* had the lowest density of 180 macroinvertebrates present. *Elodea canadensis* had the highest density of macroinvertebrates across samples (n=666). *Vallisneria americana* had an intermediate density of macroinvertebrates *(n*=415 . Taxonomic classification of macroinvertebrates is ongoing with most collections belonging to Amphipoda, Diptera, Coleoptera, and Gastropoda groups.

THIAMINE CONCENTRATION AND LIPID CONTENT OF PREY FISH FROM THE GREAT LAKES REGION.

Nicholas Farese, Matthew Futia, Jacques Rinchard
SUNY Brockport

Thiamine deficiency complex (TDC) is prevalent in several salmonine species throughout the Great Lakes region and negatively affects their recruitment. Thiamine plays major roles in growth, reproduction, and neurological development of fish and can only be obtained through diet. The objective of this study was to determine if lipid content affects thiamine concentration in prey fish, which would explain the presence of TDC in salmonines. Prey (alewife, rainbow smelt, and round goby) were collected from six lakes: lakes Champlain, Erie, Huron, Michigan, Ontario, and Cayuga Lake. Lipid content was determined using gravimetric analysis, while thiamine concentration was measured using high performance liquid chromatography. Thiamine concentration and lipid content varied significantly among species within lakes and within species among lakes. Overall, alewife had the highest lipid content (7.4 ± 4.2 %), while round goby had the lowest (2.5 ± 1.0 %). Round goby had the highest thiamine concentration (21.0 ± 8.0 nmol/g), while rainbow smelt had the lowest values (8.9 ± 4.7 nmol/g). Thiamine concentration and lipid content were not significantly correlated for rainbow smelt nor round goby. In contrast, immature (<150 mm) alewife had a positive relationship and mature (>150 mm) had a negative relationship between thiamine concentration and lipid content. These results suggest that the relationship between thiamine concentration and lipid content is species and age specific.

IMPACT OF JAPANESE BARBERRY ON THE PHYSIOLOGICAL CONDITION OF BREEDING OVENBIRDS.

Abigail Frawley[1], Katherine Hensel[1], Chad Seewagen[2], Susan Smith Pagano[1]
[1]Rochester Institute of Technology, [2]Great Hollow Nature Preserve and Ecological Research Center

Japanese barberry (*Berberis thunbergii*) is a widespread invasive plant that has become prevalent in Northeastern forests. However, little is known about the impacts of this invasive shrub on breeding habitat quality for forest breeding songbirds. We studied Ovenbirds (*Seiurus aurocapilla*) at the Great Hollow Nature Preserve and Ecological Research Center in New Fairfield, CT in order to investigate physiological indicators of breeding habitat. Breeding-ready male Ovenbirds were captured using mist-nets in June 2017 and blood was sampled. Chronic physiological stress was determined by measuring the heterophil:lymphocyte ratio in blood smears made from each sample. Total plasma protein and plasma triglyceride concentrations were measured using colorimetric plasma assays. Both chronic stress and plasma metabolite levels were used to evaluate the overall physiological condition of each individual in relation to the presence or absence of barberry in their breeding territory. In addition, samples of barberry fruits were analyzed for energy, fat, and phenol content. Individuals living in territories with barberry in the understory were compared to those living in territories without barberry to determine if the presence of barberry impacts the physiological condition of Ovenbirds as they initiate breeding.

DETECTION OF A NON-CANONICAL SPLICE SITE THROUGH COMPARATIVE ANNOTATION OF THE *DROSOPHILA FICUSPHILA* MULLER D ELEMENT

Jonathon F. Fleming, Matthew R. Skerritt, PhD
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 euchromatic region of the *D. ficusphila* Muller D element. Three genes, *CG14448, jim, and CG11226*, and their associated isoforms, were annotated using a *Drosophila*-specific mirror of the University of California, Santa Cruz Genome Browser supported by the Genomics Education Partnership (GEP) at Washington University in St. Louis. Surprisingly, during annotation of *jim*, a non-canonical splice site donor (GC) was detected between exons two and three. Such variations have been reported in only 1% of *Drosophila* genes and may have consequences in terms of alternative splicing events. The genome browser was set to display evidence tracts for BLASTX alignments to *D. melanogaster* orthologous proteins, gene predictions, RNA-Seq alignment data, and TopHat splice site predictions. Using these lines of evidence, the best-supported gene model for each predicted gene was generated, including translation start site, intron splice sites, and translation termination site. All gene models were assessed for accuracy and completeness, and have been independently verified. The overall goal of this project is to analyze the types and distributions of conserved regulatory motifs near the transcription start site of *Drosophila* Muller F and D element genes.

STRUCTURE AND FUNCTIONAL ANALYSIS OF REGULATORY ELEMENTS INVOLVED IN THE MAINTENANCE OF GERM LINE STEM CELLS.

Dallas Fonseca, Vandita Bhat, Zachary Campbell, Te-Wen Lo
Ithaca College

Proper eukaryotic development requires the precise regulation of post-translational modifiers such as RNA-binding proteins. Defects in RNA-binding proteins or their target sites can disrupt the cell-cycle, resulting in tumor formation, a hallmark of cancer. In *C. elegans*, members of the conserved PUF (Pumilio and FBF) protein family regulate germline proliferation. PUF-8 and FBF (two paralogs *fbf-*

1 and *fbf-2*) function in the mitotic region of the germ line yet have distinct biological functions. Both recognize RNA via eight modular repeat units. However, the length of the consensus binding motif differs. PUF-8 recognizes an eight nucleotide element (PBE) while FBF-2 binds to a nine nucleotide consensus motif (FBE). Previous work has shown that the fifth repeat of FBF-2 is essential for flipping out the sixth base of the mRNA strand. We hypothesized that alterations to this repeat may switch its binding preference from FBE to PBE. We used an *in vitro* molecular genetics screen to identify mutations in the fifth repeat of FBF-2 that resulted in a switch for binding from FBE to PBE. After screening ~5,000 unique transformants, one provided the key molecular phenotype. Mutations with confirmed FBE to PBE binding switches, are being introduced in the endogenous *C. elegans fbf-2* locus using CRISPR/Cas9. Phenotypic and genetic characterization of these mutants will reveal key mechanistic features required for PUF regulatory function. To further understand PUF function, we are also taking a candidate approach to examine PUF protein binding partners.

IDENTIFICATION OF TRANSPOSABLE ELEMENTS IN THE GENOME OF THE TERRESTRIAL ISOPOD, *TRACHELIPUS RATHKEI*.

Rose Fontana, Christopher Chandler
SUNY Oswego

Transposable elements are sequences of DNA which appear multiple times throughout a genome. This is because the transposons are able to jump around the genome, often bringing with them sections of surrounding DNA. This feature of transposable elements can make the analysis of a genome complicated. The complication occurs when genome assembly from short sequencing reads is attempted. Software exists which identifies transposable elements and annotates each element. This software, however, has drawbacks. The software functions fastest on smaller genomes, rendering the genomes of organisms like the terrestrial isopod Trachelipus rathkei too large for this approach to be successful. Another problem occurs when the software requires a database of known transposable elements, forcing the need for additional software. The last problem occurs when the software can only manipulate an assembled genome, causing time and energy being redirected towards assembling the genome, as opposed to concentrating on their primary goal. Due to these problems with existing software, the goal of this work is to develop a new approach to identify and mask transposable elements in a genome assembly in an efficient manner. This approach uses raw Illumina reads to identify sequences that are likely to be repetitive, which allows the software to mask DNA in a genome sequence, without the need to go through the entire annotation process.

PREVALENCE OF METHICILLIN RESISTANCE GENE VARIANTS IN A DAIRY HERD IN WESTERN NEW YORK

Emily E. Forrester, Rachisan G. Djiake, Mark Gallo, Ph.D.
Niagara University

An area of concern to the health of many organisms involves methicillin-resistant *Staphylococcus aureus* (MRSA). Initial methicillin resistance was found to be due to a penicillin-binding protein termed MecA. Since that time other similar proteins have been found and are labeled accordingly. Interest in the various Mec homologs is of interest from an evolutionary perspective. The movement of the genes is still an open question. Humans are not the only hosts for *Staph*, in fact it is found to be problematic in the dairy industry where it can lead to mastitis. This disease is typically treated with antibiotics, but as we have seen in human medicine there are few available options. This project involves analyzing methicillin resistance patterns in a dairy herd from western New York. Specifically, this research will determine which *mec* gene variants are present through collection of skin cell samples from the udders of fifty dairy cattle and isolating *Staphylococcus*. These isolates will be analyzed in regard to antibiotic resistance and several other physiological properties, as well as isolating chromosomal DNA, performing PCR, and identification

of which variants of the *mec* genes are present. These findings will be used to correlate the presence of *Staph* containing certain genes and its relationship to the prevalence of mastitis in dairy cattle.

INVESTIGATION INTO SLFN11 MEDIATED INHIBITION OF INFLUENZA VIRAL PROTEIN PRODUCTION.

Alex Freedenberg[1], Stephen Dewhurst[2], and Jonelle Mattiacio[1]
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Each year in the United States 5-20% of people get infected with Influenza A virus (IAV) which leads to around 200,000 hospitalizations and between 3,000 to 49,000 deaths a year. It's therefore imperative that we understand the biology of the virus and explore methods to limit virus replication. Viruses are completely dependent on the host cell and hijack the translational machinery in order to produce viral proteins. A recent publication describes a novel strategy involving the Schlafen 11 (SLFN11) host protein, which restricts viral replication through inhibition of viral protein production. This interferon induced protein has been found to limit viral protein production of Human Immunodeficiency virus (HIV) in a codon bias manner. RNA viruses such as HIV and IAV often use unique codons in relation to host codon usage. Due to this similarity, we hypothesized that SLFN11 would have a similar effect on IAV viral protein production. Preliminary data suggests there is a slight decrease in NP viral protein production in the presence of SLFN11 with in vitro experiments. Unexpectedly, there is no decrease in viral protein production in the context of a viral infection, even though SLFN11 expression levels are unaffected by the virus. Future studies will focus on determining the level of viral protein reduction by repeating initial western blot and luciferase experiments with slight changes in methodology. Also, we will be investigating why the reduction in viral protein does not occur in the presence of virus infection.

G

EXPRESSION AND PURIFICATION OF FULL-LENGTH LGN FOR X-RAY CRYSTALLOGRAPHY

Justin Galardi, Kyle Cohen, Brandy Sreenilayam
SUNY Brockport

Breast cancer is a relatively common disease, developing in 1 in 8 women in the U.S. statistically. Currently, no cure is available. The basis of this study centers around LGN protein, named specifically for its characterized repetitions of leucine (L), glycine (G), and asparagine (N) residues in the N-terminal half. The protein holds an important role in mammalian cell division and has been determined to have notable effects in both mitotic spindle alignment and cell polarity. Interestingly, LGN is overexpressed in most breast cancer cells, and it has been determined that the 450th threonine residue (T450) is phosphorylated. However, there are currently no available crystal structures of LGN containing T450, nor are there any full-length crystal structures of LGN. The short term goal of this project is to establish and optimize conditions for the overexpression and subsequent isolation and purification of wild-type LGN from baby hamster kidney (BHK-570) mammalian tissue culture cells. The long term goal is to purify LGN to 95%, optimize conditions to grow LGN crystals, and ultimately solve the crystal structure of full-length LGN. Liposomal transfection of wild-type pCMV-LGN plasmid into BHK-570 tissue culture cells is currently used for LGN's expression, and a modified immunoprecipitation procedure has been employed for isolation of LGN. Presently, the isolation of LGN has been successfully confirmed through SDS-PAGE and Western blot analysis. The current focus of the project lies in optimizing procedural conditions to maximize purity of LGN. Given the potential connection between T450 phosphorylation and breast cancer cell growth as well as lack of continued research on the topic, the continuance of this project will provide beneficial new information that may eventually aid the development of novel breast-cancer treatments.

G

SEX-SPECIFIC SOCIAL AFFILIATION IN CAPTIVE BELUGA WHALES (*Delphinapterus leucas*).
Debora Garcia de Oliveira Silva-Gruber, Michael Noonan
Canisius College

The current study investigated the social affiliations of 21 captive beluga whales housed in two large social groupings at a facility in North America. The results revealed that male adults clearly preferred to be in the proximity of other adult males, swimming with them at an average rate that was seven times the rate of female adults being associated with other female adults. The adult male-adult male preferences also significantly exceeded adult male-adult female associations. These findings suggest that the male-male associations stem from internally motivated social preferences, rather than from ecological constraints or migratory tendencies.

INVESTIGATING THE AGING OF BLACK BALLPOINT INKS USING TIME-OF-FLIGHT SECONDARY ION MASS SPECTROMETRY (TOF-SIMS).
Sarah A. Gehl, Robyn E. Goacher

Niagara University

Ink forensics, and the ability to detect deposition order of inks can play an important role in the judicial and criminal justice systems. Determining the deposition order of inks would allow a forensic analyst to assess whether or not an important paper document had been forged or altered after the initial writing was completed. This research aims to continue exploring the use of Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS), a surface sensitive technique, to analyze black ballpoint ink intersections, specifically Papermate, Bic and Staples brand pens.[1] Multiple data analysis techniques were used to determine the deposition order of the inks including Multivariate curve resolution (MCR) and regions of interest (ROIs). This project explores the aging of the inks, by comparing the same samples six months apart to evaluate whether the apparent ink deposition order changed over time. Furthermore, inks were compared to see if there were any ink components that changed between the initial analysis and after months of aging. The future of this research involves further investigation of drying time impacts on the results, as well as continuing to analyze different intersections. The ultimate goal is to determine whether this is an analytical technique can be adopted by the criminal justice system as a way to explore and analyze important handwritten documents.

[1]. Goacher, R. E.; DiFonzo, L. G.; Lesko, K. C., Challenges Determining the Correct Deposition Order of Different Intersecting Black Inks by Time-of-Flight Secondary Ion Mass Spectrometry. Analytical Chemistry 2017, 89 (1), 759-766.

ALTERNATIVE SPLICING DURING ADIPOCYTE DIFFERENTIATION.
Peter Giangrasso, Dr. Laurie Cook, Dr. Rongkun Shen
The College at Brockport, SUNY

We obtained the expression data of the RNAs of pre-adipocytes and post- adipocytes using the cutting-edge next-generation sequencing technology (RNA-Seq). We used Multivariate Analysis of Transcript Splicing (MATS) to identify the alternative splicing events that significantly changed before and after cell differentiation. Analysis of the resulting splice data was facilitated by visualization in custom tracks in UCSC Genome Browser. There were 629 significant splicing events detected using in the untreated adipocytes and 466 significant splicing events detected in the MCH treated adipocytes. These significant events were detected using junction counts as well as reads on target. Further analysis with more biological replicates and deeper sequencing will be completed in the future to further support this. We suggest that the significant changes in splicing between the control adipocytes and the adipocytes treated with melanin concentrating hormone (MCH) have a relation to obesity.

TARGETING DXP SYNTHASE USING THDP MIMICS TO DEVELOP NEWER ANTIOBIOTICS

Peter Girardi, Amera Alsalahi, Dr. Kevin Callahan
St. John Fisher College

The prevalence of antibiotic-resistant bacteria in nature has had a significant effect on the human biome, accounting for bacterial infections and the emergence of diseases that are untreatable. The ability for these microorganisms to mutate and evolve has led to antibiotics now only being a short-term cure for these types of diseases. Recent studies have proposed a new method to combat pathogens by specifically inhibiting enzymes in the methylerythritol 4-phospahte (MEP) pathway, such as 1-deoxy-D-xylulose 5-phosphate (DXP) synthase. Bacteria use the MEP pathway for synthesis of essential molecules called isoprenoids. Functions of isoprenoids include their role as structural components of the cell membranes, hormone signaling, protein degradation, and transcription regulation.1 Inhibiting DXP synthase would inhibit this essential pathway that could thus kill the bacteria. The goal of this proposal is to purify DXP synthase, as well as the sequential enzyme in the pathway, DXP reductoisomerase (DXR). Following purification and quantification of these two proteins, we will test the activity of the DXP synthase in the presence and absence of drug inhibitors. Conversion from DXP to 2-C-Methyl-D-erythritol 4-phosphate (MEP) by the enzyme DXR will be coupled with NADPH oxidation to measure the activity. Lab techniques to be used include affinity chromatography, Bradford assay for protein quantification, protein activity assays, and SDS-PAGE.

A CONVENIENT SYNTHESIS OF BIODEGRADEABLE GLYCOPOLYMERS VIA THIOL-ENE CLICK CHEMISTRY.

Samuel Gerardi, Michael Hardy, John M. Rowley
Houghton College

Synthetic glycopolymers have interesting potential as new materials for applications such as targeted drug delivery and tissue engineering. Possibly more enticing, however, is the idea of a glycopolymer consisting of a biodegradable backbone. It was the goal of this research to continue development of a convenient synthesis method for generating biodegradeble glycopolymers. Using glucose as a model monosaccharide, and poly(vinylcyclohexene oxide carbonate) as the biodegradable polyester backbone, an attempt was made to utilize the thiol-ene reaction to create a biodegradable glycopolymer with pendant glucose moieties. Esterification of diacetal-protected glucose with 3,3’-dithiodipropionic acid followed by reduction with tributylphosphine and deprotection with trifluoroacetic acid yielded glucose 3-mercaptopropionate as confirmed by IR, 1H NMR, HSQC, COESY, and MS/MS experiments. An attempt was made to “click” glucose 3-mercaptopropionate onto PVCC via photoinitiation of the thiol-ene reaction.

CRITICAL BONE FRACTURE REPAIRS: A COMPARISON OF THE MECHANICAL PROPERTIES OF CALCIUM PHOSPHATE BIOACTIVE CEMENT AND PIG BONE.

Barnabas Gikonyo, Sabrina Medina, Mark Soto
SUNY Geneseo

Previously, the most effective method for supplementing/replacing a bone was an autograft. This method comes with risks as a result of the invasive nature the autograft procedure ensues;by removing a small section of bone and using it as a boe simulant at the fractured site. Increased infection and limited bone supply in younger and elder patients are some concerns associated with this approach. This study aims to develop an alternative system to replace an autograft. For these initial studies, we use pig fibula to compare the properties of our novel cement system. Calcium Phosphate Cement (CPC), a biocompatible bone substitute composed of Hydroxyapatite (HA), a major component of human bone, is a base ingredient for the cement. Due to the successful ability of these cements to osseointegrate and initiate bone growth, we focus our efforts in the challenges of adequate porosity size and mechanical

strength. The new cement was characterized using published methods and the data obtained is presented and discussed.

DECADAL CHANGES IN SALT MARSH PRODUCTION AND CARBON STORAGE: A TEST OF THE SPACE-FOR-TIME SUBSTITUTION APPROACH.

Sarah Goldsmith, Ryan Brett, Charles Bachmann, David Osgood, Christy Tyler
Rochester Institute of Technology

Coastal salt marshes are effective carbon sinks, however, there is still great uncertainty in the long-term carbon burial capacity and how it could change with age. Additionally, carbon sequestration and burial rates within individual salt marshes have high spatial variation and there are few studies that address this. This project takes advantage of a well-studied salt marsh chronosequence on Hog Island, a barrier island which is part of the Virginia Coast Reserve (VCR) Long Term Ecological Research (LTER) site. Spartina alterniflora, the dominant plant species, was re-established following a 1962 storm that deposited approximately 1 m of sand over the island. Variability in Spartina marsh recovery allows the opportunity to evaluate change over time in biotic and physico-chemical properties, including above and belowground biomass and carbon sequestration potential. Since 1962, the chronosequence was not overwashed to a significant degree but is subject to sea-level rise, increasing the potential for water-logging stress. Sites on Hog Island were studied intensively during the 1990s, and predictions regarding the successional process were generated using the space for time substitution. We predicted that plant production followed a bell-shaped pattern, peaking at an intermediate age before declining as limitations were imposed by accumulation of sediment sulfide, while belowground carbon continued to increase asymptotically. Developmental patterns proceeded more quickly at lower marsh elevations. Returning to these sites affords the opportunity to test hypotheses generated based on the chronosequence approach, and to evaluate the resilience of salt marshes of different ages to the stress of sea level rise.

EFFECTS OF S-NITROSATION ON PEROXIDASE PATHWAYS IN BRASSICA RAPA.

Aaliyah W. Grandy, Alexander S. Milliken, Lindsay S. Burwell
Wells College

Antioxidant pathways help organisms adapt to stressors in their environment through a series of modifiable proteins. In plants, these stressors include salinity, thermal, and pathogenic stress. Stress produces cytotoxic free radicals and reactive oxygen species as metabolic byproducts. Previous works have shown stress responses coincide with large releases of nitric oxide in plants. Nitric oxide is an important signaling molecule that protects plants from abiotic stress. This protection has been attributed to a variety of nitric oxide signaling pathways, including post-translational modifications of the H2O2-scavenging peroxidase family of proteins. Regulation of two types of peroxidases in Brassica rapa (turnip) (ascorbate peroxidase and glutathione peroxidase) by a nitric oxide post-translational modification (S-nitrosation) was the focus of this study. S-nitrosation is a nitric oxide dependent post-translational modification that reversibly modifies cysteine residues. Root extracts were incubated +/- S-nitrosocysteine (Cys-SNO), then exposed to exogenous H2O2. Peroxidase activities were then assayed using UV/Vis spectrophotometry. This work found that ascorbate and glutathione peroxidases were differentially regulated by S-nitrosation. Ascorbate peroxidase was activated and glutathione peroxidase was inhibited in the presence of ≥50µM and ≥400 Cys-SNO, respectively. This is the first time turnip peroxidases have been shown to be regulated by S-nitrosating agents. We propose that bio-signaling molecules like S-nitrosocysteine inhibit glutathione peroxidase while increasing ascorbate peroxidase activity. Changing the active peroxidase pathway this way could serve to conserve glutathione pools

within plant cells. Future studies will further investigate how peroxidases are regulated by S-nitrosation and why Cys-SNO treatment modulates the two classes of peroxidases differently.

