ABSTRACTS

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Oral Presentation Abstracts (alphabetical by first author)

THE EFFECT OF ETHYL ACETATE OIL EXTRACTS OF *HEXASTYLIS ARIFOLIA* ON PC12 CELL CULTURES. Lindsay Achzet, Wells College, 170 Main Street, Aurora NY 13026 and MaryAnne Sahawneh, Samford University, Propst Building, 800 Lakeshore Drive, Birmingham, AL, 35229.

Hexastylis arifolia, colloquially known as wild ginger, has been used for centuries in traditional medicine. A major component of *Hexastylis arifolia* is safrole, and according to previous studies, safrole may have potential benefits for neurodegenerative disorders. In the current study, PC12 neurite cells, which are a model system for neurons, were exposed to safrole that was extracted from the roots of *Hexastylis arifolia* using ethyl acetate. The effect of the extracted safrole on PC12 cells was measured by observing the number and length of neurites. The safrole extract-treated PC12 cells showed an increase in neurite length, but not in neurite number. Since there was an increase in the neurite length, this was interpreted as the extracted safrole having a neuroprotective effect on PC12 cells. Further studies are needed to observe whether a similar effect of safrole can be seen in neurons and also to investigate possible cellular pathways that are active in these PC12 cells.

SYNTHESIS OF A UREA PMSA INHIBITOR AND ITS USE IN PHOTOACOUSTIC IMAGING. Nnamdi Akporji, Michael Regan, and Hans Schmitthenner, A114 Thomas Gosnell Hall, RIT College of Science, 85 Lomb Memorial Drive, Rochester, NY 14623.

The goal of this project is to utilize a Prostate Specific Membrane Antigen (PSMA) urea-targeting agent coupled to imaging agents for use in near infrared fluorescence (NIR), photoacoustic imaging (PAI), and positron emission tomography (PET). The questions that will be addressed include if a molecule for prostate cancer can be detected and if conjugating targeting agents to imaging agents is possible. The synthesis of the prostate cancer (PrCa) imaging agents involves several steps. The first important step is the synthesis of a PSMA Urea-targeting agent. This difficult synthesis is on going and will continue in spring semester. The second part of the project, which involves investigating linker groups and coupling urea-targeting agent to PAI and NIR imaging agents, shall take place over the summer. The inhibitor may also be used by others in our group for related PET and PET-NIR agents. This project will result in a new method of early detection of prostate cancer and accurate diagnosis of established prostate cancer.

REGULATION OF THE HOST INNATE IMMUNE RESPONSE BY VESICULAR STOMATITIS VIRUS (VSV) OCCURS IN A CELL SPECIFIC MANNER. Rachel L. Becker, and Maureen C. Ferran. Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, New York.

Vesicular Stomatitis Virus (VSV), is a well-studied, prototypical member of the family Rhabdoviridae. Research in our lab focuses on the mechanisms used by VSV to prevent production of the interferon (IFN) protein and thereby evade the host's main antiviral response. Upon infection, VSV rapidly limits host transcription. This inhibition is primarily a function of the VSV matrix (M) protein; which blocks bidirectional nuclear-cytoplasmic transport of mRNA and inhibits RNA polymerase function. While it has been hypothesized that VSV prevents

synthesis of the IFN protein by inhibiting general host transcription, we hypothesize that VSV conducts a targeted suppression of the IFN gene. In support of our claim, we have found that the VSV M protein prevents activation of NF-kB, a transcription factor that is necessary for induction of the IFN gene. Our current investigations aim to elucidate the mechanism used by VSV to suppress transcription of IFN mRNA and to identify the viral components involved. We will present our work examining IFN mRNA production in L929 (mouse connective tissue) and HeLa (human cervical adenocarcinoma) cells following infection with several strains of VSV_{IND} (HR), using real-time qPCR and ELISA. Our data suggests cell-type differences in IFN mRNA induction during VSV infection, lending support to our claim that, in addition to inhibiting general host transcription, VSV suppresses the host's IFN response in a targeted, cell-specific manner.