DETERMINATION OF STEROL SPECIES AND LEVELS THAT PROVIDE LOCALIZED ENHANCEMENT OF ELECTRON TRANSPORT RATES IN TOBACCO THYLAKOID MEMBRANES.

Alexis Grebenok1, Robert Grebenok1 and David Becker2
Canisius College

The objective of this project is to examine the role(s) played by various sterol types and their titers on photosynthetic electron transport rates in transgenic tobacco. We employ transgenic lines of tobacco that express a microbial 3-hydroxysteroid oxidase (a.k.a. cholesterol oxidase) gene, whose gene product is localized to the chloroplast. Products of the enzyme action include the 3 keto- derivatives of sitosterol, stigmasterol, campesterol and cholesterol, and these oxidized steroids make up approximately 70% of the total steroid composition of the transgenic thylakoid membranes. We detect no oxidized steroids in control thylakoids. The modified steroid profile of transgenic thylakoids is coincident with elevated rates of in vitro light saturated whole chain electron transport (WCET) compared to WCET rates in control thylakoids. We will discuss sterol specificity as well as localization of the steroid effect to PS I and/or PS II.

EFFECTS OF CLIMATE WARMING IN SHALLOW, LARGE NEW YORK STATE LAKES.

Teryl R. Gronwall
Honeoye Lake Watershed Taskforce

Dr. Nelson Hairston (Cornell University) and Dr. Bruce Gilman (Finger Lakes Community College), in collaboration with Honeoye Lake Watershed Task Force Chairman Terry Gronwall and Dorothy Gronwall, are studying conditions that may contribute to late summer blooms of cyanobacteria in Honeoye Lake. This three year (2016-2018) research project is funded by a grant from the U.S. Department of Agriculture and Cornell's Atkinson Center for a Sustainable Future. Samples are analyzed and processed at the community college's Muller Field Station located in the southern Honeoye Valley.

The hypothesis under investigation is that climate warming is changing summer thermal regime in the lake, causing surface water temperature to rise, creating a slightly stronger thermocline, and longer time periods of stratification in the water column. This would contribute to longer periods of benthic anoxia (< 1 mg/L D.O.) and allow for more legacy phosphorus to be released from bottom substrates into the hypolimnion. This enhanced internal loading is thought to fuel cyanobacterial blooms when nutrient-enriched hypolimnetic waters are brought into upper waters during storm events.

The 2016 and 2017 data were continuously collected from two water profile thermistor arrays, with meteorological measurements gathered at a nearby shoreline weather station. Findings are presented along with their correlation to timing of lake cyanobacteria blooms. The most significant discovery is the role that internal seiches may play in causing thermocline disturbances that promote localized rather than lake-wide blooms.

Findings from this three year project will help to determine if legacy phosphorus plays a significant role in fueling the lake's cyanobacterial blooms of late summer. If this link is confirmed, then mitigation strategies can be focused on techniques that address the legacy nutrient issue and funding opportunities can be explored by the lake taskforce.

H

CELL GROWTH OF *CHLAMYDOMONAS REINHARDTII* IN RESPONSE TO ANTIOXIDANTS.

Andriana Guzelak, Noveera Ahmed
St. John Fisher College

Chlamydomonas reinhardtii is a single-celled bi-flagellated algae that is a widely used model system for studying eukaryotic cilia and flagella. The cell cycle of Chlamydomonas can be synchronized by alternating periods of light and dark. The growth phase is dependent on light, while the commitment point processes are light-independent. Under ideal growth conditions, cells may undergo multiple rounds of mitosis before the daughter cells are released. In this experiment the effectiveness of antioxidants such as B12, tocopheryl polyethylene glycol succinate (TPGS) and N-acetylcysteine as stimulants for increased cell division are tested at various concentrations. It is proposed that these antioxidants are beneficial in promoting cell division and in recovery after cryopreservation. The aim of this study is to choose the most effective antioxidant and to test the agent in conjunction with classic CPA's such as N, N-dimethylformamide (DMF), N,N-dimethylacetamide (DMA), N-methylformamide (NF) and hydroxyacetone (HA).

H

ENVIRONMENTAL CONTEXT INFLUENCE ON THE COMMON MUDPUPPY (*NECTURUS MACULOSUS*).

Adam Haines, Christopher Pennuto
Buffalo State College

Many organisms inhabit a wide variety of habitats with differing environmental context, potentially influencing their behavior and morphology. For example, some fish species show significant differences in body shape dependent on whether they inhabit lake or stream environments. However, environmental context effects on herpetofauna body shape remain largely unexplored. The common mudpuppy (*Necturus maculosus*) is a large, fully aquatic salamander species that inhabits a variety of hydrologically different habitats, including lake and stream environments. This project compares a suite of morphological measurements, as well as differences in diet and behavior, collected from lake and stream populations of mudpuppies. Preliminary results show lake mudpuppies are heavier ($P = 0.073$), have larger mass:total length ratios ($P = 0.017$), higher volume:total length ratios ($P=0.030$), have longer tails ($P = 0.002$), but shorter heads ($P=0.014$) than stream mudpuppies. These observations increase our understanding of how environmental context may influence behavior and morphology of the common mudpuppy while adding to the limited knowledge base of this understudied, aquatic salamander.

EFFECT OF BIOAVAILABLE LEAD PHOSPHATE IN GLYCINE MAX GROWN IN SOIL INOCULATED WITH RHIZOBIUM.

Tilor Hallquist, Kelsey Lawton, Amanda Van, Olivia Lopatofsky, Gregory Fox, Dr. Seema Thomas
Rochester Institute of Technology

The effects of lead (Pb) contamination on *Glycine max* (Soy Bean) plants grown in soil inoculated with rhizobium and $Pb_3(PO_4)_2$ were studied. In plants, lead inhibits cell membrane functionality causing morphological, physiological, and biochemical functions. Rhizobium is an effective option for bioremediation due to its high metal toxicity tolerance. Growth was monitored in soil induced with rhizobium and various concentrations of lead phosphate. Inhibited germination varied among treatments with the amount of bioavailable lead ranging 3.16mg/kg to 3.96mg/kg with treatment concentrations ranging from 100-900ppm. Atomic Absorption Spectrophotometer (AAS) was used to determine the absorbance of soil samples from the calcium chloride extraction, which were then used to determine the amount of bioavailable lead in each soil sample. Statistical analysis denotes a p-value of 0.963, which supports the null hypothesis that the amount of lead phosphate in the samples did not affect the amount

of bioavailable lead in the soil that would affect the germination and growth of the soybean plants. Later analysis showed that greater concentrations of lead phosphate in the soil led to oversaturation, and caused the lead to fall out of the system decreasing the amount of bioavailable lead in the samples.

SHIFT IN THE FATTY ACID SIGNATURES OF ATLANTIC SALMON IN RESPONSE TO LAKE ONTARIO PREY DIETS

Cory Hammond, Matt Futia, Jacques Rinchard
The College at Brockport - State University of New York

Fatty acid signatures (FAS) can be used to demonstrate predator-prey relationships based on the principle "you are what you eat". To evaluate the transfer of fatty acids from prey to predator, three different prey fish diets, which consisted of cisco (*Coregonus artedi*), alewife (*Alosa pseudoharengus*), and a mixed 1:1 ratio of the two prey fish were fed to Atlantic salmon (*Salmo salar*) through a controlled feeding experiment over a two-month period. Fish were fed 5% of their body weight in triplicate tanks per dietary treatment. Growth and FAS were monitored biweekly. No significant changes in growth were observed throughout the experiment. Fatty acid signatures of prey diets differed significantly (ANOSIM; $R = 0.852$; $P < 0.01$). At the end of the feeding experiment, Atlantic salmon FAS had changed based on their respective diet. The fatty acids most responsible for a shift in Atlantic salmon FAS were 18:1n-9, 16:0, 20:5n-3, and 22:6n-3. This shift in FAS indicates that fatty acids can represent the predator-prey relationship overtime (8 weeks).

VEGETATION AND SMALL MAMMAL INTERACTIONS DETERMINING TICK ABUNDANCE ACROSS SPATIAL SCALES.

Claire Hartl, Kathryn Amatangelo
The College at Brockport

Past studies have linked invasive shrubs such as Japanese barberry and honeysuckle to changes in tick abundance. Swallowwort, however, is a vine that is primarily found closer to the ground. By studying swallowwort, I will determine how the different growth form affects relative humidity in areas where swallowwort is both present and absent. Presumably, the swallowwort will create a dense shaded area which will help to retain moisture and provide optimal habitat for ticks, who are extremely sensitive to changes in relative humidity. My project looked at swallowwort invasions in the greater Rochester area to determine if tick abundance increased between areas with swallowwort as opposed to areas without swallowwort at the same sites. Microclimate stations at each plot were used to record temperature and relative humidity data to determine suitability for tick habitat. In addition to tick sampling, I conducted small mammal trapping at the sites. Small mammals, especially white-footed mice, serve as hosts for ticks, primarily in the larval and nymphal stage. By trapping small mammals I was able to determine both the abundance of potential tick hosts and the tick burden of infected mammals that I trapped. I hope to use this data to draw larger conclusions about how vegetation and small mammal interactions affect tick abundance, and ultimately, dynamics of tick-borne diseases, such as Lyme disease, at the local scale.

CHARACTERIZATION OF GUT BACTERIA DIVERSITY IN MIGRATORY SONGBIRDS

David Held, Lexie Haley, Ashlyn Kornetz, Allison Rehm, Kelly Roberts, Veronica Schabert, Kristen Covino, Daniel P. Haeusser
Canisius College

Scientists increasingly appreciate the enormous influence of gut microbiota on animal health and behavior. The majority of research on the gut microbiota of birds is limited to poultry, but migratotry birds may also play roles in distributions of antibiotic resistant bacteria through the environment. Additionally, variations in bird gut microbiota may contribute to migratory bird health and survival. Here

we present methods of characterizing bacterial species present in the gut microbiota of migratory songbirds along with preliminary results. We have begun isolation of unique bacteria on a variety of nutrient media from cloacal swabs that were collected from migratory avian species at the Braddock Bay Bird Observatory in Western NY. Following isolation of unique colonies we performed microscopy with Gram staining for initial characterization to allow optimal DNA extraction procedures. Universal primers to the bacterial 16S ribosomal RNA gene were used for PCR amplification, followed by sequencing for species identification. Finally, we assayed potential antibiotic resistance with the Kirby-Bauer diffusion protocol. We will be continuing this characterization and in the future hope to also consider correlation of differences in gut bacteria communities with migratory bird characteristics including sex, age, and behaviors.

ANALYSIS OF HIGHER ALCOHOLS IN SCOTCH USING GAS CHROMATOGRAPHY.

Shaun Henderson, Dr. V. Niri, Dr. J. Schneider
SUNY Oswego

Whisky from Scotland is known a scotch and is simply a mixture of chemicals such as ketones, aldehydes, esters, and especially alcohols. The mixture of these chemicals gives rise to each scotch's unique flavor. Each region in Scotland is known for making a particular type of flavoring in the scotch. To see if there is a correlation between the makeup of the chemicals and the region the scotch comes from a qualitative and quantitative study needed to be performed comparing the class chemicals with the greatest variation in concentrations, for this alcohol was the chosen class of chemicals to study. A headspace extraction of the volatile higher alcohols was chosen to sample the whisky. Optimization of the extraction and run parameters where performed and standards for each alcohol of interest were run and relative retention times were obtained for each standard. Comparisons using percent composition of higher alcohols were made on three different scotches.

GETTING BACK IN THE FIELD: UNDERGRADUATE RESEARCH PROJECTS ON ASIAN PEARS.

Taylere Herrmann, Morgan Pimm, Brianna Lees, Daniel Stein, Maryann Herman
St. John FIsher College

Asian pears are a challenging specialty crop in upstate NY with limited scientific data available. In collaboration with local growers, three undergraduate researchers designed and conducted experiments from 2015-2017. Results of these studies can provide data to decrease production costs and increase fruit quality. Challenges and feasibility for undergraduate research projects will be discussed.

Timing of harvest plays a key role in fruit quality and has been linked to internal browning (IB), a physiological disorder of unknown etiology. IB leads to brown water-soaked areas of pear flesh without external indication. Temperature at harvest, transport temperature, and storage conditions may influence IB development. A study examined the impact of harvest date and cold storage length on fruit quality (fresh weight, diameter, soluble solid content, firmness, skin color were assessed) and incidence and severity of IB in two Asian pear varieties. Feasibility of measuring oxalate-soluble pectin levels in fruit to predict likelihood of IB was investigated.

Insect pests and diseases, such as the fireblight, provide a constant challenge for growers. Few tools are available to prevent or treat insect and disease outbreaks and little is known about microbes that live on and around Asian pear trees. Undergraduate researchers isolated, subcultured, and stored bacteria and fungi from leaves, fruit, and soil. Isolated species were characterized by morphology and universal 16s ribosomal DNA and ITS primers were used to amplify and sequence bacterial and fungal isolates, respectively. The microbe library will be used to investigate potential biological controls for diseases and insect pests.

DILUTION OF THE MATRIGEL MATRIX AFFECTS THE FORMATION OF 3D SPHEROIDS IN PROSTATE AND LUNG CANCER CELL LINES.

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3D cell cultures closely resemble the natural growth of cells in tumors and mimic aspects of tumor cell behavior and cellular response. Thus the formation of tumor mass spheroids allows for more physiologically relevant data for in vitro tests. A549 and C4-2, which are respectively lung cancer and prostate cancer cell lines, were cultured in an artificial 3D Matrigel matrix. A variety of Matrigel concentrations were used to observe which gave better spheroid formation. Dilution of the Matrigel helped C4-2 prostate cancer cells form spheroid cultures. The Targeted Molecular Imaging Agents (TMIAs), specifically A1 and B1 that bind to the Prostate-Specific Membrane Antigen (PSMA), were also tested to see whether these molecules could penetrate and internalize into the C4-2 spheroids, thus showing the tumor penetrating ability of the targeting agents. The ability of agents to penetrate into a tumor mass as demonstrated by our data and our new 3D tumor model may contribute to more effective applications that can be utilized in cancer treatment and in vivo tumor imaging.

NOVEL SELENORHODAMINE DYES AS PHOTOSENSITIZERS IN EXTRACORPOREAL PHOTOPHERESIS.

Jacqueline Hill, Mark Kryman, Gregory Schamerhorn, Michael Detty, Zachariah McIver
University at Buffalo, Wake Forest University

Rhodamine dyes have found wide use as fluorescent probes due to their preferential uptake in the mitochondria and selective accumulation in carcinoma cells. One of the most well-known rhodamines, Rhodamine-123, utilizes a xanthylium core with an oxygen heteroatom. The Detty lab has focused on synthesizing analogues of Rhodamine-123 with varying heavy chalcogens (S, Se, and Te), core modifications (half-julolidyl, julolidyl, and bis compounds), as well as amide and thioamide substituents at the 9-position of the core. These compounds have been tested as photosensitizers (PSs) in the photodynamic therapy (PDT) of cancer and, more recently, in extracorporeal photopheresis (ECP) prior to hematopoietic stem cell transplantations (HSCT) as a preventative measure against acute graft-versus-host disease (GVHD). The preferential uptake of rhodamines in the mitochondria is attributed to their high polarizability and alloreactive T cells, the primary culprit in GVHD, have an increased mitochondrial metabolism coupled with impaired P-glycoprotein function: perfect for a rapidly transported rhodamine dye to selectively accumulate in the activated T cells while being extruded from the resting and memory T cells.

VIBRATIONAL SOLVATOCHROMISM OF PHARMACEUTICAL DRUGS TO INVESTIGATE THE INTERMOLECULAR INTERACTIONS.

Krista Hirsch, Andrea Bills
St. John Fisher College

The intermolecular interactions of pharmaceutical drugs have been studied at large to determine the interactions that could possibly occur in the body. Vibrational solvatochromism was used to investigate these interactions through the use of IR spectrometry. The frequency of the absorbance of the drug in various organic solvents shifts depending on the polarity of the solvent. Three models were used to determine the interactions including Kamlet-Taft, Catalan, and Laurence-Legros-Chantzis-Planchat-Jacquemin. Carbamazepine and Naproxen have been investigated, with the Catalan model being the best to describe these interactions. The most prevalent interaction observed is the basicity of the molecule, which shows how the molecule is a hydrogen acceptor. Overall, this research will potentially help to gain a better insight of how these drugs interact within the body.

H

POPULATION GENETICS OF SCAEVOLA ON CULEBRA, PUERTO RICO.

Lauren Hodkinson, Susan Witherup
Ithaca College

On the islands of Puerto Rico, the native species of the coastal shrub *Scaevola plumieri*, co-occurs with an invasive species, *Scaevola taccada,* introduced from the indo-pacific islands. We are interested exploring the genetic diversity of both *S. plumieri* and *S. taccada* on the island of Culebra, PR in order to characterize the differences in genetic variation of an endemic species versus an invasive species. We hypothesize that the *S. plumieri* would have a greater amount of genetic diversity than the invading species as *S. taccada* is more recently established on the island rather than being well established on the island like *S. plumieri*. Leaf samples from both *S. plumieri* and *S. taccada* populations were collected from Culebra during January of 2015 and March of 2017, dried with silica gel, and the genomic DNA from each leaf was extracted upon return to the lab. Using microsatellite primers developed for *S. taccada* and *S. montana*, 2 different microsatellite regions were amplified and analyzed using DNA fragment analysis. Fragment peaks were analyzed using the program Geneious where peaks representing the fragment size of the microsatellite alleles were identified and recorded for each individual. This data was then evaluated through the program Arlequin which implements a series of tests to determine molecular variance (AMOVA), test for deviations from Hardy Weinberg Equilibrium and test for correlations between geographic distance and genetic variation. These analyses showed that the alleles for each microsatellite were distributed across all populations on Culebra and there was no correlation between distance and genetic diversity of populations. We are currently adding to this work by developing species-specific microsatellite primers for *S. plumieri* using whole genome sequence data generated from Illumina MiSeq paired-end sequence data. Additional primers will help us confirm our preliminary Culebra analyses, as well as to extend our analyses to populations already sampled in nearby Vieques island.

DISCOVERY OF CONCURRENT DIRECT AND INDIRECT CHANNEL POLARIZATION TRANSFER IN DYNAMIC NUCLEAR POLARIZATION EXPERIMENTS WITH NONIONIC SURFACTANTS.

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The College at Brockport, State University of New York, Technical University Darmstadt

Dynamic Nuclear Polarization (DNP) is increasingly utilized in solid state NMR spectroscopy as a hyperpolarization method to drastically enhance NMR sensitivity. In DNP enhance NMR spectroscopy, microwave irradiation saturates electronic states of a stable paramagnetic polarization agent, which then transfers the polarization to nuclei of interest. Given that the processes of transferring polarization from electron to nuclear spin involve interactions that may contain chemically relevant information, the original intent of the studies was to explore radical-solvent interactions using nonionic surfactants as the solvent because these have recently been recognized as novel, benign solvents for chemistry. These DNP studies led to a discovery of a new phenomenon where polarization is transferred by two concurrent pathways, directly from electron to ^{13}C nuclear spin and indirectly via the proton spin reservoir through inherent nuclear Overhauser (NOE) type cross relaxation processes. The experimental findings that led to this conclusion will be presented. A brief introductory background on DNP NMR will be provided as well.

BATTLE OF THE BABIES: BEECH INTERFERENCE WITH MAPLE REGENERATION

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SUNY-ESF

Beech bark disease is a pathogenic complex that causes decline and mortality of American beech (*Fagus grandifolia*) in northern hardwood ecosystems. Under stress, American beech produces root sprouts.

As a result, aftermath stands have a dense population of small beech in the understory, which interferes with regeneration of more valuable species, such as sugar maple (*Acer saccharum*). The purpose of this study was to investigate beech interference with maple regeneration in 26 forest stands in the White Mountains of central New Hampshire. Densities of American beech and sugar maple germinants, seedlings, saplings, and small trees were collected in 1994, 2003, and 2012 in 13 stands and in 2004, 2010, and 2015 in another 13 stands. We looked at the competition between the two species as a function of site characteristics, visual assessment of beech bark disease severity, and soil chemistry. There were fewer germinants of both beech ($p=0.06$) and sugar maple ($p=0.04$) in stands with higher net nitrogen mineralization. The number of juvenile beech declined with increasing soil extractable calcium ($p=0.04$). High soil calcium is important to the health of sugar maple. Understanding these influences could lead to better management of beech and the species that compete with it in the context of the continuing spread of the invasive disease complex.

EFFECTS OF PLASTIC POLYMER COMPOSITION ON EARLY MICROBIAL ASSOCIATION IN A FRESHWATER ENVIRONMENT

Renee Hoover, Carley McMullen, Mark Gallo, Ph.D.
Niagara University

Plastic polymers have become omnipresent in our environment. From beverage bottles, to packaging, and even automobiles, it's hard to imagine our lives without plastic. But, what happens once a piece of plastic is discarded? In our environment we consider it trash, but on a microscopic level our plastics are home to a diverse ecosystem of microbes forming complex biofilms on this xenobiotic habitat.

Six most commonly used consumer plastics were placed in the Niagara River and examined for the microbial life that colonized them. Microbial communities of bacteria formed quickly and after one week the plastic samples were collected, DNA was extracted from the attached microbes, and sent out for genetic analysis. The results confirmed a rich, diverse microbial consortium that varied greatly between the plastic polymers. It was also determined that the numbers and the diversity of microbes changed over time. These results indicate that different species of bacteria may prefer particular plastic surface chemistry and compete with each other for resources on these locations. The research shows that microbial communities can and do form on plastics in the environment and that they do so discriminately. Learning which microbes are present on different polymers and what metabolic processes they carry out in their ecosystems may help us find new, innovative ways to deal with discarded plastics in the environment.

EMBRYONIC EXPOSURE OF CHICKEN CHICKS (*GALLUS GALLUS DOMESTICUS*) LEADS TO HEIGHTENED SENSITIVITIES TOWARDS THE EXPOSED SCENT

Ryan Hughes, Gregory B. Cunningham
St. John Fisher College

Chickens (*Gallus gallus domesticus*) have long been used as a model species for testing olfactory responses: they are easy to maintain and can be manipulated in ways that are difficult to do in the wild. It is well established that when embryos are exposed to a scent (via the eggshell), the chicks hatch out with preferences for the scent. Here we show that this exposure also leads to heightened sensitivities towards the scent. This sensitization may facilitate foraging in this precocial species. Furthermore, chicks may learn certain qualities of the exposed scent, as exposing a chick to a fruit-related scent lead to higher responses to another fruit-related scent. These studies collectively help us to understand properties of olfactory imprinting.

H

THERMOBACILLUS COMPOSTI: PRODUCTION OF A GLYCOSIDE HYDROLASE FOR UNIVERSAL BLOOD?

Nadine Husami, Mark Gallo, Ph.D.
Niagara University

The antigenic trisaccharides of A- and B-type blood cells are the source of problematic immune responses that are associated with many medical procedures involving the transfer of foreign blood into a patient (blood transfusions, organ transplantations, etc.). Enzymatic cleavage of the terminal sugars of A- and B-type blood cell antigens – N-acetylgalactosamine and galactose, respectively – has been proposed as a method for the production of O-type blood from any blood cell type. Glycoside hydrolases have been the key enzyme family studied for this method due to their ability to cleave carbohydrate linkages, specifically glycoside-1,3-linkages. Use of a glycoside hydrolase for terminal sugar cleavage of red blood cell antigens has been studied for years, in which initial studies proposed the use of a glycoside hydrolase isolated from a coffee bean. Ultimately, there has not yet been a glycoside hydrolase with sufficiently effective activity for all possible glycoside linkages associated with the antigenic portions of red blood cells. Recently, a new strain within the genus *Thermobacillus* isolated from a composting reactor – *Thermobacillus composti* – was found to produce glycoside hydrolases that could serve as an effective means for the production of null-type red blood cells. However, the enzymes isolated from *T. composti* have yet to be explored for such use, but instead have only been explored for application in waste degradation. This project aims to analyze the trisaccharide cleavage activity on red blood cells of glycoside hydrolases isolated from *T.composti* through enzyme isolation, purification, and overexpression in the BL21 strain of *E. coli*.

ENCAPSULATION AND DELIVERY OF TRASTUZUMAB INTO HUMAN BREAST CANCER CELLS USING CHOLESTOSOMES™

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According to the American Cancer Society, 1 in 8 (12%) of women in the United States develop invasive breast cancer. Among those individuals, approximately 25 to 30% of breast cancer cells exhibited elevated HER2 levels.1 HER2 positive breast cancers identified by a pathologist typically exhibit amplification of the HER2 gene resulting in an overexpression of HER2 receptors.2 The HER2 receptor (Human Epidermal Growth Factor Receptor 2) is a member of the epidermal growth factor family important for the intracellular signaling and regulation of cell growth. Trastuzumab (Herceptin®) is an IgG1 monoclonal antibody that has been proven to be effective in HER2 positive patients. Trastuzumab binding to HER2 interferes both directly and indirectly with downstream intracellular signaling pathways.3,4 Unfortunately, less than about 35% of patients benefit from treatment with trastuzumab while the remainder exhibit initial or acquired resistance to treatment.4,5 Importantly, brain metastasis frequently occurs in trastuzumab treated patients.6 This population of resistant patients inspires efforts towards a more effective delivery system for trastuzumab, including those that can cross the blood-brain barrier. This laboratory has developed a neutral lipid based vesicle (the CholestosomeTM), that uses naturally occurring lipids for the delivery of a wide variety of therapeutics, including small molecules, antibiotics, peptides, and proteins. Previous work has shown CholestosomeTM -mediated delivery of FITC-labelled peptides into various mouse tissues (including brain) after oral administration. The CholestosomeTM can therefore potentially be used to orally deliver compounds for which intravenous administration is the only effective dosing route. The present studies describe the initial efforts at CholestosomeTM encapsulation of trastuzumab.

ANTIMUTATOR ACTIVITY OF NUDIX HYDROLASES FROM *E. COLI*.

Thomas Hynes, Suzanne O'Handley
Rochester Institute of Technology

The Nudix Hydrolase superfamily is characterized by the ability to hydrolyze substrates containing nucleoside diphosphate linked to some moiety x, hence the name Nudix. Within the Nudix superfamily, MutT is an established anti-mutator. This functionality is a point of debate for, the other members of the superfamily. Experiments to analyze anti-mutator activity were carried out on the 13 *E. coli* Nudix hydrolase knockouts. Overnight cultures of each *E. coli* knockout were grown and plated on LB-agar containing Streptomycin or Nalidixic Acid, or diluted a million-fold and plated on LB-agar or LB-agar containing Kanamycin (knockouts all contain Kanamycin resistance markers). After ~16 hours incubation, colonies were counted. The MutT knockout demonstrated the ability to gain antibiotic resistance to Streptomycin and Nalidixic Acid by producing many viable colonies on all plates. The other E. coli Nudix hydrolase knockouts grew on LB-agar and in the presence of Kanamycin but not in the presence of Streptomycin or Nalidixic Acid. These results indicate that MutT is in fact an antimutator, as previously established, but the other Nudix hydrolases are not anti-mutators.

J

THE USE OF ARTIFICIAL NEST BOXES TO DETERMINE PREFERENCE AND PRODUCTIVITY OF HOUSE WRENS AT THE SUNY BROCKPORT CAMPUS

Emily Jackson
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House Wrens (*Troglodytes aedon*) are small, cavity-nesting passerines. They can be found nesting in natural crevices and nest boxes provided by humans. This study focused on two questions: Do House Wrens prefer Audubon or Peterson nest boxes? If they do have a preference, are they more productive in the preferred box style? The study took place on the west side of The College at Brockport, SUNY campus. We used 40 artificial nest boxes: 20 Audubon and 20 Peterson. The boxes were monitored weekly during calm, dry weather using protocols developed by the North American Bluebird Society. We collected data on box selection, when eggs were laid, how many eggs were in each nest, and if each nest fledged young. We used a Chi-square Test for Association to test for preference and found that there was no significant difference in box selection (x^2= 0.11, df = 1, p = 0.74). We used a Wilcoxon Signed Rank Test to test for productivity between box styles and found that there was no significant difference in nest success (W = 3.0, p = 0.371). Vegetation data collected at each site showed that House Wrens selected sites near the forest edge ($\bar{x}$ = 28 m); however, nests that successfully fledged young were located further from the edge ($\bar{x}$ = 42 m). These results suggest that box style does not matter for selection. House Wrens select nest sites that are close to trees and shrubs; however, preferred sites might not be favorable for nest success.

THE EFFECTS OF PALE SWALLOWWORT (*CYNANCHUM ROSSICUM*) ON NATIVE MOTH COMMUNITIES.

Wyatt Jackson, Kathryn Amatangelo
SUNY Brockport

The establishment and dispersal of invasive vegetation is a major threat to native ecosystems. Many invasive species are able to displace native species due to a heightened competitive advantage and ability persist under a wide variety of conditions. Invasive plants have a tendency to homogenize flora which can quickly degrade native habitats. These areas affected by invasion often become unsuitable for populations of insect species due to the loss of native food sources. One important insect group of concern are moths (Lepidoptera). This study seeks to understand the relationship between the invasive

plant, pale swallowwort (*Cynanchum rossicum*), and moth communities in forest understories Moths were collected for identification via light traps in 30x30m plots with high incidence of pale swallowwort and at paired control sites with sparse native understory vegetation. The most diverse family sampled was Erebidae, which include common moths such as litter moths, tiger moths, owlets and others. Preliminary results suggest that there are no significant differences in abundance, species richness, or diversity between control and invasion sites. Moth abundance was shown to increase on nights with higher temperatures but were no affected by wind speed or humidity. The next step is to identify potential indicator species of swallowwort invasion and extend the study to sites with high percent cover of native understory vegetation. This study could be used to help land managers understand the effects of invasive vegetation on insect communities.

DEVELOPMENT OF A LOW-COST PLATFORM FOR 3D BIOPRINTING APPLICATIONS.
Connor Jensen, Frenando Ontiveros PhD.
St. John Fisher College

3D printing technology has greatly advanced in the past few years. Due to this rapid advancement, it is now possible to create three-dimensional models that are designed with a simple design software on a computer. With the availability of user-friendly, high-resolution printers growing, we have the opportunity to use these tools for biological purposes. Our goal is to develop a low-cost platform on which a hydrogel material can be printed consistently and accurately into a scaffold upon which cells can adhere and proliferate. We have modified a low-cost commercial 3D printer to create such a platform. 3D bioprinting presents multiple challenges outside of regular 3D printing. Such hurdles as material choice, cell type, growth and differentiation factors, and technical complexities related to the sensitivities of living cells and tissue formation all must be overcome. Our modified 3D printer effectively delivers biomaterials such as alginate, collagen, and gelatin into a biocompatible scaffold for cell adhesion, differentiation, and proliferation. The scaffold can be incubated in a cell solution which will allow for the cells to grow in the printed design. This project allows for a cheap method to provide opportunities to expand class research projects, drug testing, disease research, and tissue implantation. Furthermore, this project provides a platform for us to enhance our knowledge of cell and tissue biology and can have a significant impact in the clinical setting. By developing our project and printing platform at an affordable cost, we can show how engineering tools can be used to solve biological problems.

IF YOU CAN'T TAKE THE HEAT… SEASONAL PATTERNS IN TEMPERATURE SENSITIVITY OF MICROBIAL EXOENZYMES IN RIVER BIOFILMS
Sameer Jhaveri, Jonathan O'Brien
Canisius College

Bacteria have the ability to produce multiple versions of the same enzyme in order to adjust to environmental condition. We sought to find patterns in activity of two enzymes (LAP and AP) from stream biofilms across a range of temperatures (4ºC, 15ºC, 25ºC, 37ºC, and 55ºC). We found a differences in enzyme activity between the enzymes as temperature increases. Moving forward, we would like to test if bacteria produce alternate versions of the enzymes that perform better at colder temperatures in order to maintain function in colder conditions.

IDENTIFYING THE SOURCE OF INFECTION IN SNAPPING TURTLE (*CHELYDRA SERPENTINE*) EGGS
Jerome Job, Poongodi Geetha-Loganathan
SUNY Oswego

Microbial infections are one of the main causes for loss and extinction of animal wildlife posing a serious threat to ecosystem and biodiversity. It was observed that *Chelydra serpentina* (snapping turtle) eggs

collected from Rice Creek Field Station (RCFS), SUNY Oswego, were infected with an unknown microbial contamination that lead to the death of 58% of clutches collected in last four years. We isolated and characterized the microbial colonization from the infected eggs and identified pathogenic fungal (Fusarium) and bacterial (Bacillus and Pseudomonas) species infecting *Chelydra serpentina* eggs inhibiting embryo development. Here, we continue to identify the source of fungal infection (soil or transmitted from parents or both) that is found to be a possible treat to significant loss in population sizes of snapping turtles. To collect swab samples from adult turtles, netted traps were set up around the RCFS during summer 2017 and swabbing method involved gentle scraping of the epithelium using sterile Q-tips. Soil samples were also collected from nesting and non-nesting areas and all the samples were stored at 4°C until analyzed. Cultures from samples collected were established on plates with Fusarium specific Rose Bengal medium. Morphological and molecular characterizations of cultures are performed to identify the infecting species.

EFFECTS OF ATRAZINE ON FRESHWATER MUSSELS

Manna Job, Poongodi Geetha-Loganathan
SUNY Oswego

Atrazine is a commonly found herbicide contaminant in water bodies across the United States. Atrazine is reported to interfere with hormonal functioning in animals and humans including endocrine disruption causing delayed puberty and de-masculinizing; reproductive disruptions with increased risk of miscarriages, susceptibility to birth defects like gastroschisis. Atrazine has also shown to potentially produce reduced birth weights, reduced maternal weight, and developmental defects in various strains of different animal species. Fresh water mussels are used as a common biomarker for testing the effects of toxins as they are filter feeder, toxins will be directly incorporated into their cells by diffusion. Here, we investigate the effects of atrazine in native freshwater mussels (*Elliptio complanata*). Gill filaments from mussels exposed to atrazine of concentration 150 g/L results in the effect on ciliary epithelium. Ciliary cells connected to the epithelium are either merged together or completely absent. Also, the skeletal rods and the connective tissue supporting the ciliary filaments were reduced in size resulting in malformed gills. Studying the teratogenicity of atrazine will be helpful in preventing the herbicide from contaminating the water bodies and subsequently the animals.

K

TESTING TERATOGENICITY OF PENICILLIN ON PLANARIAN REGENERATION

Asya Kadic and Poongodi Geetha-Loganathan
SUNY Oswego

Antibiotics like penicillin are commonly dumped into water bodies by means of medical runoff or human waste; sewage treatment plants are not designated to treat all the substances contained in medications. Continuous exposure to low level of pharmaceuticals can affect the growth and reproduction of aquatic communities. Few preliminary studies have documented the effects of drug contaminants in water on aquatic organisms to cause endocrine disruption but needs extensive scientific studies and analysis to understand the impact presented by these chemicals. Planarians are different from other bilaterians in that they possess a large pool of adult stem cells that is responsible for regenerating any part of their body, including the brain. Our key findings from testing penicillin on planarians include: **1)** higher concentration of penicillin is toxic to flatworms, **2)** penicillin inhibits wound healing capacity in planarians resulting in delay forming blastema, **3)** rate of regeneration is affected by penicillin, **4)** differential response to antibiotic can be observed in stem cells residing in different regions of body, and **5)** worms which were sensitive for antibiotics during the initial period of treatment later becomes resistant to penicillin and can grow normally proving the antibiotic resistance accumulated over period. These are

determined through culturing explants cut from different part of the planarian body and growing them in different concentrations of penicillin diluted in the spring water.

DISTRIBUTION OF MACROINVERTEBRATE ASSEMBLAGES OF IRRIGATION DITCHES AND STREAMS IN WESTERN MONTANA, IN RELATION TO PHYSIOCHEMICAL CHARACTERISTICS.

Meredith Kadjeski
Trent University

In recent decades, the relationships between environmental conditions and community structures of stream macroinvertebrates have been investigated in many parts of the world. It is well recognized that assemblage structure changes with alterations in catchment or local land use. Despite the large distribution of irrigation canals flowing through thousands of acres of agricultural land, aquatic macroinvertebrate community composition and diversity are largely unstudied in western Montana. We evaluated the relative importance of multiple physiochemical parameters that influence the ecology of benthic macroinvertebrate communities and the richness of Ephemeroptera, Plecoptera, and Trichoptera (EPT) assemblages in thirteen reaches of agricultural ditches and thirteen streams on the Flathead Indian Reservation. Univariate and multivariate metrics were used to assess changes in assemblage composition associated with agricultural land use. The results indicated increased pollution and decreased richness and diversity in agricultural areas. The physiochemical variables selected by multiple regression models contributed significantly to variation in EPT taxon richness. Analysis of variance revealed significant relationships between macroinvertebrate communities in ditch and stream sites. The finding that catchment land use may result if macrohabitat differences and, ultimately, differences in taxonomic composition between agricultural and natural streams can be used to optimize future bioassessment on macroinvertebrates.

EFFECTS OF DISINFECTION BYPRODUCTS ON THE EARLY DEVELOPMENT IN ZEBRAFISH.

Shannon Keller, Rachel Pelsang, Sean Ryan
St Bonaventure University

Chemicals and pollutants can enter aquifers from a number of natural and manmade sources. While some of these chemicals may not be toxic to organisms that live in or drink from these aquifers, once this water reaches water treatment facilities, the chlorides and bromides used to treat the water can react with these pollutants to create many different and potentially toxic disinfection byproducts (DBPs). Zebrafish are an excellent vertebrate model system for observing early development, as all major organs are clearly visible during this stage. They also serve as an ideal model for developmental toxicology studies, as they live in an aqueous environment and are exposed to any pollutants via contact and ingestion. Using purified versions of DBPs that have been previously identified, wild-type embryos, dechorionated prior to the shield stage of development, were exposed to different concentrations of DBPs. Phenotypes associated with early zebrafish development, including brain, eye, jaw, heart, fin, notochord, body shape and length were observed and recorded through 120 hours post fertilization. These results may indicate specific tissues and developmental pathways that are affected by a particular DBP, and could potentially suggest how that specific DBP may be affecting other organisms interacting with or ingesting the same chemical.

EVALUATION OF PESTICIDE RESIDUE CONTENTS IN FRUITS AND VEGETABLES AFTER DIFFERENT WASHING TREATMENTS.

Ilayda Kelley, Kyle Harbour
SUNY Oswego

Pesticides are substances that are used to eliminate, prevent, or control insects, animals, weed, fungi, or bacteria from damaging crops. The use of pesticides, especially in agricultural production, involves health risks even with proper application. The risk increases significantly with improper use of the pesticides. The health risks in question include headaches, dizziness, lack of appetite, rapid pulse, muscular incoordination, vomiting, chemical burns, loss of reflexes, unconsciousness and even death. Therefore, evaluating the effect of washing methods on pesticide residue contents is highly significant. In this research, pesticide residues on fruits and vegetables are evaluated before and after different methods of washing using Solid Phase Microextraction (SPME) coupled with Gas Chromatography-Mass Spectrometry (GC-MS). The method for analysis was developed successfully and applied to green grape samples.

ANALYSIS OF LACCASE AND SINAPIC ACID EFFECTS ON LIGNIN WITH TIME-OF-FLIGHT SECONDARY ION MASS SPECTROMETRY.

Kylie Kiah and Dr. Robyn Goacher
Department of Biochemistry, Chemistry and Physics, Niagara University

Biofuels can be a carbon-neutral alternative to gasoline because the carbon dioxide released from combustion of biofuels was previously removed from the atmosphere by the living plant. The use of non-food plant materials such as trees or grasses (lignocellulose) avoids the problem of using food sources, such as corn, to produce ethanol. Within plants, lignin is a main structural component that wraps around the polysaccharides. To access the polysaccharides in plants to make biofuels, the lignin must be broken down. Laccase is an enzyme known to break down lignin, and certain mediators are thought to facilitate laccase in its degradation of lignin. Previous studies using sinapic acid as a mediator for the degradation of whole wood indicated that sinapic acid may be grafting onto lignin, causing an apparent rise in the amount of lignin present. There was also an increase in the proportion of S-lignin units relative to G-lignin units. This poster will describe how isolated lignins from both hardwood and softwood were treated with laccase and sinapic acid separately and together to study the effects on lignin and to better understand these observations. Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) was utilized to study the surface of the lignin samples and data was analyzed through Principal Component Analysis (PCA) and peak ratios. In some cases, sinapic acid grafting onto lignin seemed to occur. Further investigation into other lignin sources will be pursued. Understanding the modification of lignin can lead to improved biofuels and bioproducts in the future.

SPOTTED SALAMANDER (Ambystoma maculatum) CONSERVATION STRATEGIES DURING SPRING MIGRATION.

Ben Knowlton, Bruce Gilman
Finger Lakes Community College

With the first warm evening rains each spring, spotted salamanders (*Ambystoma maculatum*) begin a synchronous migration from hillside forests down to the southern Honeoye Valley. They are seeking breeding pools, ponds, and shallow depressions in the extensive silver maple-ash swamp forest that occupies nearly 900 acres of the valley floor. Perhaps it is this abundance of potential breeding sites that contributes to the large migrating population observed every spring. As adults during the summer,

spotted salamanders are seldom encountered, spending much of their time burrowing underground in the upland forests.
The college's Muller Field Station is ideally located in the center of this migratory pathway but, unfortunately, so is County Road 36. To decrease the accidental road kills of spotted salamanders, a volunteer campaign is organized annually to physically move salamanders across the highway. This year, over the course of two nights, an estimated 2000 spotted salamanders were moved to safety on the opposite side of the road. In addition, over 400 Jefferson's salamanders (*Ambystoma jeffersonianum*), numerous red efts (*Notophthalmus viridescens*) and a few spring peepers (*Hyla crucifer*) were also rescued.
In addition to making a difference for the salamanders, this activity profoundly affects the volunteer students and local neighbors. Going beyond wildlife observation to actual wildlife conservation put into action, saving salamanders is an instantaneous reward and a memory that will continue to inspire and transform one's conservation ethic in the future.

FACILITATING EARTH SCIENCE EDUCATION THROUGH A PARTNERSHIP OF TEACHERS AND AMATEUR PALEONTOLOGISTS.
Daniel Krisher
Rochester Academy of Science

Primary and Secondary teachers are continually searching for innovative methods and lesson plans for teaching Earth Science. The creation and implementation of these can often be constrained by a lack of time, appropriate materials and a lack of the required detailed knowledge. The FOSSIL Project, which is a National Science Foundation funded group composed of professional and amateur paleontologists, recently held a Fossil for Teachers Professional Development workshop to help address this need.

Thirty participants representing K – 12 teachers and amateur paleontologists participated in the workshop held from August 1 to the 6 at the Florida Museum of Natural History in Gainsville. The deliverables for the workshop were: the creation of classroom fossil collections, the generation of lesson plans and the establishment of a viable collaborative network between teachers and amateur paleontologists. The classroom collections were created by the teachers using fossil specimens provided by amateurs and the museum. The fossils used spanned the entire geologic timescale and ranged from trilobites to whale vertebrae. Lesson plans, covering a wide range of paleontological topics, were created by teams of teachers and amateurs. When completed the lesson plans were presented by the teachers in a poster session. Productive collaborations were facilitated via workshop activities as well as an end of workshop collecting trip to a Pliocene stream deposit in Gainsville. Networking and collaboration are ongoing via the Teaches Professional Development Group on the myFOSSIL website (www.myfossil.org).

L

ANALYSIS OF DRUG FACILITATED CRIMINAL ACTS USING SOLID PHASE EXTRACTION AND LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY.
Kimberly LaGatta, Kerina Heard, Shokouh Haddadi, Vadoud Niri
SUNY Oswego

Drugs Facilitated Crime (DFC) is a general term that is used to describe crime perpetrated using over-the counter drugs such as Rohypnol, Xanax, Valium and a multitude of other sedatives. These sedatives are often used in crime such as robbery, the maltreatment of the elderly and children, as well as rape and other sexual assaults. Identification of the drugs, or their metabolites in biological specimens such as urine, blood, saliva and hair of victims is commonly proof of exposure to the drug. However, since most

of these drugs are highly potent, they can act at very low doses and it is difficult to detect their presence using routine analytical methods. The detection of the drugs and their metabolites in urine and blood at sub ppb levels is required to track the use of this drug in criminal cases even days after they were administered. In this project an analytical method using Solid Phase Extraction (SPE) coupled to Liquid Chromatography Tandem Mass Spectrometry (LCMSMS) was developed to extract and detect commonly used drugs and some of their metabolites at concentrations of sub ppb in aqueous samples. The developed method will be used for analyzing the drugs in biological samples such as urine and blood.

EFFECT OF HABITAT TYPE ON WASP ABUNDANCE AND DIVERSITY ON THE SUNY GENESEO CAMPUS.
Jason Lang, Jennifer Apple
SUNY Geneseo

An ongoing study on bee diversity conducted on the SUNY Geneseo campus used a standard sampling method involving small bowls painted with different fluorescent colors and filled with soapy water to capture bees; this type of trap often attracts other flying insects including wasps. We took advantage of these incidental captures to investigate the effects of habitat type on wasp abundance and diversity. Samples were collected from the College Green, an area of open lawn surrounded by manicured flower beds; the Arboretum, two different sites near native plantings surrounded by secondary successional forest; and the no-mow zone, a roadside unmowed field. The wasps were pinned or pointed, depending on size, and sorted based on lowest taxonomic level reached. The wasps were catalogued by collection date, location, bowl color, and identity. Yellow bowls collected significantly more wasps than blue bowls or white bowls at all sites. The site Arboretum 2 had the highest diversity, while the College Green had the lowest. Parasitoid wasps were rare at the College Green site, perhaps because grounds management may limit the availability of host species. The presence of human-made structures that offer nesting substrates could explaina high relative abundance of vespids found at the College Green site, while ichneumonids were the most abundant taxon at all other less managed sites on the edge of campus.

AN INVESTIGATION OF NUTRITIONAL EFFECTS ON BEECH BARK DISEASE CAUSAL ORGANISMS.
Gretchen Lasser, Mariann Johnston, Mike Mahoney, Vizma Leimanis, Jason Stoodley
SUNY College of Environmental Science and Forestry

Beech bark disease (BBD) invaded North America over a century ago but the pathosystem is still not well understood. This disease occurs when beech scale insects, *Cryptococcus fagisuga* (invasive) and *Xylococcus betulae* (native), attack American beech (*Fagus grandifolia*) and feed on the inner bark making the tree susceptible to infections by *Neonectria ditissima* and *N. faginata*, fungi which cause cankers that eventually kill the tree. Recent research in second-growth aftermath forests show that high bark N:P predicted canker development (Cale, et al., 2015) so improved understanding of the nutritional aspects of this disease will allow for better mitigation techniques in aftermath zones. I am conducting research in the White Mountain National Forest in New Hampshire, at Hubbard Brook and Bartlett Experimental Forest, taking advantage of an existing study of multiple element limitations in northern hardwood ecosystems with treatment plots of N, P, NP, Ca, and untreated controls across three age classes (young, mid, old). I am using several methods to quantify BBD and identify causal agents. Photographic analysis is being used to quantify *Neonectria* lesion density and scale feeding wounds, and *Neonectria* collection is underway for identification, DNA analysis, and culturing on agar media. I expect to see more new lesions in N and NP plots, and in older stands. Results of these efforts will allow for baseline measurements, data on local inoculum sources, quantification of the relative proportions of the two *Neonectria* species across nutrient addition sites, and the creation of a collection of *Neonectria* for future inoculation experiments.

L

NAGD FROM *YERSINIA PESTIS*

Minh Le, Lucinda Dass, Isreal Moreno, and Suzanne F. O'Handley
Rochester Institute of Technology

NagD UMPase from *E. coli* is a member of the p-nitrophenyl phosphatase family of the Haloacid Dehalogenase (HAD) superfamily. There is a NagD homolog in *Yersinia pestis* with an 86% identical and ~94% similar amino acid sequence, and thus it was predicted to be a UMPase like NagD from *E. coli*. However, the only way to truly know the activity of a enzyme is to characterize the purified protein. We have cloned the gene, overexpressed the protein, and determined that NagD from *Y. pestis* is active on UMP. We are in the process of purifying the protein so that we can finish characterization of the enzyme and compare it to NagD from *E. coli*. *Y. pestis* is the causative agent of "the plague", a disease of historical significance that is still prevalent today. Studying proteins from *Y. pestis* will help us to understand this pathogen better and may help us to discover potential novel antibiotic targets.

PROTEIN CATALYSTS FOR ENERGY STORAGE.

Jennifer Le, Vincenzo Firpo, Banu Kandemir, Saikat Chakraborty, Kara L. Bren
University of Rochester

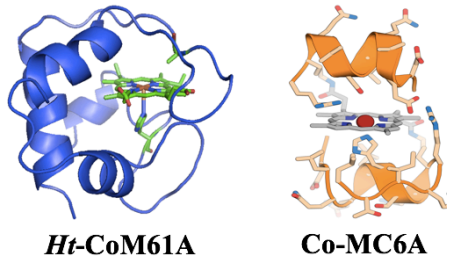

Figure 1. Left: Model of Ht-CoM61A. PDB ID: 1AYG. Right: Model of Co-MC6A.

Energy storage in the form of fuels produced in light-driven reactions is an alternative to the use of fossil fuels. Our group is interested in developing catalysts to produce alternative fuels, with one focus being on reducing aqueous protons to hydrogen (H_2). Our lab has shown that *Ht*-CoM61A, a cobalt-substituted bacterial cytochrome *c*, electrochemically evolves H_2 in water with turnover number (TON) >270,000 (**Figure 1**).[1] Here, the photochemical reduction of protons to H_2 in water at neutral pH with ascorbic acid as the electron donor and $[Ru(bpy)_3]^{3+}$ as the photosensitizer is presented. The metalloporphyrin active site of *Ht*-CoM61A has the advantage of being buried in a structured protein environment, allowing for the fine-tuning of the primary and secondary coordination spheres of the cobalt ion. Synthetic protein catalysts also feature a protein scaffold to maintain function and stability, as demonstrated by Co-MC6A, a mini-protein with a covalently attached cobalt porphyrin (**Figure 1**).[2] In this work, we demonstrate that the synthetic protein electrocatalytically reduces protons to H_2 in water in the presence of oxygen. Future work involves protein engineering to tune the active site molecular and electronic structure to understand factors that influence activity and mechanism.

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MEASURING IMMUNE RESPONSE IN RELATION TO PREVALENCE OF CHYTRIDIOMYCOSIS IN *LITHOBATES CLAMITANS* (GREEN FROG) POPULATIONS IN OSWEGO COUNTY NEW YORK.

Jason Lowery, Nathan McKean
SUNY Oswego

Although many different factors are contributing to world-wide amphibian decline, two of great concern are the pathogens responsible for chytridiomycosis and ranaviriosis. Chytridiomycosis is a fungal infection caused by the Chytrid fungus *Batrachochytrium dendrobatidis* (Bd). Previous trends observed within a long term study assessing the overall presence of these two diseases in Oswego County indicate that there is a sex-based bias towards higher infection prevalence in females. Breeding behavior in L.

clamitans is hypothesized to be associated with a decrease in innate immune health, which could be related to increased Bd prevalence. During the 2017 breeding season (May- August), 210 frogs were sampled from two locations in Oswego County and assessed for disease presence using Polymerase Chain Reaction and Gel electrophoresis. Of these 210 samples, enough blood was obtained from 94 individuals (41 female, 53 male) to perform Enzyme-Linked Immunosorbent Assays (ELISA) to determine blood corticosterone concentration. Preliminary analysis of a subset of disease data suggests the prevalence for Chytridiomycosis during the 2017 breeding season to be between 21- 35%. Despite the fact that Bd is high during the breeding season, preliminary data show there is no difference in corticosterone levels between males and females, suggesting that another explanation is needed for the sex-based bias observed.

SYNTHESIS AND CHARACTERIZATION OF NOVEL ORGANOSILICON COMPLEXES BEARING THE 8-HYDROXYQUINOLINE N-OXIDE LIGAND.

Kathleen I. Lowry[1], Bradley M. Kraft[1], William W. Brennessel[2]
[1]St. John Fisher College [2]University of Rochester

Organosilicon complexes of the form RSi(QNO)2Cl (QNO = 8-oxyquinoline N-oxide; R = tBu, p-tolyl, Bn) were synthesized and characterized by 1H, 13C, and 29Si NMR spectroscopy. Organosilicon complexes of the same form (R = Me, Ph) were synthesized and characterized by 1H, 13C, and 29Si NMR spectroscopy, and elemental analysis. Multiple X-ray crystal structure solvates of MeSi(QNO)2Cl and of MeSi(QNO)2(OSO2CF3) revealed separated ion pairs with trigonal bipyramidal complex cations in each. In all cases, a single isomer is formed with both N-oxide groups in axial positions. The similarity of the NMR spectra of MeSi(QNO)2(OSO2CF3) and MeSi(QNO)2Cl suggest that they also exist as separate ion pairs in CDCl3 solution.

M

FATTY ACID SIGNATURES OF SALMONINE FISH FROM LAKE MICHIGAN.

Christopher Maier, Nathan Barker, Michelle Edwards, Sergiusz Czesny, Jacques Rinchard
The College at Brockport- State University of New York, Illinois Natural History Survey

Lake Michigan has recently experienced large changes in chemistry and biological community composition resulting in food web structure alterations. To detect these alterations, fatty acid signatures (FAS) of nine prey species including alewife, round goby, bloater, deepwater sculpin, rainbow smelt, slimy sculpin, nine-spine stickleback, spottail shiner, and yellow perch were quantified. Fish were collected by federal, state, and tribal agencies throughout the lake and assigned to one of four quadrats: southwest, southeast, northwest and northeast. Belly flaps were sampled and analyzed for lipid and fatty acid composition. Non-metric multidimensional scaling plots demonstrated separation among species (ANOSIM; $R = 0.638$; $P<0.01$), with the greatest difference between alewife and round goby (SIMPER; average dissimilarity = 26.78%). The major fatty acids responsible for the difference were 20:5n-3, 18:1n-9, 22:6n-3, and 16:1n-7. Spatial distribution of alewife and round goby did not affect their FAS significantly (ANOSIM; $R = 0.073$; $P>0.05$ and $R = 0.085$; $P>0.05$, respectively). These results indicate that alewife and round goby rely on distinct food sources that are spatially consistent throughout the lake.

M

THE ROLE OF FILAMIN IN RESPONSE TO BRIEF MECHANICAL STIMULATION.
Jack Marcucci
SUNY Oswego

The mechanisms by which cells sense and directionally migrate in response to mechanical perturbation are not well understood. Previous research has demonstrated that the actin cytoskeleton of the cell is required to detect a mechanical stimulus- however, exactly what aspect of the cytoskeleton is responsible for this sensing is unclear. Acting binding proteins (ABPs) in the cytoskeleton may be responsible for the detection of mechanical stimulation. In this study, we researched the role of the ABP, filamin in cell response to shear flow. Dictyostelium discoideum cells that are exposed to a mechanical stimulus show a rapid and transient increase in actin polymerization and phosphorylation of a protein ERK2. To analyze the role of filamin in the cellular response to mechanical stimulation, we measured actin polymerization in filamin – null and filamin rescue cells using a fluorescently-tagged biosensor. Using immunoblotting techniques, we also quantified levels of phosphorylated ERK2 following a mechanical stimulation assay. Levels of response were not significantly higher in filamin rescue compared to filamin-cull cells. However, these results are inconclusive as the filamin rescue cells did not display appropriate filamin expression. Future work will explore more efficient methods to rescue filamin expression as well as investigate the role of other ABPs.

NI UNA MENOS: A NEW MOVEMENT AGAINST GENDER VIOLENCE IN LATIN AMERICA.
Samantha Martin
SUNY Geneseo

In this presentation I discuss my preliminary analysis of ethnographic research conducted principally in Valparaíso, Chile during June and July of 2017. The study seeks to capture the goals, methods, and effectiveness of Ni Una Menos, a new movement against gender violence in Latin America. Participant observation during a protest march in Buenos Aires supplements interviews with feminist activists and representatives of organizations against sexual violence. Because Chile and Argentina have considerable youth involvement in protests concerning social justice issues, this project also investigates students' perspectives on the movement's efficacy and shortcomings. A key objective is to understand the obstacles facing the movement in the sociocultural context of a traditionally machista society.

THE EFFECT OF COMPOST ADDITION ON BIOGEOCHEMICAL CYCLES IN CREATED WETLANDS
Michael McGowan, Benjamin Hamilton, Thulfiqar Al-graiti, Taylor Williams, Sonia Huang, Carrie McCalley, Christy Tyler
Rocherster Institute of Techonology

More than half of the wetlands in the continental United States have been destroyed since the 1800s, and as a result many of the ecosystem services that they provide have been lost. Due to the value of these services, the Clean Water Act mandates mitigation for wetland loss through restoration or creation of wetlands elsewhere. However, created wetlands often lack the functionality of natural wetlands and there is a need for research to develop better management strategies that more consistently achieve successful project outcomes. The addition of organic matter to created wetlands has been proposed as a method to promote development of microbial communities, biogeochemical cycles, nitrogen removal and control invasive species. However, the complex abiotic and biotic interactions in wetlands that vary in antecedent land use history, nutrient status and hydrology complicate predictions of the impact of organic matter addition, and additional organic matter may also promote greenhouse gas production. Organic matter in the form of municipal leaf litter compost was added to large transects in created wetlands at High Acres Nature Area in Perinton, NY. Seasonal fluxes of methane, nitrous oxide and carbon dioxide were measured in chambers and potential denitrification

was assessed. Dissolved organic matter in porewater was analyzed by NMR and fluorescence to evaluate the quantity and quality of carbon sources for microbes, and the microbial community structure will be assessed. Preliminary results suggest that organic matter addition alters carbon availability and promotes nitrogen removal, but also increases methane release.

CATALYTIC AND AUTO-OXIDATION OF IRON.

Matthew Michienzi, Alyssa Ryan, Nicholas Burdett, and Christopher S. Stoj
Niagara University

Metal ions serve as essential prosthetic groups for numerous proteins in biological systems. Iron is necessary for proper functioning of enzymes throughout the cellular respiration system, for example, and yet both iron deficiency and iron overload are deleterious for organisms. The complex mechanisms by which organisms acquire, mobilize, and utilize iron has yet to be fully elucidated. Iron has two redox forms: FeIII and FeII. In biological systems iron is utilized as FeII, however under aerobic conditions FeII is rapidly auto-oxidized to the bio-unavailable FeIII form at pH>6. As such, biology is confronted with abundant sources of iron but must manage the reduction of environmental FeIII, producing bioavailable FeII for structural and functional enzymatic reactions, with an inherent driving force favoring re-oxidation under common aqueous conditions. The mechanisms by which biological systems modulate the redox status of iron are central to a creating a comprehensive view of metallobiochemistry and the role of this essential biological cofactor. We have begun to evaluate the pH dependence of FeII auto-oxidation in comparison to the catalytic oxidation of iron by chelators and the ferroxidase enzyme Fet3p from yeast. Chelators which favor FeIII increase the rate of FeII oxidation. Similarly, catalysis by Fet3p, which couples the oxidation of FeII to the reduction of molecular oxygen, favors rapid FeII turnover.

MACROPHYTE RAKE SURVEYS IN CANANDAIGUA LAKE, 2016-2017, WITH MAPPED SPATIAL PATTERNS FOR AQUATIC INVASIVE SPECIES.

Kim McGarry, Bruce Gilman
Finger Lakes Community College

Current knowledge of macrophyte community composition is essential to guide lake and watershed management. Recent changes have altered the species, distribution, and abundance of macrophytes. Dreissenid mussels have contributed to improved water clarity, increasing light penetration and expanding areas where submerged vegetation can grow. Nutrient-rich runoff has spurred dense aquatic plant growth. The native macrophyte community is also at risk from introductions of aquatic invasive species. Once established, aquatic invasives can outcompete native species, reduce habitat quality, and infringe on recreational experiences.

The goals of this macrophyte rake survey were to determine the number of aquatic macrophytes, estimate relative abundances, map their phytogeography, document depth distribution patterns, and to discover the extent of aquatic invasive species establishment. Replicate sampling (369 total rake tosses) occurred at 55 locations representative of all shoreline habitats. Water depth and GPS coordinates were recorded at each location. Overall plant abundance and individual species abundances were estimated using a semi-qualitative scale developed by the NYS Citizens Statewide Lake Assessment Program (CSLAP).

Twenty five aquatic macrophytes were detected, including three invasive species: Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*) and starry stonewort (*Nitellopsis obtusa*). This diversity included submersed, floating and emergent species, and was remarkably similar to historic data listing 26 species. Vegetation grew in depths ranging from 0.5 to 6.8 meters. Location richness ranged from 1 to 13 species based on multiple tosses at each location. The macrophyte with

the greatest location frequency (62%) and highest relative frequency (17%) was common stonewort (*Chara vulgaris*).

MARMOSET CALL RECOGNITION USING NEURAL NETWORKS.

Elizabeth Moore, Ross Snider, Ph.D.
Montana State University, Electrical and Computer Engineering Department, Hobart and William Smith Colleges, Physics Department

Marmoset monkeys communicate with each other through vocalizations. Vocalizations consist of various sounds or noises that animals make in order to provide information to others. These vocalizations fluctuate through different frequencies and durations, allowing there to be several calls each with their own specific characteristics. Some of the most frequent calls that the Marmoset monkeys use are Twitter calls, Phee calls, and Trill calls. We developed a neural network that is trained to recognize Marmoset Twitter and Phee calls. A neural network is a type of machine learning algorithm that is modeled after the human brain and its nervous system. It is able to learn by experience and recognize different patterns of its inputs. The neural network we generated consists of one hidden layer with 22 nodes. It was trained with a total of 40 Marmoset calls: 20 Twitter calls and 20 Phee calls. It received a 100% success rate for the training set, validation set, and testing set. This neural network can be used by researchers who are studying the neural and social interactions of Marmoset monkeys.

SOIL NUTRIENTS AFFECT ON FALL LEAF RETENTION IN NORTHERN HARDWOOD FORESTS.

Madison S. Morley[1], Griffin E. Walsh[2], Ruth D. Yanai[1]
[1]State University of New York College of Environmental Science and Forestry, [2]Yale University

In northern hardwoods, autumn leaf abscission signals the end of the seasonal photosynthesis. Northern hardwood forests have been subjected to acid deposition from anthropogenic pollution which has increased nitrogen availability, making phosphorus limitation more likely. This study examines the effect of soil nitrogen and phosphorus additions on leaf retention in 13 stands in three sites in the White Mountains of New Hampshire, USA: Bartlett, Hubbard Brook and Jeffers Brook. These sites are a part of a study of Multiple Element Limitations in Northern Hardwood Ecosystems which examines plots that are either unfertilized or treated with nitrogen (N), phosphorus (P), or both nitrogen and phosphorus (N + P) additions. Leaf litter was gathered from five systematically placed litter traps in each plot four times between October and November of 2016, and then once during June of 2017. At each time interval, the proportions of leaves retained among treatments were analyzed with a randomized complete block design analysis of variance. Longer leaf retention was observed in plots treated with N: October 8th (3% more than unfertilized trees; $p = 0.04$), October 17th-18th (15%, $p < 0.01$), and October 22nd-24th (25%, $p = 0.02$). Statistical significance was only seen on P treated plots on Oct. 22nd- 24th (14%, $p = 0.07$). With addition of limiting nutrients, trees may extend their growing season with less dependence on nutrient reabsorption from leaves. This evidence suggests that increased nitrogen deposition could be causing delays in leaf abscission in deciduous forests.

N

CHOLESTEROL OXIDASE ACTIVITY IN THE SUBCELLULAR MEMBRANE FRACTIONS OF TRANSGENIC TOBACCO.

Daniel Nguyen, John Cleary, Robert Grebenok
Canisius College, Dept. of Biology

The objective of this project is to examine the movement and deposition of oxidized sterols within the sub-cellular membrane fractions of transgenic tobacco. We employ transgenic lines of tobacco that express a microbial 3-hydroxysteroid oxidase (a.k.a. cholesterol oxidase) gene, whose gene product is localized to the Chloroplast. Sterol products of the enzyme action include the 3 keto- derivatives of sitosterol, stigmasterol, campesterol and cholesterol, and these oxidized steroids make up approximately 70% of the total steroid composition of the transgenic Chloroplast membranes. We detect no oxidized steroids in control Chloroplast membranes. The movement and deposition of oxidized sterols from the chloroplasts to other sites of deposition will be discussed.

HISTOLOGICAL ANALYSIS OF THE EFFECTS OF ESTROGEN MIMICS ON BLACKNOSE DACE IN THE FINGER LAKES REGION

Nhung Nguyen, Penelope Murphy, Susan Cushman, Walter Bowyer
Hobart and William Smith Colleges

Endocrine disrupting chemicals adversely affect exposed fish populations. Our goal was to histologically determine the effect of these chemicals on Blacknose Dace (BND) in the Finger Lakes region of New York, specifically the Seneca Lake watershed. Male gonads were dissected out, processed, sectioned and observed under a trinocular microscope. Five of 101 male BNDs had testis-ova. It is uncertain if there is a correlation between these findings and fish exposure to endocrine disruptors.

O

PHENOTYPIC PLASTICITY IN D. MELANOGASTER: INVESTIGATING THE EFFECTS OF TEMPERATURE ON BODY SIZE

Lota Ofodile, Judith Appenteng, Mubeen Jaffri, & Andrew D. Stewart
Canisius College

Phenotypic plasticity is the ability of organisms to alter some aspects of their phenotype (observable traits) during development, such as morphology, behavior, etc., in response to changes in their environment. When environments rapidly change, these plastic traits often allow individuals to survive in sub-optimal conditions. Therefore, phenotypic plasticity can be critically important for survival and adaptation in many species. In Drosophila melanogaster, environmental temperature is specifically known to alter body-size. In this project, we utilized five different lines of D. melanogaster that had been selected for three different body-sizes (small, large and divergent), which we then reared at three different temperatures (18°C, 25°C and 31°C) in order to observe the effect of temperature on their respective body-sizes (e.g. thorax length) of these flies and look for any differences in phonotypic plasticity between the lines.

P

SURFACE MODIFICATION OF POLYBENZIMIDAZOLE (PBI) TREATED WITH OZONE.

Omran Omar*, Bao Ha*, Katerina Vega*, Andrew Fleischer*, Hyukin Moon*, Joel Shertok*, Alla Bailey*, Micheal Mehan***, Surendra K. Gupta**, and Gerald A. Takacs*.
** RIT School of Chemistry and Material Science ** RIT Dept. of Mechanical Engineering *** Xerox Analytical Services, Xerox Corporation*

Polybenzimidazole (PBI) film is used in high temperature Proton Exchange Membrane Fuel Cells (PEMFC). Before its activation, the polymer is doped with phosphoric acid which provides the protons for transport through the polymer. The goal of this research is to oxidize PBI film in order to increase the hydrogen bonding sites with the phosphoric acid and, hopefully, improve the conductivity of PEMFC. Ozone was reacted with PBI film and X-ray photoelectron spectroscopy (XPS), which analyzes the chemical composition of the top 2-5 nm of the surface, detected a rapid increase in O atom concentration with treatment time up to a saturation level of ca. 28 atomic % after 90 min. Atomic Force Microscopy (AFM) measurements showed little change in surface roughness with treatment time. The water contact angle of the treated film decreased by ca. 60% compared to untreated PBI film indicating an increase in hydrophilicity and hydrogen bonding due to the formation of the polar oxygenated functional groups on the surface. Washing the treated samples with water lowered the O atom concentration because of the formation of a weak boundary layer due to breakage of bonds in the decomposition of the primary ozonide.

P

INEXPENSIVE METHOD TO PERFORM GENOTYPING OF THE CANINE GENOME USING RFLP'S.

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Cancer affects tens of millions of canines within the United States of America, with millions of more new diagnoses made every year. This disease arises by virtue of genetic mutations that influence the process of mitosis, a form of cell division. Analysis of the canine genome has led to identification of mutations that contribute to specific types of cancer. However, the process of genotyping canines is currently quite expensive and not feasible for many veterinarians. Hence, this study aims to increase the availability of inexpensive genotyping techniques to more clinicians, such as veterinary oncologists in rural areas. By utilization of existing genomic information, bioinformatic tools, and custom software scripts, Restriction Fragment Length Polymorphisms (RFLP's) have been identified in the canine genome and primers flanking single nucleotide polymorphisms (SNPs) of interest have been synthesized. We are attempting multiplex PCR and will report on our progress. Eventually, a cost effective and easily replicable PCR based approach to genotyping canines will be reached, to ultimately assist in the diagnosis of canines that are predisposed to cancer.

SULFUR CYLCING BY MEMBERS OF THE ACIDITHIOBACILLUS GENUS IN THE ACIDIC SPRINGS OF THE IROQUOIS NATIONAL WILDLIFE REFUGE.

Haley V. Parker, and Cassandra L. Marnocha
Niagara University, Biology Department

The Iroquois National Wildlife Refuge wetlands are home to a set of acidic springs that act as a constant source of sulfide. This unique environment supports microbial communities that have not previously been studied. We examined the microbial community structure of two of these acidic springs and found that they were low in species diversity when compared against the nearby Oak Orchard Creek. Acidophilic bacteria were common in both springs, with the genus, *Acidithiobacillus*, predominant in the

more acidic spring and making up a notable percentage of the community of the second spring. We have isolated an *Acidithiobacillus* strain capable of chemoautotrophic growth on inorganic sulfur compounds. We are currently studying how this organism uses different sulfur species in its metabolism. The implications for the study of this particular *Acidithiobacillus* culture would be the ability to predict how the presence of this microbe might change the geochemistry of the springs themselves, and the surrounding wetlands.

A PARTIAL EGG OF DEINONYCHUS ANTIRRHOPUS CONTAINING EMBRYONIC REMAINS, FROM UNIT VI CHANNEL STRATUM OF THE EARLY CRETACEOUS CLOVERLY FORMATION OF CENTRAL MONTANA.
William L. Parsons, Kristen M. Parsons

A partial egg from Deinonychus antirrhopus (Speilberg's "Velociraptor") in three substantial fragments and some smaller eggshell pieces have been recovered from a site within the Early Cretaceous Cloverly Formation of central Montana. The largest fragment is approximately 40 mm in length, 20.64 mm in width and 8.24 mm in thickness. It is somewhat flattened, with the broken ends of hollow limb bones exposed along the broken edges between the sides of the compressed eggshell. The tiny (17 mm) but complete skull including teeth was also recovered. We substantiate our identification of this egg based on cortical patterning and egg shell histological comparisons that were conducted between these fragments and the egg shell directly associated with D. antirrhopus specimen AMNH 3015. This egg and associated fragments were found within the mudstone layers representing the fresh water channel deposits of Unit VI of the Cloverly Formation. These fragments were not found in any nesting pattern or nesting environment. Through x-ray and micro CT analysis, embryonic material has been observed inside the larger egg fragments. A set of two asymmetric circular tooth holes penetrate one side of the largest eggshell fragment. Several other eggs representing at least four other ootaxa have also been recovered. This field research has revealed that within Unit VI, beneath the most prominent upper hard sandstone stratum, there are further strata made up of both far more friable sandstone and low energy, depositional sand layers, all of which contained coprolites, mollusks, egg fragments, small bones, burrow casts, petrified root and wood fragments. The consistent preservation of embryonic material within these D. antirrhopus egg fragments as well as in all the other differing eggs and associated fragments may be due to their rapid deposition within relatively sterile fresh water channel mudstones, associated with some volcanic ash, all of which has been designated as Unit VI of the Early Cretaceous Cloverly Formation. Similar preservation may occur in fresh water mudstone channel deposits within other geologic formations. This egg/embryo discovery helps to increase our understanding of the earliest ontogenetic development of D. antirrhopus and the preservational capacity for eggs and embryonic materials within freshwater mudstone channel deposits.

ANALYZING THE FACTORS THAT PLAY A ROLE IN NEST BOX SELECTION AND NEST SUCCESS OF TREE SWALLOWS (TACHYCINETA BICOLOR).
Oscar Pecci Perez, Zac Falconer, Emily Jackson, and Andie Graham
The College at Brockport State University of New York

Tree Swallows (*Tachycineta bicolor*) are a native songbird found throughout North America that nest in tree cavities and artificial nest boxes. We used Peterson and Audubon nest boxes to determine if Tree Swallows prefer a box type. We also assessed the success rate of fledglings from nest boxes. A total of 40 nest boxes, 20 Peterson and 20 Audubon, were placed at different locations at The College at Brockport SUNY campus. From April until August 2017, we monitored nest boxes using methods developed by the North American Bluebird Society and gathered information on box selection and nest success. We collected vegetation data to determine if vegetation influenced nesting. We used a Chi-square Test for Association to determine box preference and the Wilcoxon Signed Rank Test to

determine nest box productivity. Of the boxes used by Tree Swallows, 45% were Audubon and 54% were Peterson, which was not significantly different (x^2=0.13, *df* = 1, *p* = 0.72). Additionally, we found no significant difference in the productivity of Peterson and Audubon boxes (*W*=31, *p*=0.343). Vegetation data showed that boxes that were > 108 m from the forest edge were selected more frequently than those closer to the forest. Additionally, boxes that successfully fledged young were > 89 m from the forest edge. These results suggest that tree swallows do not have a preference between box types and that productivity is similar in both box styles; however, distance to forest edge appears to play a greater role in nest box preference and productivity.

IDENTIFYING PROMOTER REGIONS OF GENES ESSENTIAL TO NOTOCHORD DEVELOPMENT IN ZEBRAFISH.

Rachel Pelsang, Shannon Keller, Sean Ryan, PhD.
St. Bonaventure University

In this study, promoter regions of genes shown to be expressed specifically in the notochord of zebrafish were targeted. Using bioinformatics data and tools available for the zebrafish genome, regions upstream of these genes that may contain gene regulatory elements were identified. Once regions of interest were identified, PCR was used to amplify the regions from genomic DNA. The Tol2 transposon system was then used to insert synthetic genes into the genome and verify if the promoter regions can drive tissue-specific expression of green fluorescent protein (GFP). Following the development of embryonic zebrafish, transient expression of GFP was viewed during the first five days post fertilization, and any tissue-specific expression was recorded. Once promoter regions that drive tissue-specific expression in the notochord are identified, these promoters can be used to drive the expression of other genes in the notochord. Similarities between promoter regions of genes that are specifically expressed in the notochord could also give insight to the essential elements of the promoter region in notochord genes.

EFFECTS OF FULLERENES ON A FRESHWATER BENTHIC COMMUNITY: TOXICITY AND IMPLICATIONS FOR ENVIRONMENTAL PROCESSES AND FUNCTIONS.

Sarah Ponte Cabral, Charles Border, Callie Babbitt, Christy Tyler, and Elizabeth Wronko
Rochester Institute of Technology

Fullerenes are a class of carbon allotropes with unique properties that make them useful in a variety of applications, including cosmetics, medicine, optics and electronics. This diverse array of applications and derivatives has led to the need for an understanding of the environmental implications of engineered carbon nanomaterial release. In this study, we combine traditional toxicity testing using a model organism and ubiquitous benthic bioturbator, Lumbriculus variegatus, with a microcosm approach to understand the implications of affects toxicity on benthic macroinvertebrates on biogeochemistry and ecosystem function. The carbon fullerenes C60, PCBM and C70 had only minor sublethal impacts on L. variegatus. In microcosm experiments using sediments from Irondequoit Bay, an embayment of Lake Ontario, at high concentrations C60 enhanced benthic ecosystem metabolism and showed small impacts on nitrogen cycling processes. L. variegatus had significant impacts on benthic metabolism and sediment nitrogen release, but these impacts were not substantially influenced by fullerene. These preliminary experiments illustrate that although engineered carbon nanomaterials may have an impact at high concentrations, at anticipated environmental concentrations there is little measurable impact on overall benthic ecosystem function. The ultimate goal of this project is to enhance our understanding of engineered nanomaterials and their potential risks in aquatic systems, support development of guidelines and policies regarding environmental safety of engineered nanomaterials and contribute to a safe and sustainable nanotechnology industry.

OPTIMIZATION OF PARAMETERS FOR CARBENE LABELLING OF GAS PHASE PEPTIDE IONS: A NOVEL TECHNIQUE FOR STUDYING PROTEIN TOPOGRAPHY.

Jennifer Pond, Paul Martino
Houghton College

Carbene labeling of gas phase peptide ions is a novel mass spectrometry-based technique used to study protein topography. The technique provides a way to characterize dynamic structural topographical changes similar to HDX-MS and FPOP-MS techniques.

In order to perform this technique, peptide or protein samples need to be rapidly removed from solvent and then quickly reacted with a derivatization reagent that will selectively (and aggressively) modify amino acid residues on the outer topography of the peptides or proteins. The derivatization, since mass is preferentially added to specific residues, essentially captures the structural information that is later sorted out by mass spectrometry experiments.

Key to the success of the strategy is efficient derivatization of proteins or peptides as they rapidly enter the gas phase. We chose "soft" electrospray ionization to rapidly remove solvents and generate protein or peptide ions that momentarily retain structural integrity, then derivatized the proteins using carbene that was generated *in-situ*.

In order to work with biologically relevant samples, we attempted to perform these experiments using various initial buffered solutions of proteins and peptides. We report the relative stability of our electrospray under various initial buffered solutions as well as associated carbene derivatization yields. We also report how alterations in our electrospray apparatus alignment affected carbene derivatization yields.

R

STUDY OF HISTORIC QUARRIES IN ERIE AND NIAGARA COUNTIES, NEW YORK, 1820-1930

Mariana L. Rhoades
Stone Industry Research

This research was undertaken because the early quarry industry in New York State has not been well documented. The New York State Geological Survey undertook field studies on the state's rock units from 1839-1843; the federal government began documentation through the census in 1880, but substantial time gaps are apparent. Many of the sources for this industry are so fragile that special permission was required to use them. These sources are now in this research and every detail is well-documented (census reports, newspaper reports, historic and geologic maps, history texts, more).

During the 110 years covered by the research, Erie County, New York had over 80 historic quarries and/or lime kilns with 57 found in Niagara County. Other differences between the counties are: Niagara County had far more records of Erie Canal contractors moving extracted stone on the canal or building canal structures; Erie County had few records of stone contractors. Using the same sources as listed above, the Niagara County quarry/kiln locations were very difficult to identify whereas the Erie County locations were more readily located.

In this research, the primary rock units quarried in Erie County were the Upper Silurian Bertie Formation and the Akron dolostone; and the Middle Devonian Onondaga Limestone (Buehler and Tesmer, 1963). Quarry excavation in Niagara County was primarily in the Lower Silurian Medina Group; and the Middle Silurian Clinton and Lockport Group (Tesmer (Editor) 1981).

Mariana L. Rhoades has taught geology at St. John Fisher College since 1991 and has taught a range of geology courses at SUNY-Empire from 1992 to 2010. M.L. Rhoades received a BS in Geology through SUNY-ESC and a MS in sedimentary geology from the University of Rochester.

EFFECTS OF LONG-TERM NUTRIENT ADDITION ON ACER SACCHARUM SAP FLOW.

Alexandrea Rice
SUNY-ESF

The majority of water lost in terrestrial ecosystems is through transpiration. Tree transpiration is essential for nutrient distribution and biomass accumulation, however, the role of nutrient availability on sap flow has yet to be determined. This study aims to provide insight in this uncertainty. Xylem flow measurements are used to estimate the water use of whole trees and are scaled to the ecosystem. This study used the Granier temperature differential method was used to test the effects of nutrient additions on Acer saccharum sap flow. These measurements were taken in the Bartlett Experimental Forest, located in the White Mountain National Forest, New Hampshire. This location is part of a long-term ecological study where several stand ages receive nutrient additions. The stand used in this study is a mature hardwood stand that is separated into five plots, each plot receiving either 30 kg N ha-1yr-1, 10 kg P ha-1yr-1, both N and P combined, a one-time 100 kg Ca ha -1 or nothing. Previous studies have observed that three years after a calcium addition treatment, transpiration rates peak and then start to decline rapidly to ambient flow. Since the calcium was applied six years ago, I hypothesize that no increase in sap flow in the calcium addition plot will be observed, even though one was observed in 2014. Previous nutrient limitation studies on these plots have determined that the Bartlett Experimental Forest is P limited; therefore I would expect to see an increase in sap flow with the addition of P.

ARAL PHOSPHATASE FROM BACILLUS SUBTILIS, A MEMBER OF THE HAD SUPERFAMILY

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The HAD (Haloacid Dehalogenase) superfamily is a diverse superfamily with a majority of the enzymes being phosphatases. One family of the HAD superfamily is the nitrophenyl phosphatase family, so named because the first family members were yeast enzymes found only to hydrolyze p-nitrophenyl phosphate. Since that time, a number of enzymes with a variety of activities have been identified, including an enzyme from *B. subtilis*, AraL, originally designated as a sugar phosphatase. The AraL gene has been subcloned to incorporate a HisTag for nickel affinity chromatography, and the enzyme has been expressed, purified and characterized. Interestingly, it was found that although AraL does cleave phosphate from some sugar phosphates (ribose 5-phosphate, ribulose 5-phosphate, and arabinose 5-phosphate), intermediates of glycolysis (glyceraldehyde 3-phosphate, phosphoenolpyruvate, and dihydroxyacetone phosphate) are much better substrates for the enzyme. Since glycolytic intermediates are better substrates, AraL's role may be to regulate the glycolysis and gluconeogenesis pathways when arabinose is the carbon source. Arabinose is metabolized into intermediates that enter in the middle of the glycolysis pathway. The fact that intermediates after the arabinose point of entry are substrates, and intermediates before the arabinose point of entry are not substrates, suggests that AraL may inhibit glycolysis and activate gluconeogenesis.

EVALUATING THE EFFECTS OF BISPHENOLS A, F, AND S ON PRIMORDIAL GERM CELL MIGRATION IN ZEBRAFISH (Danio rerio) EMBRYOS USING FLUORESCENT MICROSCOPY.

George Roba, Sarah Safura, Edward Freeman
St. John Fisher College

Primordial Germ Cell (PGC) migration occurs in early embryonic development and is highly conserved across taxa. During PGC migration the cells follow chemical cues secreted from somatic cells, to migrate from primary ectoderm to the gonadal ridge. PGC migration occurs within the first 24 hours post fertilization (hpf) in zebrafish, making the organism an efficient model for observing the migration pathway. Proper PGC migration is necessary for normal gonad development and, in some species, sex determination. Disruption of this process leads to defects in gonad formation and abnormal sex determination and differentiation. Studies have shown that endocrine-disrupting chemicals (EDCs) such as bisphenol A (BPA) disrupt PGC migration in zebrafish. BPA is one of the most widely used synthetic compounds worldwide, as it is used to make polycarbonate plastics. Organisms are exposed to BPA via leaching from plastics and industrial dumping of chemicals. Many studies provide evidence of the harmful effects of BPA on living organisms. In response, manufacturers have started to use replacements such as bisphenol F (BPF) and bisphenol S (BPS). However, due to their high degree of structural similarity to BPA, it is likely that BPF and BPS are just as harmful to organisms.

In this study, we use antibody staining and fluorescent microscopy to confirm that BPA exposure results in abnormal PGC migration in zebrafish embryos, as previously studied. In addition, we also illustrate that BPF and BPS exposure results in similar PGC migration defects. Embryos were exposed to bisphenols in the following concentrations: 17.5 µM and 35 µM BPA, 25 µM BPF, and 25 µM BPS. Fluorescent microscopy with BPF and BPS-treated embryos showed a similar PGC staining pattern as previously noted in BPA-treated embryos. Analysis of both BPS and BPF-treated embryos showed that 20% presented with a control-like PGC staining pattern (very tightly packed with minimal spacing between cells). The remaining 80% showed staining patterns characteristic of BPA-treated embryos.

TARGETED MUTAGENESIS IN DROSOPHILA USING CRISPR-CAS9.

Timothy Rooney, Steven Stowers, Ph.D., Douglas J. Guarnieri, Ph.D.
Saint Bonaventure University

A classical approach to deduce the function of a gene is to examine the phenotype of a loss-of-function mutant for that gene in a model organism, such as *Drosophila melanogaster*. CRISPR-Cas technology allows for targeted mutagenesis anywhere in a genome via the specific nature of Watson-Crick base pairing. The CRISPR-Cas system's precision emerges from guide RNAs hybridizing to DNA, followed by specific DNA cleavage via Cas9. Cas9 is the endonuclease protein of our CRISPR-Cas system. We have made a plasmid vector containing two guide RNAs to target the gene CG1105 in *Drosophila* for deletion. CG1105 is a homolog of mouse/human *Arrdc2*. *Arrdc2* was shown to be upregulated in the brains of mice during food restriction (Guarnieri et al, 2012). However the function of Arrdc2 is unknown. After generating the plasmid, Sanger sequencing was used to confirm our inserts. This plasmid has been injected into *Drosophila* embryos that express Cas9 in their germline. We are performing a series of crosses to generate fly lines carrying our desired mutation. The mutation will be identified by genomic PCR using a pooling strategy. Besides the possibility of visible mutant phenotypes, we plan to do lifespan and feeding assays to determine the physiological role of CG1105.

S

SYNTHESIS OF CHALCOGENOPYRYLIUM DYE BASED SERS REPORTERS.

Lauren E. Rosch, Michael R. Detty
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Surface enhanced Raman scattering (SERS) has been recognized as a biomedical imaging technique due to its multiplexing capabilities. Multiplex biomarker imaging improves early disease detection by sensing multiple disease biomarkers at once. Available SERS reporters are limited to a few approved commercially available dyes, such as IR792. Pyrylium dyes contain a highly modifiable scaffold that can be used to generate unique, spectroscopically distinguishable dyes with applications as SERS reporters. Pyrylium dyes can be functionalized with high chalcogen content to obtain high-binding affinity between a reporter and the SERS substrate, typically a gold nanoparticle. Sum-frequency generation vibrational spectroscopy (SFG-VS) can be used to determine the binding angle between a dye and the gold surface. The position and location of the chalcogen atoms in pyrylium dyes affects their binding angle. A new library of chalcogenopyrylium dyes containing 3-thienyl substituents was synthesized and analyzed as potential SERS reporters for multiplex biomarker imaging. These dyes are hypothesized to bind at a unique angle compared to previously investigated 2-thienyl pyryliums and will provide more insight into how structural modification affect binding surface coverage and SERS intensity.

PRODUCING INTERACTIVE VIDEO VIGNETTES: AN ONLINE, LIVE-ACTION-BASED APPROACH TO SUPPLEMENTAL LEARNING.

Patrick Rynkiewicz, Dina L. Newman, L. Kate Wright
Rochester Institute of Technology

STEM education reform has long been promoting the development of new interactive learning tools to encourage active learning of core disciplinary concepts. The RIT Molecular Biology Education Research (MBER) lab has developed ten Interactive Video Vignettes (IVVs) for Biology with the purpose of providing students with an interactive, live-action, online learning environment that supports deep learning of fundamental concepts in biology. These online tools represent a unique interdisciplinary approach that combines visual arts and biological concepts. Student users must make predictions, answer questions, collect and/or analyze data, and reflect on what they discover through the activity, which always includes a realistic scenario involving undergraduate biology students. This presentation describes the process of developing an IVV through the lens of the speaker's experience helping write, stage and perform in the Divide and Conquer IVV, which focuses on meiosis. We used a backward design approach to develop the content based on learning goals and addressing common misconceptions about meiosis. The exercise is also an example of how the DNA Triangle framework can be used to engender deeper understanding of genetic concepts. IVVs are free and available to any instructors who would like to use them in their classes.

S

PREVALENCE OF BETA LACTAMASE ANTIBIOTIC RESISTANCE IN STAPHYLOCOCCUS SPECIES ISOLATED FROM WHITE-TAILED DEER IN WESTERN NEW YORK

Abigail E. Salter, Mark Gallo, Ph.D.
Dept of Biology, Niagara University

Staphylococcus is a microorganism present in many environments, including a resident in as well as on many animas. Its interaction with its host can range from benevolent, benign, disruptive, virulent, and occasionally even deadly. Strains of specific concern are those that exhibit antibiotic resistance, as some are being found that are impossible to treat with existing drugs. Thus, antibiotic resistance has become a great concern in the clinical world because of the health implications it may have. However, humans are

not the only hosts of *Staphylococcus.* Animals in the wild are hosts to microbes that may exhibit antibiotic resistance naturally, although it may be induced by exposure to antibiotics. Such hosts include white-tailed deer, *Odocoileus virginianus. Staphylococcus* from the noses of these deer have been isolated and purified. This research examines the antibiotic resistance profiles of these isolates. Future work will include the molecular characterization of the mechanisms of antibiotic resistance and comparing to known antibiotic resistance genes found in bacteria isolated from clinical and agricultural settings.

EFFECT OF GENISTEIN AND ICI ON HISTONE MODIFYING ENZYMES IN OVARIAN CANCER CELLS

Jenna Sauter, Victoria Granger, Lisa Morey
Canisius College

Genistein is classified as an isoflavonoid and is a major component of the soybean. It is thought to be a chemotherapeutic against many forms of cancer because of its ability to effect biochemical processes like apoptosis and metastasis through epigenetics. In several epidemiological studies, it has been shown that countries who consume more soy products also have lower incidences of hormone based cancers. Additionally, research has shown that Genistein has the ability to impact ovarian cancer cell growth. This work focused on the effects of both Genistein and ICI on the expression of histone modifying enzymes (HMEs) in the human ovarian cancer models, OvCaR33 and SkOV33. It aimed to determine if Genistein directly impacted three different HMEs and if it worked via the estrogen receptor.

USING STABLE HYDROGEN ISOTOPES TO REVEAL MIGRATORY PATTERNS IN COMMON YELLOWTHROATS

Veronica Schabert, Kelly Roberts, and Kristen Covino
Biology Department, Canisius College

Avian migratory patterns are understudied in warblers like the Common Yellowthroat and show variation across populations. Migratory patterns are useful in determining important stopover locations and can be used in studies of climate change, population size changes, and land use issues. A relatively novel method used to study individual migratory birds is stable isotope testing. Large-scale geographic features such as mountain ranges, precipitation patterns, and declining ambient temperatures creates isotopic landscape that has a north-south gradient in North America. This is due to the fact that when hydrogen atoms of different atomic weights collect in the atmosphere, heavier atoms fall out first. This hydrogen isotope signature in turn becomes incorporated into tissues of plants, insects, and other organisms, including insectivorous migratory songbirds. The Common Yellowthroat (*Geothlypis trichas*), the subject of this study, is a common North American Breeding bird that winters in the southern United States and Central America. The following analyses of Common Yellowthroat migration patterns will be conducted: 1) sex-specific migration between the two stopover sites, and 2) age-specific patterns between the spring and fall migratory seasons. By using stable isotope ratios of hydrogen atoms found in rectrices (tail feathers) of birds, the origin of where the feather grew can be found thereby making it possible to investigate migratory patterns. Feathers are collected from migrants during the spring and fall migratory seasons at Appledore Island Migration Station (Maine) and Braddock Bay Bird Observatory (New York). After collection, feathers go through an intense cleaning process before they are dried, packaged into silver capsules, and sent for analysis using mass spectrometry. Data will then be used to create probabilistic assignment models to map individuals to a range of breeding origin.

S

ADAPTIVE MANAGEMENT OF PALE SWALLOW-WORT.

Jackie Schnurr, Tessa Hopt, Jiali Liu, Caitlyn Smith, Mike Szarowski
Wells College

Pale swallow-wort (Cynanchum rossicum) has become a major invader of forested areas of central New York, decreasing the diversity of native species and forming monocultures in susceptible areas. However, the major ecological impacts of this species have not been investigated in a systematic way. We combined an adaptive management model with the methods proposed by the Global Invader Impact Network (GIIN) to investigate the effects of pale swallow-wort in the oak-dominated forests of Wells College, in Aurora, NY. In Summer 2017 we established 4 blocks of 10 paired experimental 2 x 1 m plots, where 1 x 1 m was chosen to either remain invaded by pale swallow-wort or to have the swallow-wort removed by 4 different treatment types: cutting at the ground level (Cut), pulling and removing as much roots as possible (Pull), treating with the herbicide RoundUp (RoundUp), or treating with the herbicide Specticle (Specticle). Surrounding the invaded area was scattered 10 1x1m control plots that had no swallow-wort present. We evaluated the amount of swallow-wort and native species in the plots both before and after treatment. We found that the best treatment for controlling swallow-wort is the herbicide Specticle, but that it also kills the native species. To preserve the native species the Pull treatment had the biggest impact, but it was also the most labor intensive. We are hoping to use this study to serve as a baseline for the release of the biocontrol agent, Hypena opulenta, a leaf-eating moth species that was recently approved for the control of swallow wort.

A COMPARISON OF THREE METHODS OF POST-MORTEM TOOTH ANALYSIS TO AGE WHITE-TAILED DEER.

Noah Seabrook, C. Eric Hellquist
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Aging deer provides important information for both hunters and ecologists. Hunters enjoy knowing the age of the bucks/does caught mostly for conversational purposes and personal knowledge. Ecologists use age at death to describe demography, population fluctuations, disease abundance, and migratory patterns of ungulate populations. For decades, hunters used a simple wear and tooth eruption method (Method 1) to determine age of deer within broad groupings of fawns, yearlings and adult. This method provided great accuracy to determine ages of deer up to 2.5 years. In the late 1940s, the difficulty of aging adult deer past 2.5 years led C. W. Severinghaus to establish a more structured method of tooth development and wear patterns. This method classified teeth into six main classes with a set of sub-classes based on growth-height and wear of the deer's dentition (Method 2). Nearly seventy years later, S. M. Cooper and colleagues (2013) presented a strict measurement based approach for age determination within broad groupings of fawns, yearlings, and adults (Method 3). Method 3 utilizes measurements of the dentine present in the third pre-molar tooth. This study compares the three methods using partial-lower jawbones from white-tailed deer (n=37). We hypothesized that for adult deer beyond the age of 2.5 years, Methods 2 and 3 will present nearly identical ages for each jaw. Analyses are currently being completed that will allow us to determine if each aging technique will provide consistent age determination for individuals.

NOREPINEPHRINE'S EFFECT ON THE ABILITY OF ENTEROBACTERIACEAE TO COMMUNICATE WITH EACH OTHER

Shanique Service, Mark Gallo, Ph.D.
Dept of Biology Niagara University

Norepinephrine is a member of the catecholamine family that functions as a hormone and neurotransmitter to mobilize resources for action in the mammalian brain and body. We share our bodies with countless numbers of bacteria which construct our microbiome. Our extracellular signals, including norepinephrine, can affect the physiology of certain bacteria that have come to recognize key mediators in us. In particular, norepinephrine stimulates cell growth of *Escherichia coli*, a gram-negative enteric bacterium that exists in the intestinal tract. *E. coli* is a member of the *Enterobacteriaceae*, a family of bacteria that share distinguishable properties, including the ability to produce toxins, enzymes, and other factors that allow it to function as a virulent pathogen. One such factor is an autoinducer, which can cause positive feedback to the producer cells. However, it is unknown whether other bacteria can interpret this *E. coli*-specific autoinducer signaling molecule and then act accordingly. Observing the effects of norepinephrine on the growth of other enteric bacteria, as well as the communication, if any, between other bacteria will be resourceful in understanding the pathogenicity of the gut microbiome. This study will observe cell growth in *Salmonella, Yersinia, Klebsiella, Shigella, Enterobacter* and *Serratia* on minimal media as well as pre-conditioned media varying in norepinephrine concentration to determine the effects of autoinducer functionality on other *Enterobacteriaceae*.

DEVELOPING A SYNTHETIC PATHWAY FOR PRODUCTION OF FLUORESCEIN-LABELED PEPTIDES.

Jack Sherwood, Elana Stennett
Hobart and William Smith Colleges

Our group is interested in studying the interactions between labeled peptides and reverse osmosis membranes as this can lead to inefficiency in water purification. Solid-phase peptide synthesis, a common protein synthesis technique, was used to construct labeled peptide chains. Fmoc-protected amino acids were attached in a step-wise manner to a resin by modifying well-documented protocols. The concluding step involved attaching a fluorophore, fluorescein, to the peptide chain before deprotecting and detaching the now labeled peptide from the resin. Liquid chromatography-mass spectrometry (LC-MS) was used to confirm the successful synthesis of the peptide. However, the LC-MS method for purification needed to be optimized by modifying the composition of the mobile phase. Alanine-methyl ester was first used as a substitute for a peptide to test activation and reaction times as well as reaction conditions. Successful attachment of carboxyfluorescein to the peptide was observed after reaction with the activating and coupling reagents HOAt and DIC followed by deprotection with Reagent B, a standard deprotection solution. Challenges arose when attempting to attach fluorescein sodium salt to the peptide. Despite successful attachment to the alanine-methyl ester, no attachment was observed to the peptide. Additional testing is underway to understand if the failure of this attachment is a result of attachment protocols or the deprotection procedure.

THE USE OF A BATESIAN MIMICRY LEARNING MODEL TO REDUCE TURTLE NEST PREDATION RATES.

Paul Shipman, Nicole Dergosits, Elijah Hall, Gretchen Horst, Christina Ideman, Taylor Kovar,Teresa Leon, Michael Litman, Charles Parr, Ryan Pluck, Emily Waller, Collin Zelli
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Predation rates on turtle nests in North America have been reported to be as high as 90-100%. Nest predation represents the greatest cause of turtle mortality, and the increase of predator species due to natural and anthropogenic causes has confounded conservation efforts for several species. Finding and monitoring natural nests is difficult and such activities may cause disturbance that attracts the attention

of potential nest predators. Artificial nests containing chicken eggs have long been used to assess predation rates on turtle nests. We studied the rates of nest predation on the Rochester Institute of Technology campus during September and October 2017. After an initial training period, we recorded weekly predation rates on 12 artificial nests split across two locations to be as high as 100%. We then studied the efficacy of using artificial nests coupled with a non-lethal unpalatable substance as a Batesian mimicry learning model to reduce turtle nest predation rates.

INVESTIGATION OF NEST PREDATION AS A CAUSE OF TURTLE CAPTURE RATE DECLINES ON THE SEQUOYAH NATIONAL WILDLIFE REFUGE, OK.

Alexandra Shipman, Dr. Paul Shipman
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Research sponsored by the Cherokee Nation of Oklahoma on the Sequoyah National Wildlife Refuge in Eastern Oklahoma found major population declines in the red-eared slider (*Trachemys scripta*), and the Ouachita map turtle (*Graptemys ouachitensis*) over a 19-year period. Although capture rates of alligator snapping turtles (*Macrochelys temminckii*) collected in 2016 and 2017 were comparable to those found in a 1997-2000 study, there is concern that the cause(s) of observed declines in smaller, shorter-lived turtle species could also impact alligator snapping turtle populations, and may not yet be apparent due to differences in life histories. Nest predation is a common cause of turtle mortality and we investigated nest predation on the refuge using artificial nests. Preliminary data from our artificial nest study in 2017 found that there was a 90% depredation rate over three days on ten artificial turtle nests. Using trail cameras, we observed that the dominant nest predators were raccoons (*Procyon lotor*) (73%), followed by nine-banded armadillos (*Dasypus novemcinctus*) (11%). The remaining predators (16%) were unidentified. We propose that artificial nests utilizing chicken eggs injected with a non-lethal dose of quinine may serve as a Batesian mimicry learning model to reduce the rates of predation on turtle nests by common predators.

THE EFFECT OF URBANIZATION ON MONARCH BUTTERFLY HABITAT.

Laura A.B. Smith, Tara Cornelisse PhD
Canisius College

Monarch butterflies (Danaus plexippus), monarchs hereafter, are important flagship species that help promote the protection of all pollinators, which are very important to ecosystem health. They are currently being threatened by habitat loss due to urban and agricultural development. We surveyed local habitat factors and monarch abundance across an urban to rural gradient to determine which factors are most important to monarch survival and development. At 12 sites (4 urban, 4 suburban, 4 rural) habitat factors such as canopy cover, vegetation cover and type, and other invertebrate presence were measured. We also measured percent herbivory on milkweed and monarch abundance by recording the presence of larvae or eggs. We found that, overwhelmingly, urban green spaces were most productive in terms of number of milkweed and monarch young. But, counter to that, floral resources were very depleted in urban areas when compared to rural areas. Our findings suggest that the most effective way to slow depletion of the monarch population is to increase conservation efforts in urban parks and undeveloped land by changing management practices to preserve floral resources.

EFFECT OF GENISTEIN ON HISTONE MODIFYING ENZYMES IN PROSTATE CANCER CELLS

Nick Smothermon, Lanni Aquila, Lisa Morey
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It has been well documented that different populations have different cancer incidence. In particular, Asian populations have lower incidences of endocrine cancers, like breast and prostate cancer. One

possible explanation is a difference in diet and one of the main components of Asian diets is soy. Genistein, the main metabolite of soy, is a phytoestrogen and is thought to be protective. In addition, genistein has been shown to influence cellular function by regulating the epigenome. One potential mechanism is via the expression of histone modifying enzymes (HMTs); proteins involved in the organization and accessibility of chromatin. The accessibility of DNA is a major contributing factor to regulating transcription and translation. The goal of this study was to examine the effects of genistein on the expression two histone-modifying enzymes (HMEs), SET8 and SIRT1 in human prostate cancer. SET8, a histone methyltransferase, and SIRT1 a histone deacetylase, have been shown to have altered expression in cancer. Two human prostate cancer cells, PC3 and LNCaP were exposed to three different doses of genistein and the expression of the HMEs were investigated. This study will further our understanding of how genistein may impact cancer cell function.

IDENTIFICATION OF LNCRNA DIFFERENTIAL EXPRESSION DURING ADIPOCYTE DIFFERENTIATION.

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The genes contained in the genome can be separated into two distinct groups: protein coding genes and noncoding genes. Protein coding genes have been extensively studied as they are important to almost all biological processes. The non-coding genes contain short RNAs, including microRNAs, and long noncoding RNAs (lncRNAs). LncRNAs, defined as longer than 200 nucleotides, are an emerging class of important regulators involved in various fundamental biological processes such as transcriptional regulation, cell differentiation, and chromatin modification. Adipocytes, or fat cells, are the cells composing the adipose tissue in the body. Pre-adipocytes undergo a dramatic phenotypic transformation following differentiation into adipocytes. During the differentiation, there exists protein-coding genes that experience significant expression changes. Here we propose that expression levels of some lncRNAs also have significantly changed during the differentiation. We obtained the expression data of RNAs pre-adipocytes and post-adipocytes using the cutting-edge next-generation sequencing technology (RNA-Seq). We used GENCODE lncRNA annotation as reference to analyze the RNA-Seq data and identify the differential expression of lncRNAs before and after cell differentiation. Through the comparison of adipocytes over a three-day differentiation span, the expression of 162 lncRNAs were significantly changed, with 89 transcripts upregulated and 73 transcripts downregulated.

MICROBIOTA OF THE INVASIVE CROP PEST, SPOTTED WING DROSOPHILA.

Gabrielle Solomon, Peter Newell
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Drosophila suzukii is an invasive agricultural pest that arrived in New York in 2011. Using a serrated ovipositor, the female is able to deposit her eggs in fresh fruit rather than rotten fruit as other Drosophila species do. As the larvae hatch, grow, and develop, the fruit is spoiled and is no longer marketable. This research investigated the microbes associated with D. suzukii and hypothesized that unique aspects of the microbiome allow for the proper growth and development of their larvae. To determine the presence of D. suzukii in Oswego County, traps were set at Rice Creek Field Station and Fruit Valley Orchard. These results indicated that the insect is present in Oswego County, and the best time to trap D. suzukii was mid to late July. Each D. suzukii individual was homogenized in sterile saline solution and a selective plating procedure was used to isolate bacterial and yeast microbes from their gut. Overall, bacterial density per fly was slightly greater than yeast density per fly. To identify microorganisms isolated from flies, genomic DNA was isolated, marker genes amplified by PCR, and sequenced by Sanger sequencing. Our results suggest that the most prevalent bacteria found in D. suzukii were members of the Enterobacteriacea and other gammaproteobacteria, contrary to some

prior studies. The most prevalent yeast genera found in D. suzukii were Candida and Hanseniaspora. Further investigation will enable the examination of the physiology of isolated microbes and their impact on the growth and development of fruit fly larvae.

UNTANGLING METABOLIC COOPERATION: INVESTIGATING SYNERGISTIC GROWTH OF ACETOBACTER AND LACTOBACILLUS BACTERIA IN CO-CULTURE.

Andrew Sommer, Peter Newell
SUNY Oswego

The composition of the microbiome has been shown to significantly impact nutrition and health of the fruit fly *Drosophila,* as well as other animals. *Lactobacillus* as well as *Acetobacter* species are commonly documented gut flora. Interestingly*, Acetobacter 54* and *Lactobacillus brevis* appear to have a mutualistic relationship, reaching higher cell densities when grown in co-culture than when they are grown separately. This research investigated this mutualism, testing the hypothesis that syntrophic metabolism occurs between the bacteria. To measure synergistic growth, a quantitative co-culture assay was applied to several Acetobacter transposon mutants with metabolic enzyme deficiencies. Co-culture synergistic interactions are reduced when gluconeogenesis is prevented in *Acetobacter*, suggesting *Acetobacter* assimilates carbon from a source other than glucose. Our results suggest lactate, a by-product of the *Lactobacillus* metabolism acts as an important carbon source used by *Acetobacter*. Analysis of gluconeogenesis mutants revealed that mutants show abnormal growth phenotype in lactate while still producing acetoin as a by-product. Future research will use Gas Chromatography to investigate the production of intermediates formed by in mono- and co-culture conditions. If these experiments show that *Lactobacillus* consumes metabolic byproducts of *Acetobacter*, they will confirm our prediction that syntrophic metabolism drives synergistic growth of these two species. The metabolic connections between the two species highlight the importance of interactions within the microbiome and their impact on animal health and nutrition.

INVESTIGATION INTO THE ANTIVIRAL ACTIVITY OF KALANCHOE PLANT EXTRACTS AGAINST INFLUENZA A VIRUS.

Xayathed Somoulay, Anand Sridhar, Ph.D., Maryann Herman, Ph.D., and Jonelle Mattiacio, Ph.D
St. John Fisher College

Since the 1950s, the prevalence of antiviral resistance to influenza has increased tremendously due to random mutations in the influenza genome, as well as genetic reassortment. These genetic changes in the virus encode proteins that cannot be targeted by current antivirals. For this reason, it is important to study the basic biology of the virus and continue to develop new drugs to treat influenza infection. The plants of the genus, *Kalanchoe*, are native to tropical areas and have been used in folk medicine as they are said to have antiviral and anti-inflammatory properties. We propose to explore the potential antiviral activity of *Kalanchoe* plant extracts against influenza A virus. Our aims are to determine the cytotoxicity of *Kalanchoe* extracts on Madin Darby Canine Kidney (MDCK) cells, as well as to determine the viability of influenza-infected cells after treatment with these plant extracts. Additionally, we wish to investigate the optimal antiviral ability of *Kalanchoe* at different stages of influenza infection.

ALTERATION OF AMINO ACIDS WITHIN N-TERMINUS, α-HELIX, β-STRANDS, AND LOOPS TO DETERMINE ERH FUNCTION.

Lily Southivongnorath, Stuart I. Tsubota, Ph.D.
SUNY The College at Brockport

Enhancer of rudimentary homolog or ERH is a highly conserved protein encoded by the *enhancer of rudimentary* gene, *e(r).* ERH is necessary for cellular division, the Notch-signaling pathway, and

pyrimidine biosynthesis in *Drosophila melanogaster* or the common fruit fly, and cancer progression in humans. Human ERH can replace Drosophila ERH, showing that the human ERH functions normally in the fruit fly. This finding has enabled us to study the activity of human ERH within the fruit fly. The overall objective of this research project is to determine the importance that previously identified amino acids, located within the N-terminus, α-helix, β-strands and loops of ERH, have on the normal activity of the human ERH. This poster focuses primarily on the two-step cloning process of eight different mutant *e(r)* alleles. The successful clones were sent for insertion into the fruit fly genome. Future work will focus on these transgenic fruit flies to assess the activity of the mutant proteins, through their ability to rescue mutant *e(r)* phenotypes.

EFFECTS OF GRAZING ON CARBON STORAGE IN CREATED WETLANDS

Delanie Spangler, Evan Squire
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Wetland habitats provide an array of ecosystem services, including provision of habitat, carbon sequestration, and carbon storage. Carbon is stored in wetlands' biomass and anaerobic soils, where plants bring in CO2 through photosynthesis and deposit it in the soils through decomposition and root respiration. However, wetland ecosystems are threatened by development and urban growth, creating the need for restored and created wetlands. The functionality of natural wetlands is difficult to recreate, leading to ineffective created wetlands with poorly functioning ecosystem services. This project explores the effects of herbivory on these created wetlands to quantify the impact of large grazers, such as deer, geese, and ducks, on carbon storage. Through the use of herbivore exclusion plots in created wetlands, changes in plant community structure, emergent and submerged biomass, and photosynthesis were evaluated in plots with and without influence of grazers. Plots unaffected by large grazers showed higher vegetation cover and higher emergent biomass, while the plots exposed to grazers showed higher submerged cover. These results suggest that grazers play an important role in wetland community dynamics and influence the carbon storage in created wetlands.

ISOLATION OF BACTERIAL ENDOPHYTES FROM GARLIC: PRODUCTION OF QUORUM-SENSING SIGNALS IN THE ACYL-HOMOSERINE LACTONE CLASS

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Garlic is a commonly used culinary herb, which possess beneficial human health properties. Bacterial endophytes (bacteria inside the tissue of host) were isolated from three garlic varieties. Internal tissue from surface-sterilized garlic bulbs were inoculated in minimal and rich liquid media and incubated for three days. Thirty-four morphologically different bacterial endophytes were isolated by plating serial dilutions of cultures on the surface of media which were subsequently purified to single colonies by repeated subculturing. Of the thirty-four endophytes, four tested positive for quorum-sensing signals using two complementary acyl-homoserine lactone (AHL)-dependent whole-cell biosensor strains, CV026 and NTL4 (pZLR4). The combination of thin layer chromatography to separate AHLs and detection by whole-cell biosensor resulted in the identification of three or two distict AHL quorum sensing signals being produced by the four garlic endophytes. The identification of these QS producing bacteria can seed future work to: 1) specifically determining the chemical identity (structure) of the AHL signals, and 2) to determine the genus and species of the bacterial endophytes isolated from garlic stem tissues by way of whole genome and or 16S rDNA nucleotide sequencing.

S

KINETIC STUDY OF ALKYL SUBSTITUTED ACETOACETIC ACIDS IN AQUEOUS SOLUTIONS.

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Four alkyl substituted acetoacetic acids were prepared and their rate of decarboxylation was studied in aqueous solutions in the temperature range 30-50 °C. Activation energies were calculated based on the first order rate law and compared to the DFT calculated activation energies in the gas phase. We have confirmed that the concerted mechanism of beta keto acids decarboxylation in solutions is not supported.

Alkyl substituted acetoacetic acids have been characterized by single crystal x-ray data analysis for the first time. It was found that acids are packed in crystals by making hydrogen bonding in pairs between carboxylic groups. We were trying to explain experimental activation energies in solution by the distance of the C-C bond that will break in the decarboxylation reaction.

ABUNDANCE OF MICROPLASTICS IN STOMACH CONTENTS OF LAKE ONTARIO CHINOOK SALMON (ONCORHYNCHUS TSHAWYTSCHA) AND ALEWIFE (ALOSA PSEUDOHARENGUS).

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The prevalence of microplastics in the aquatic environment may be harmful to fish that indirectly or directly ingest them. These effects may include inhibition of gastrointestinal functions, creating blockages, and impairing feeding. Contaminated microplastics can also act as a vector for toxic chemicals to enter the tissues of organisms through ingestion. The recreational and economical value of fishing in the Great Lakes could be affected greatly if the fish populations are impacted by microplastic ingestion. Previous studies have shown that prey fish often have significant concentrations of microplastics within their digestive tracts. In Lake Ontario, alewife, round goby, deepwater sculpin, and slimy sculpin all ingest microplastics. In addition, microplastics have been collected within these species from eighteen sites around Lake Ontario. For this study, we analyzed ten Chinook salmon stomachs and ten alewife digestive tracts from individuals collected from Lake Ontario off of Oswego, NY (alewife) and chinook salmon (Salmon River, Altmar, NY). Fish tissues were dissolved with 4 M KOH and 30% H_2O_2 and the resulting solution was vacuumed filtered to isolate microplastics. The potential trophic pathways of microplastics in freshwater systems predict that higher trophic level fish, such as the Chinook salmon, would accumulate higher levels of microplastics by consuming large amounts of lower trophic level species . Alternatively, these plastics may pass through the digestive tracts of salmon and therefore not be detectable within spawning individuals.

IDENTIFICATION OF IN SITU IRON SPECIES IN C-H ACTIVATION REACTIONS.

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Iron catalysis is a cheaper and less toxic alternative to the use of precious metal catalysts for C-H functionalization. However, the mechanisms of iron-catalyzed C-H functionalizations are not well-studied, and few in situ iron species have been identified. The goal of this study was to identify several low-valent off-cycle iron species present in situ during C-H functionalization reactions. Utilizing common techniques for single crystal growth, iron species were crystallized out of solution and analyzed using an X-ray diffractometer. Several iron(I) species were identified, and a novel crystal structure was obtained for an iron species with a Li(THF) adduct. None of these species are believed to be catalytically active,

but the elucidation of their structures provides interesting information about the behavior of off-cycle iron species in situ.

IDENTIFYING REPRODUCIBLE METHODS FOR MICROALGAE BIODIESEL PRODUCTION.

Colleen Steward, Shannon Murphy, Dr. Barnabas Gikonyo
SUNY Geneseo

Reliance on dwindling reserves of fossil fuels poses a major threat to future economic and energy security, worldwide. Current research efforts are exploring ways to make plant-based biofuels environmentally, socially, and economically sustainable. Fast-growing, photosynthetic microalgae are a promising biofuel feedstock because they require less arable land and are more efficient at converting sunlight into chemical energy than terrestrial plants. Moreover, microalgae are capable of yielding high percentages of the fatty acids and essentials oils that can be converted chemically to diesel fuel. Despite these advantages, many biological and economic constraints limit the commercialization of microalgae fuels. One solution is to improve the efficiency of chemical processes, including lipid extraction and transesterification. Our work aims to identify reproducible methods for producing biodiesel from dried microalgae. Non-polar lipids were extracted from dried *Chlorella* using a 2:1 chloroform-methanol solvent at 15.0% $\pm$ 3.0% (n=3) of total algae mass. Infrared Spectroscopy (IR) analysis detected the presence of alkenes (~3010 cm^{-1}), alkanes (2850-2950 cm^{-1}), and a ketone (~1710 cm^{-1}). These functional groups suggest successful isolation of triacylglycerol with saturated and unsaturated fatty acid tails. Dried lipids were reacted with methanol and an acid (HCl) catalyst in a transesterification reaction. Although no discernable layer separation occurred, IR analysis of a hood-evaporated product detected alkenes, alkanes, an ester (1740 cm^{-1}), and an alcohol (3270 cm^{-1}). These functional groups suggest the presence of fatty acid methyl esters and residual methanol contamination. Future work will attempt to induce better separation of the desired methyl ester product and to perform the transesterification *in situ*.

NONLINEAR MECHANICS AND CRACK PROPAGATION IN ARTICULAR CARTILAGE MODELED AS A DOUBLE NETWORK GEL

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Rochester Institute of Technology

Here, we attempt to understand the structure-function relationships underlying the toughness and crack resistance of articular cartilage. Articular cartilage (AC) is a water containing network of collagen and aggrecan. It is a material found on the ends of bones that acts to cushion joints. We model AC as a double network hydrogel, which consists of an interconnected stiff network and flexible network, both of which are in a fluid. These networks are studied using rigidity percolation theory. We seek to understand how the material propagates stress and relaxes, and how these properties give rise to a material as tough and extensible as AC. We also study crack propagation in AC. Our results may help understand the mechanical properties of AC and similar tissues, as well as help design materials with toughnesses similar to those of AC.

NOVEL SOLAR CELLS: THE INKJET PRINTED NANOCRYSTALLINE INORGANIC PEROVSKITE FILMS

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We discuss herein the halide based perovskite solar cells (HPSCs). This type of solar cells have low cost, impressive power conversion efficiency, and long carrier lifetimes and diffusion lengths, which are remarkable results. Unfortunately organic based HPSCs have a few drawbacks including being sensitive to heat, moisture, and radiation induced degradation. A novel approach is to use inorganic based HPSC materials, which bring a variety of advantages. CsPbBr3 quantum dot (QD) inks have been used in an inkjet printer to print photoactive-perovskite QD films. The current-voltage I(V) and capacitance-voltage C(V) transport measurements indicate that the photocarrier drift lifetime can exceed 10 milliseconds for the CsPbBr3 quantum dot printed perovskites films. The successful printing of photoactive-perovskite QD films of CsPbBr3, shifts the paradigm towards the rapid prototyping of various perovskite inks and multilayers as an optimal solar cell type of the future.

EFFECTS OF INVASIVE PALE SWALLOWORT ON NATIVE SOIL BACTERIA

Michael Szarowski
Wells College

It has been shown that many plants influence the soil microbial community in their immediate surroundings. Pale swallowort (Cynanchum rossicum) is a common invasive weed found throughout the Finger Lakes region. I hypothesized that pale swallowort could be influencing the microbial community to outcompete native plants. In order to evaluate the potential consequences of pale swallowort on the microbial community, I collected soil samples from areas within a pale swallowort infestation and from areas of native plant communities within the Cayuga Lake region. Soil samples were diluted to isolate the bacteria using stepwise dilution and streaked on TSA plates using sterile technique. The plates were incubated for a period of two days at 37°C. I counted the number of colonies on each plate and defined colonies based on morphology and coloration. Preliminary results suggest pale swallowort has a positive impact on bacterial growth, showing greatly increased numbers of both bacterial colonies and diversity. This trend is consistent across all samples. This reflects research performed on other plant species. These results support the hypothesis that pale swallowort is influencing the soil microbial community, which could potentially provide a competitive advantage.

T

MICROWAVE SURFACTANT-THERMAL SYNTHESIS AND CATALYTIC ABILITY OF [Cu3(BTC)2] MOFS.

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Microwave irradiation has proven to be an effective synthetic tool for organic, inorganic, and organometallic compounds as well as solid-state and inorganic nanomaterials. The direct heating of the sample often leads to shorter reactions times and higher yields making microwave synthesis a green synthetic pathway.[1,2]

Metal-organic frameworks (MOFs) are insoluble, porous materials with Lewis acid reaction sites that have attracted much attention in the past two decades as exciting new candidates for heterogeneous catalysis. There is still a need for fundamental understanding about how reaction conditions affect MOF structure, size, morphology and consequently catalytic ability.

The microwave surfactant-thermal synthesis of a copper trimesate MOF was explored in polyethylene glycol and related surfactants. This resulted in a significant decrease in particle size of product compared to synthesis in ethanol and water. The MOFs were characterized using PXRD, IR, TGA, and SEM. Conversion of hexanal to dimethoxyhexane was tested with the commercially available catalyst (Basolite C300) and a 95% conversion in 24 hours was observed. Future work includes testing the catalytic ability of surfactant-

thermally synthesized MOFs for comparison.

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IDENTIFICATION AND CHARATERIZATION OF DNA REGULATORY ELEMENTS VIA THE COMBINATION OF GENETICS AND BIOINFORMATICS.

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Identifying DNA regulatory elements essential for proper gene expression can be done experimentally using reporter constructs and/or chromatin immunoprecipitation (ChIP). Bioinformatic databases are able to predict these elements; however these predictions rely on experimental evidence to ascertain function. We utilize bioinformatics software along with previously published ChIP data in order to identify functional transcription factor binding sites for the glucocorticoid receptor. Potential glucocorticoid responsive elements (GREs) in the mouse genome were located using a database called JASPAR and further analyzed by comparing the mouse sequence with the corresponding sequence in the human to identify the most likely functional elements. Using these bioinformatics approaches, potential GREs have been selected and we are cloning those regions into a luciferase reporter vector. Luciferase assays will be conducted to determine the function of these DNA elements as enhancers. This project explores how bioinformatics techniques can be used in determining functional binding of transcription factors.

DETERMINATION OF BIOFOULING MECHANISMS OF SINGLE AND BINARY PROTEIN SOLUTIONS OF BSA AND HEMOGLOBIN UNDER VARYING PH AND SALINITY CONDITIONS.

Shivam Tewari, Elana Stennett
Hobart and William Smith Colleges

With access to fresh water decreasing, increasing the efficiency of water filtration systems is of noted interest. Fouling of membranes in these systems due to protein adsorption decreases the rate at which water can be purified. The rate at which membranes foul is known to be dependent on membrane and solution chemistry. A study of the interactions between hydrophobic polyvinylidene fluoride (PVDF) 0.22 µm membranes and the proteins bovine serum albumin (BSA) and hemoglobin (Hb) at various environmental conditions was undertaken. Membrane-protein interactions were studied with solutions of 4 g/L BSA or 0.2 g/L Hb in a 0.15M PBS buffer at pH = $pI_{protein}$ in order to corroborate results found in the literature, as well as a median pH = 6. Protein-protein interactions were studied with binary solutions of BSA and Hb at pH = 6. Solution chemistry was further probed in the absence of salt or with the addition of either 0.1M NaCl or 0.1M $MgCl_2$. The type of fouling was determined by fitting eluate flux curves with equations that model fouling. This data was used to elucidate the mechanism in which different combinations of membrane, protein, and environmental conditions affect the efficiency of water purification.

CHELATION AND DYNAMIC BEHAVIOR IN NEUTRAL HYPERCOORDINATE ORGANOSILICON COMPLEXES OF 1-HYDROXY-2-PYRIDINETHIONE.

Erin R. Tiede, William W. Brennessel, Bradley M. Kraft
St. John Fisher College; University of Rochester

A series of organosilicon complexes containing the OPTO (1-oxo-2-pyridinethione) ligand were synthesized and characterized by ^{1}H, ^{13}C, and ^{29}Si NMR spectroscopy as well as X-ray crystallography.

T

The crystal structures of a series of silacycloalkanes of the form $(CH_2)_xSi(OPTO)_2$ (x = 3, 4, 5) were compared along with $Me_2Si(OPTO)_2$ to examine the influence of ring size on chelate strength as well as the effect of the silacycle relative to the open-chain structures. The carbon resonances of the ligand in various complexes were identified using ^{1}H-^{13}C HMQC NMR experiments. The relative order of several of the carbon resonances was found to depend on temperature and the substituents bonded to silicon. Variable-temperature NMR studies revealed dynamic chelation equilibria involving dissociation of the Si←S=C bond.

SPRINT TRAINING IMPROVES ENDURANCE PERFORMANCE BUT NOT SPRINT PERFORMANCE IN AGED ZEBRAFISH, OR DOES IT?

Brian Tran, Dr. Kathleen Savage
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Previous studies have shown that trained, (endurance and sprint) aged zebrafish demonstrated no improvement in sprint or endurance performance, while young and middle-aged zebrafish improved both performance measures, suggesting that aged fish are unable to improve swimming performance. The present study was undertaken to investigate these findings. A group of aged zebrafish underwent a sprint test and a separate endurance test before training. The fish were sprint trained for 10 sessions over the course of two and a half weeks. Following these two and a half weeks, the fish were re-tested to determine their post training performances. The aged zebra did not show an improvement in sprint performance, but did show an improvement in endurance performance. There is ample evidence that aged organisms undergo sarcopenia, the loss of muscle mass, primarily the fast sprint fiber types, which suggests a cause for the observed decrease in sprint ability for older organisms. Other reasons for these findings might include the variations in fish morphology, measurement sensitivity, and day to day performance variability. Future studies on zebrafish exercise could be utilized to study various health conditions and transgenic lines of fish.

STUDYING THE HUMAN CANCER GENE, ERH, WITHIN THE FRUIT FLY, DROSOPHILA MELANOGASTER

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The initial genes shown to be necessary for the induction and survival of cancer cells were identified as activated oncogenes and loss-of-function tumor suppressor genes. It has now become clear that the altered physiological state of cancer cells has resulted in a dependence on the activity of another set of genes. This dependence on the activity of genes that are not oncogenes has been termed non-oncogene addiction (NOA), and the genes involved are referred to as NOA genes. One such gene is Enhancer of Rudimentary Homologue (ERH), which encodes an evolutionarily, highly conserved protein, ERH. The human and Drosophila ERH are 76% identical and each folds into a unique three-dimensional domain. The high structural conservation of the protein suggested that the function of the protein may also be conserved. We have tested this possibility by creating a chimeric ERH gene that consists of the non-coding regions of Drosophila ERH with the coding region of the human ERH, and replacing the Drosophila ERH gene with this chimeric gene. This chimeric ERH functions normally in the fruit fly, as shown by its ability to rescue all of the mutant phenotypes associated with an ERH null mutation. Thus, human and Drosophila ERH are functionally equivalent. Implicit in this result is that the human ERH must be properly post-translationally modified in Drosophila and must be able to interact with the normal protein-binding partners of the Drosophila ERH. What this also means is that mutagenic approaches to study the activity of human ERH can be done in Drosophila. This type of study is not possible in the human cell-culture systems. Our initial ventures into examining the structure/function relationships within ERH will be presented.

V

EMBRYOPATHIC EFFECTS OF WARFARIN DURING CHICK EMBRYO DEVELOPMENT.

Megan VanVorce, Poongodi Geetha-Loganathan
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Warfarin sodium is an anticoagulant which readily crosses the placenta due to its low molecular weight, and causes groups of congenital anomalies known as fetal warfarin syndrome. Warfarin inhibits the generation of vitamin K- dependent procoagulant proteins causing anomalies including nasal hypoplasia, stippling of the epiphyses, cleft lip without a palate, hydrocephalus and intraventricular hemorrhage. Here, we investigate relevant mechanisms of warfarin in a chick embryo teratogenicity test *in vivo* and *in vitro*. The percentage of embryos with lethal effects increased with increasing concentration of warfarin. The major phenotypes with exposure to warfarin were malformations of the head, neural tube, eyes, and heart. Due to severity of the teratogenicity, treated embryos did not survive after 48h. *In vitro*, warfarin inhibits cartilage nodule formation delaying ossification in high density cultures from chick limb mesenchyme. The intent of the study is to increase understanding of this rare but specific syndrome so we may prevent secondary morphological complications.

ORGANOGENESIS AFFECTED BY HARD ROCK MUSIC DURING CHICK EMBRYO DEVELOPMENT

Cliff-Simon Vital, Poongodi Geetha-Loganathan
SUNY Oswego Biological Sciences

It is commonly believed that exposure to classical music stimuli during pregnancy will promote fetal brain development, but to date, there is no solid scientific reasoning to prove this phenomenon. Preliminary studies from our lab using chick embryo as a model have shown that continuous prenatal exposure to a high intensity of both classical and hard rock music causes severe morphological abnormalities due to delayed development regardless of the genre of music. Here, we continue to investigate the effect of hard rock music stimulation on organ development in chick embryos. In order to study the internal phenotypes, fertilized chicken eggs were exposed to high-intensity hard rock music for 16 days; organs dissected were fixed and processed into paraffin wax; sectioned using microtome; sections were stained with hematoxylin and eosin. Results derived from this study provide a better understanding about effects of environmental stimuli on embryo development and can be applied to other vertebrates including humans.

THE ANALYSIS OF PHOSPHORYLATION AND UBIQUITINATION OF AMINO ACIDS IN THE ENHANCER OF RUDIMENTARY PROTEIN, ERH: CREATION OF MUTANT GENES

Amber Voyer
The College at Brockport

The *enhancer of rudimentary* gene plays a role in cancer progression in humans as well as cell division and growth in *Drosophila melanogaster*. It encodes the Enhancer of Rudimentary Homolog protein, ERH, which is highly conserved among species. Six sites have been identified as possible areas for phosphorylation as well as two other places where ubiquitination may occur. These sites are within the conserved portions of the protein which suggests that they have an essential role in ERH activation and function. To determine if any of these sites are in fact necessary for protein activation, mutant genes have been created containing the Drosophila untranslated regions of the gene and the human coding region containing a mutation. The mutant *e(r)* is contained within a vector. After insertion into the *D. melanogaster* genome, crosses will be analyzed to reveal which sites are important for ERH function.

W

W

ALLOMOTHERING OF A NEWBORN BELUGA CALF

Leanne Walker, Michael Noonan
Canisius College

Belugas are long-lived cetaceans that inhabit the high Artic. Because of the remoteness of their habitat, very little is known about their social behavior, including the actions that occur in a group around the time of a birth. In some cetacean species non-maternal females assist in the care of neonates. However, it is not known whether such allomothering occurs in belugas. To help address this need for information, the present study investigated the contacts made on a newborn calf by any of the adult whales housed together in a pool. Numerous care-giving behaviors by unrelated adults were observed, suggesting that allomothering does occur in this species.

DEGRADATION OF CH3NH3PbBr3 SINGLE CRYSTAL.

Congcong Wang[1], Benjamin Ecker[1], Haotong Wei[2], Jinsong Huang[2], Yongli Gao[1]
[1]Department of Physics and Astronomy, University of Rochester, [2]Department of Mechanical and Materials Engineering, University of Nebraska-Lincoln

Methylammonium lead halide perovskites are highly promising materials to fabricate efficient solar cells. However, the stability issue in various environment has prevented the material from being a competitive candidate in the long term. In this study, we have investigated the X-ray and the water degradation of freshly cleaved $CH_3NH_3PbBr_3$ single crystal using X-ray Photoelectron Spectroscopy (XPS) and Atomic Force Microscopy (AFM). The elemental ratio of the as cleaved crystal is C: N: Pb: Br: O = 1.53: 1.10: 1: 2.92: 0, very close to the ideal case. The single crystal was exposed to water from 0 L to 10^{11} L (1 L= 10^{-6} Torr · sec). A reaction threshold of ~10^8 Langmuir was found. Below the threshold in *Stage I*, H_2O only acted as an n-type dopant, and ~10% perovskite degraded because of X-ray. Above it in *Stage II*, the crystal began to decompose. About 35% perovskite was degraded by water, and released HBr and NH_3 gases. Partial NH_3 gas was absorbed by water, while $PbBr_2$ was further degraded into metallic lead and Br_2. The metallic lead reacted with water and the residual O_2 in the chamber to form white precipitate $Pb(OH)_2$. The AFM measurements revealed that the morphology of the film changed drastically from smooth to rough by water exposure.

INHIBITION OF NF-κB ACTIVATION AND SUPPRESSION OF THE IFN RESPONSE ARE INDEPENDENT FUNCTIONS OF THE VESICULAR STOMATITIS VIRUS MATRIX PROTEIN.

Amanda N. Weiss, Kaitlin A. Marquis, Maureen C. Ferran
Rochester Institute of Technology

The vesicular stomatitis virus (VSV) matrix (M) protein inhibits host transcription, translation and transport of RNA to the cytoplasm. This enables the virus to perpetuate its replication cycle because it prevents antiviral responses, including interferon-β (IFN-β), from being made. Position 51 in the M protein is necessary for the inhibition of host transcription and the IFN response, as these functions are lost in M51R mutants. Our previous work found that this position is also essential for inhibition of NF-κB, a transcription factor essential for IFN gene induction. However, it is uncertain whether inhibition of NF-κB and IFN expression are independent or connected, as the M51R mutation interfered with both functions. This project aimed to understand whether these functions are independent. In the 22-20 strain, we found a mutation in amino acid 52, a highly conserved position. In L929 cells infected with 22-20, immunofluorescence experiments showed that NF-κB was activated, whereas in cells infected with 22-25, its wild type counterpart, NF-κB remained cytoplasmic. However, similar, but only moderate, amounts of IFN mRNA were detected in L929 cells infected each with 22-20 and 22-25. This suggests the

position 52 mutation prevented 22-20 from inhibiting NF-κB activation, but not from suppressing IFN gene expression. Single step growth curve experiments confirm that these viruses replicate to similar levels, therefore the differences in NF-□B activation are not due to reduced viral replication. Together, these findings indicate that inhibition of the IFN response and inhibition of NF-κB activation are separable functions of the VSV M protein.

EXAMINING THE IMPACT OF MU BACTERIOPHAGE KIL PEPTIDE ON MREB & FTSZ IN E. COLI

Samantha Weiss, Laura Cavallari, Allyson Corigliano, Daniel Haeusser
Canisius College Biology Department

Reports decades ago noted that normally rod-shaped E. coli become spherical, prior to lysis, when infected with Mu bacteriophage expressing its kil gene. We have cloned the Mu kil gene for expression off a plasmid in E. coli and have verified the cell rounding phenotype, but additionally note cell elongation occurring. The exact target of the Kil peptide product is unknown, but we hypothesize that Kil targets the prokaryotic actin homologue MreB that is responsible for rod shape maintenance in E. coli, as well as the prokaryotic tubulin homolog FtsZ that is required for cell division. We are verifying that Mu kil expression does not lead to MreB or FtsZ degradation and are exploring its effects on MreB and FtsZ localization at different growth rates through immunofluorescence microscopy. This research will allow for elucidation of how a bacteriophage is able to alter E. coli's shape, likely through a change in cytoskeleton structure. Phage inhibition of essential bacterial cytoskeletal components could lead to potential applications for the development of future antibiotics.

FUNCTIONAL CHARACTERIZATION OF A MEMBER OF THE NUDIX HYDROLASES

Zane Wetzel, Katie Wilson, Jeffrey Mills, Suzanne O'Handley
Rochester Institute of Technology

The NUDIX family is a diverse group consisting of about 50,000 known proteins isolated from archaea, eukaryotes, and prokaryotes. Many NUDIX proteins catalyze the hydrolysis of nucleoside diphosphates, by attaching to and cleaving the bond between two phosphates. They're commonly classified as 'house cleaning' proteins and are involved in the virulence of bacteria such as *tuberculosis*. Less than 0.001% of the NUDIX proteins have been functionally characterized. We set off to functionally characterize a subset of 6 NUDIX hydrolases using *in-vitro* and *in-silico* techniques and resources. We chose the NUDIX hydrolase MutT/nudix family protein from Streptococcus pneumonia (PDB ID) '2PQV'. Standard biochemical techniques were used to overexpress, purify, and characterize the enzyme. Enzymatic activity was determined using spectroscopic measurement of a blue phosphate complex. Conditions were optimized by screening multiple assays using 5 metals, 9 substrates, and 2 buffers (Tris & Gl) with a pH range of 7-10.5. Using plasmids from DNASU 2PQV was His-tagged and expressed in *E.coli* and then purified using Ni^{2+}-affinity chromatography. A series of activity assays were conducted with 2PQV to identify its preferred substrate, pH, and metal. In total the assay screenings were ran using 5 metals, 9 substrates, and 2 buffers. Results indicated that this enzyme achieves high activity when paired with the metal cofactor manganese, and when cleaving the substrate Diadenosine tetraphosphate (AP_4A) in a pH 8.5 Glycine buffer.

FUNCTIONAL CHARACTERIZATION OF THE NUDIX HYDROLASE 3QSJ

Katherine Wilson, Zane Wetzel, Jeffrey Mills, Suzanne O'Handley
Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology; School of Chemistry & Materials Science, Rochester Institute of Technology

The NUDIX hydrolase superfamily of enzymes cleave the internal phosphate bonds of nucleosides. There are approximately 50,000 known NUDIX hydrolases from each of the three main branches of life. NUDIX

hydrolases are named such as they catalyze the hydrolysis of a nucleoside diphosphate linked to an X moiety, cleaving the internal phosphate bond between the adjacent phosphate groups. The NUDIX hydrolase which is the focus of this study, (UniProtKB C8WVE1, PDB ID 3QSJ) is an enzyme found in the bacterium Alicyclobacillus acidocaldarius, a non-pathogenic organism commonly responsible for spoiling canned fruit juices. Despite the vast number of known NUDIX sequences, very few, <0.3%, have been characterized functionally. We began to functionally characterize a subset of six NUDIX hydrolases using standard in vitro and in silico biochemical techniques. Plasmids containing the gene to encode 3QSJ were purchased from DNASU.org and transformed into E. coli to grow and overexpress protein which was then purified, concentrated, and characterized.. A number of enzyme assays were conducted the optimal substrate, metal cofactor, and pH. Results of these assays indicate that the use of Mn2+ with flavin adenine dinucleotide (FAD) at a pH of 8.5 yielded the highest relative activity.

HIGH ALTITUDE MUON FLUX, RADIATION SHIELDING, AND SPECTROSCOPY.

Jasper White, Duinya Syed, Ileana Dumitriu Ph.D., Peter Spacher Ph.D.
Hobart and William Smith Colleges

Our RockSat-C payload was integrated into a sounding rocket and launched in June 2017 at the NASA Wallops Flight Facility in Virginia. RockSat-C is the only program which gives access to space for undergraduate student research. We designed, built, and tested our payload to measure muon flux, test radiation shielding properties of different plastics, and record spectroscopy data. Our muon data collected this year was consistent with previous years. PLA, ABS, and a hemp based plastic filament were tested for radiation shielding properties. All shields were 3-D printed and Geiger kits were assembled by local Geneva middle school students. Our spectrometer recorded spectra from various layers of the atmosphere. Data collected in flight were analyzed and the results will be presented in this poster.

LIFE ON THE EDGE: THE CREATION OF, AND CONSERVATION IN, HIGHWAY ROADSIDES.

Kaitlin Stack Whitney
Rochester Institute of Technology

The interstate highway system in the United States was created by the Federal-Aid Highway Act of 1956. This act did not just result in creating the highway system though. Inadvertently, an entirely new place was created: the highway right-of-way, also known as the verge. Originally just the linear boundary between road and other land uses, the verge has markedly changed over time, becoming a physically distinct space to manage and eventually an ecosystem onto itself. That shift is most evident by recent selection of the interstate 80 highway right-of-way between Minnesota and Texas as the sole location for the federal government's 2015 national monarch butterfly conservation plan.

The highway system thus created a new place and word within the frame of 'environment' – and in turn new possibilities for conservation science. This talk briefly explains how roadsides went from a site of safety for drivers and risk for managers to becoming seen as their own ecosystem over the past 60 years in the United States. I will follow this story to the present day and our own Rochester region, using the monarch butterfly life history and conservation plan as a case study. Preliminary results from and future plans for the roadside research on Lepidoptera (butterflies and moths), additional pollinators, and other beneficial insects that is ongoing in this area will be discussed.

TRANSCRIPTIONAL ANALYSIS OF BIPOLAR CANDIDATE GENES SUGGEST A ROLE FOR ENDOPLASMIC RETICULUM STRESS.

Madilyn M. Wiles, Maria Fernanda Juarez Anaya, Douglas J. Guarnieri
Saint Bonaventure Universit

Bipolar disorder, also known as manic depression, is known to be a polygenetic disease. However, replicable risk alleles have not yet been identified by linkage analysis. Since 2006, multiple Genome Wide Association Studies (GWAS) have focused on finding novel risk alleles. We have assessed these studies and defined our own list of candidate genes. We designed qPCR primers in the mouse genome that would capture most or all of the known transcripts. By analyzing various cellular and animal models of stress (food restriction, oxidative stress, physiological stress, depressive-like behavior), we hope to find common gene expression patterns that may suggest a common biochemical pathway underlying this disorder. Our results show that there is not a common transcriptional effect in models of physiological stress mediated by glucocorticoids. However, all candidate genes showed an upregulation in a rodent model of depression as well as a downregulation in cellular models of oxidative stress. Specifically, it seems like endoplasmic reticulum stress may be responsible for the observed changes. We hope to analyze recently identified candidate genes and complete our initial analysis by increasing our samples. The identification of a common pathway should allow a better understanding of the disorder as well as the development of better treatment options of bipolar disorder.

DUPLICATE: FUNCTIONAL CHARACTERIZATION OF THE NUDIX HYDROLASE 3QSJ

Katie Wilson, Zane Wetzel, Jeffrey Mills, Susan O'Handley
Rochester Institute of Technology

The NUDIX hydrolase superfamily of enzymes cleave the internal phosphate bonds of nucleosides. There are approximately 50,000 known NUDIX hydrolases from each of the three main branches of life. NUDIX hydrolases are named such as they catalyze the hydrolysis of a nucleoside diphosphate linked to an X moiety, cleaving the internal phosphate bond between the adjacent phosphate groups. The NUDIX hydrolase which is the focus of this study, (UniProtKB C8WVE1, PDB ID 3QSJ) is an enzyme found in the bacterium Alicyclobacillus acidocaldarius, a non-pathogenic organism commonly responsible for spoiling canned fruit juices. Despite the vast number of known NUDIX sequences, very few, <0.3%, have been characterized functionally. We began to functionally characterize a subset of six NUDIX hydrolases using standard in vitro and in silico biochemical techniques. Plasmids containing the gene to encode 3QSJ were purchased from DNASU.org and transformed into E. coli to grow and overexpress protein which was then purified, concentrated, and characterized.. A number of enzyme assays were conducted the optimal substrate, metal cofactor, and pH. Results of these assays indicate that the use of Mn2+ with flavin adenine dinucleotide (FAD) at a pH of 8.5 yielded the highest relative activity.

CHLORIDE AND HEAVY METALS IN NATURAL AND IMPOUNDED WATER BODIES OF ALLEGANY COUNTY, NY.

James Wolfe, Alison Apgar, Natalia Cabrera-Febres, Hawa-Dorcas Coulibaly, Alyson DeMerchant, Daniel Hammers, Andrew Hutton, and Evan Stern.
Biology Department, Houghton College

Since 2104, we have been monitoring chloride levels in natural and impounded water bodies across Allegany County with its low population density (48/square mile), using a Seal AQ2 multichannel analyzer. We also have begun a study of heavy metal concentrations in water and sediments from the same water sources by atomic absorption spectrophotometry. Chloride concentrations from winter 2016 were lowest (1.82 mg L^{-1}) in more remote water bodies (e.g. Moss Lake) and higher (13.5, 7.2 mg L^{-1}) in lakes nearer roads and human residences (Rushford Lake, Cuba Lake). In winter 2016, levels

varied slightly between February and April samples. A similar pattern was seen for samples taken in winter 2017. Higher concentrations of chloride were found for winter 2014 as compared to 2016 and 2017, suggesting that winter severity (and the intensity of road salt application) influences levels in wetlands and lakes. We found levels of lead and nickel from water samples from Amity, Rushford, and Cuba Lakes were below levels of detection (ppb). Concentrations of copper were 12.8, 20.1, and 14.6 ppb for the three lakes respectively, which may reflect the seepage of lakefront septic systems from cottages with copper piping.

TRANSLATIONAL USE OF HOST-CELL STRESS GRANULES BY REOVIRUS.

Megan Worth, Dr. Emily Ledgerwood, Michael M. Lutz IV
Le Moyne College

Mammalian orthoreovirus (reovirus) is a dsRNA virus that is naturally oncolytic. The mechanisms behind its oncolytic behavior, however, remain unclear. Viral infection of a cell induces a cellular stress response which includes the formation of cellular structures known as stress granules (SG). SG house machinery is involved in translation initiation as well as translationally-stalled mRNAs. Recent studies have shown that many viruses modulate SG assembly, and it has been shown by others that reovirus induces, and disassembles, SG. To explore the impact of the stress response during reovirus infection, we examined the impact of SG presence at the onset of viral infection. In cells pre-treated with sodium arsenite, viral protein expression, factory formation and titer were enhanced, suggesting that induction of the stress response is beneficial to reovirus infection. Current studies focus on elucidating the role of SG in pancreatic cancer cells during reovirus infection.

X

PICOLINAMIDE AND N-PHENYL-N-PYRIDINYLUREA DERIVATIVES AS LIGANDS FOR ARYL C-N BOND FORMATION.

Mahemuti Xiadiman
SUNY Oswego

The Ullmann coupling C-N bond formations have been synthesized from reaction of aryl halides with aliphatic amines and N-heterocyclic substrates. The C-N formation has attracted considerable application in modern organic synthesis such as natural products, medicinal drugs, and pharmaceutical agents. Therefore, it is important to develop new protocols to achieve the synthesis of the bonds of interest. To reduce costs and to improve C-N coupling reaction efficiency, the Copper has been successfully catalyzed Ullmann C-N coupling with assistance of base and additive due to low cost in comparison with palladium and mild conditions requirement for the synthesis.

In recent decade the chelating ligands have been involved to promote the copper catalyzed cross coupling reaction and to solve the harsh high temperature problems and to increase the yields.

Y

SUCCESSFUL CONSTRUCTION OF A PA1006/C-TERMINAL GFP FUSION PROTEIN TO INVESTIGATE MOLYBDENUM COFACTOR BIOSYNTHESIS IN PSEUDOMONAS AERUGINOSA.

Andrea Yamutuale, Nyshidha Gurijala, Shradha Mamidi, and Johanna Schwingel, PhD
Department of Biology, St. Bonaventure University

Pseudomonas aeruginosa is an opportunistic pathogen that flourishes in the biofilms it creates using the nitrate reductase pathway for anaerobic metabolism. The nitrate reductase relies on the molybdenum cofactor. The research looked at the involvement and interaction of PA1006, a chaperone protein

involved in moving the molybdenum cofactor through biosynthesis to where it is used in the cell. Our goal was to fuse the PA1006 gene with the C-terminal segment of GFP to be used in a GFP complementation assay with interacting proteins containing an N-terminal GFP fusion. Directional cloning was used to clone the PA1006 gene from pGEM into the CGFP region of the pUC18-mini-Tn7T-Gm-CGFP link plasmid. The resulting plasmid was sequenced to confirm proper insertion. The recombinant plasmid was electroporated into P. aeruginosa for incorporation into the chromosome. The CGFP fusion was paired with N-terminal GFP fusions to investigate protein-protein interactions measured by spectrophotometry and visualized by fluorescent microscopy.

SPECIFIC LEAF AREA AND AMINO ACIDS VARY WITHIN SUGAR MAPLE CANOPIES AND ACROSS A N*P FERTILIZATION EXPERIMENT

Alex Young, Ruth Yanai, Rakesh Minocha, Stephanie Long
SUNY ESF

Understanding variation in foliar traits related to canopy depth and nutrient limitations may improve our understanding of constraints on forest productivity. Here we asses sugar maple (Acer saccharum) leaf trait variation at different heights within the canopy and across a N and P factorial experiment. Twelve sugar maple trees were climbed using minimally invasive techniques and a pole pruner and tape measure enabled leaves to be collected every two meters throughout the canopy. We ask how specific leaf area and amino acid concentration vary with canopy depth, and if seven years of annual fertilizer addition is sufficient to induce phenotypic responses. Specific leaf area increased with distance from tree top, and was highest in trees fertilized with nitrogen and phosphorous. Nitrogen addition appears to increase amino acid content (Ala, Ser, Val, Ile, Trp, Phe), but only in the top canopy positions. Tree canopy traits are influenced by fertilization and canopy depth. A greater understanding of within tree variation may guide silvicultural and minimize the uncertainty in vegetation sampling error.

POPULATION GENETICS OF THE COMMON RAVEN IN MEXICO

Sally Yraita, Nandadevi Cortes Rodriguez
Ithaca College

The Common raven (Corvus corax) has a distribution that expands across the entire Northern Hemisphere, but shows little phenotypic difference. Although they have uniform morphology, based on their genetics, it has been separated into two clades known as the ‘Holarctic clade’ and the ‘California clade’. Despite this genetic distinction, many populations have not been classified as either clade, including the populations in continental Mexico as well as islands nearby. To identify their classification, we obtained toepads from common raven found across Mexico and the Revillagigedo Islands (Clarion and Socorro) and extracted DNA from 14 samples by following a phenol/chloroform method. After isolating the DNA, we sequenced a small fragment of the control region of the mitochondria. This fragment of 150bp shows some variation; however, it is not sufficient to differentiate the individuals from the Revillagigedo Islands as an independent evolutionary unit.

Z

TESTING FOR MYCOPLASMA CONTAMINANTS BY POLYMERASE CHAIN REACTION (PCR).

Siti Nor Syahirah Zainuddin, Tyler C. Anderson, Noor Masleina Dahalan, Brianna Bonanni, Elizabeth Pattie, and Irene M. Evans
Gosnell School of Life Sciences, Rochester Institute of Technology

One of the issues in cell- based research is a mycoplasma infection. Mycoplasma are the smallest bacteria alive. Due to their tiny size, mycoplasma can barely be detected under the microscope. The lack

of a cell wall makes for flexibility, allowing formation of various shapes and helps mycoplasma to remain unnoticeable in cell culture. Mycoplasma alter the cell's metabolism and cause defects in the cell proliferation rate when introduced into cell culture. Many journals will not publish papers unless the authors certify that the cultured cells used have been tested for and been found to be free of mycoplasma. Since our laboratory publishes papers, we need to test cell lines to assure they are free of mycoplasma. We used a quick and sensitive PCR-based test (ABM's PCR Mycoplasma Detection Kit) to detect mycoplasma contaminants in cell culture. This kit-based assay is inexpensive and all components required for the PCR reaction are provided and have been optimized for amplification. A line of cells given to us gave a strong positive reaction for mycoplasma. The cells were treated with Plasmocin for 2-3 weeks to effect a cure. After 1-2 weeks, the tested medium changed from positive to negative suggesting that the mycoplasma had been eradicated. We plan to continue doing the test to ensure all our cell lines remain free of mycoplasma.

CHROMOSOME SPATIAL DISTRIBUTION IN THE LARGE BACTERIUM *Epulopiscium* SP. TYPE B.

Bayley Zubler, Kirk Anne, Elizabeth Hutchison, and Anne Pellerin.
Dept. of Physics & Astronomy, CIT, Dept. of Biology, SUNY Geneseo

We present the three dimensional (3D) spatial map of the large number of chromosomes found in *Epulopiscium* sp. type B, the second largest bacterium. This bacterium is special because it is extremely polyploid with tens of thousands of chromosomes, whereas most bacteria have 1-2 copies. Bacteria are usually limited in size by diffusion and their need for a large surface area to volume ratio. More specifically, we are interested in how polyploidy impacts the organization and structure of chromosomes in this bacterium. First, florescent probes were used to label the chromosomes within the cell via fluorescence *in situ* hybridization. Then we obtained 2D microscope images of the labeled chromosomes at various depths within the cell, creating a 3D datacube. A 3D map of the chromosomes was constructed by exploiting astronomical imaging techniques and analysis tools to precisely locate each marked chromosome within the datacube. The long term goal of our research is to better understand the cell structure of *Epulopiscium* sp. type B and the biology that allows it to achieve an unusually large cell size. This study not only provides insights into bacterial cell biology, but advances biological image analysis techniques using an interdisciplinary approach.

THE STATUS OF WESTERN BEAN CUTWORM, *Striacosta Albicosta* (SMITH), IN NEW YORK STATE.

Marion Zuefle, Ken Wise, Keith Waldron and Carol MacNeil
NYS IPM Program, Cornell University, Cornell Vegetable Program, CCE Ontario County

In 2009, Western Bean cutworm (WBC), a Lepidopteran pest native to North America's Great Plains region and west, was found in NY state. This is a pest primarily of corn and dry beans. The range of WBC has been expanding eastwards over the last two decades and now poses a serious risk to field corn, sweet corn and dry bean growers in NY. In 2010 a monitoring network was established in NY to track the movement of this pest into the state and to warn growers of potential risk. Each year, pheromone traps were placed at field corn, sweet corn and dry bean fields throughout NY and monitored weekly beginning in June. Overall WBC trap catches have steadily increased over the last eight years. Peak flight occurs between late July and early August. Knowing when peak flight occurs as well as cumulative trap catch for a site informs growers if their fields are at risk and when scouting for potential damage should be initiated.