ECOLOGICAL IMPACTS OF CARBON FULLERENES. Charles Border, Callie Babbitt, Christy Tyler, and Elizabeth Wronko. Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Carbon fullerenes are a class of carbon-based nanomaterial that have many applications due to their unique chemical properties, especially in cosmetics, drug delivery, and photovoltaics. Due to their small size, conventional water treatment methods often cannot remove them, and they are introduced to the aquatic environment through wastewater streams. Because of their unique chemical properties, and the complexity of the environmental system, the effects of these fullerenes are generally unknown. There, they can settle out into the sediment. The purpose of this experiment is to quantify the effects that carbon fullerenes, specifically C60, PCBM, and C70, have on the microbiotic communities and ecosystem function in lake sediments, using a microcosm experiment. Oxygen and nutrient changes over time will be measured at acute (2 day) and chronic (22 day) intervals, and daily water samples will be used to calculate the change in fullerene concentration in the water over time. At the conclusion of the experiment, fullerene concentrations in the sediment will be measured using a toluene extraction. Pilot studies suggest that C60 added to the water column may have a positive effect on the oxygen fluxes of these microcosms, potentially due to increased metabolism. Further research will focus on other carbon fullerene derivatives, such as PCBM and C70 ecotoxicology, and the effects of carbon fullerenes on benthic macroinvertebrates.

ANNUAL AND DIET-RELATED VARIATION IN PLASMA METABOLITE PROFILES OF FREE-LIVING AND CAPTIVE *CATHARUS* THRUSHES. Calvin Carrington, Susan B. Smith. Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Migratory birds require high-quality stopover sites that provide sufficient food for rapid fat storage to meet the energetic challenges of migration. The nutritional quality and biochemical composition of food can influence the physiological condition of birds during short stopovers. The goal of this study was to directly assess the effect of diet on captive bird physiology in order to more closely link the physiological state of free-living birds between years. Blood samples were collected from *Catharus* Thrushes at the Braddock Bay Bird Observatory, an important stopover site on the south shore of Lake Ontario, during the fall seasons of 2012-2015. Blood samples were analyzed using spectrophotometric assays to measure plasma indicators of energy

and nutrient utilization, including triglyceride, uric acid, glucose and free fatty acids to assess variation in the condition, physiological state, and diets of the birds among years. Hermit Thrushes collected at the station in fall 2014 were held in captivity and fed diets of fruits from either native or non-native shrubs. Results also indicate significant differences in the plasma metabolite levels of birds sampled in different years. There were significant differences between triglyceride, uric acid and glycerol, in 2012 and 2013 as well as 2013 and 2014, but only plasma glycerol significantly different between 2012 and 2014. Preliminary plasma metabolite data for captive thrushes show a trend towards higher fattening rates in birds consuming fruits of native shrubs than non-native shrubs. Additional analyses of free-living thrushes will consider species differences and date in order to clarify annual variation in plasma metabolites in relation to migration distance and timing. In addition, fruit availability declines as the fall migration season progresses and may contribute to within-season variation in plasma metabolites. Our data on plasma metabolites will help to demonstrate the impact of annual variation in fruit availability, as well as effects of specific fruits, on the physiological condition of migratory birds.

MULTI-YEAR TRENDS OF VIRUS INFECTION IN NORTHEASTERN AMPHIBIANS. Rachel Cary, Jennifer Olori, Brett Corbett, Tyler Worzel, Chris Chandler, and Sofia Windstam. SUNY Albany, 4 View Avenue, 1st Floor, Albany, NY 12209.

In this study 388 amphibians in Oswego County, New York were tested for ranavirus infection. Ranavirus is known to cause die-offs in amphibians, particularly in North America, and little is known about ecological factors affecting viral transmission. Tissue samples were collected and tested for the presence of ranavirus major capsid protein DNA using PCR amplification. We found a stable prevalence of infection between 22-26% over the course of three years. Ranavirus infection was higher during the summer months, particularly in August, but no significant difference was found in prevalence between species. Furthermore, females and prolonged breeders were more likely to be infected than males and explosive breeders respectively, potentially suggesting a sexually transmitted mechanism of infection. Amphibians found in aquatic habitats also had an increased probability of ranavirus infection compared to those captured terrestrially likely due to the ability of ranavirus to remain viable in aquatic environments for prolonged periods. The stable low prevalence of ranavirus in central New York may be caused by coevolution between the virus and its host amphibians such that the virus no longer causes die-offs in the population.

FORMULATION OF INSULIN FOR ORAL DOSING. J. Catalano[1], J. F. McArthur[2], J. Hughes[1], J.Schentag[2], L. M. Mielnicki[1], M. P. McCourt[1]. [1]Niagara University Department of Chemistry, Biochemistry and Physics - Niagara University, NY 14109, [2]State University of New York at Buffalo, Department of Pharmacy and Pharmaceutical Sciences, Buffalo, NY 14214.

Diabetes is a chronic condition that causes high blood sugar levels that are potentially fatal if left unmanaged. Type 1 diabetes requires treatment with daily insulin hormone injections, while Type 2 diabetes usually requires treatment with insulin as the disease progresses. Injection of insulin is therefore the primary treatment against this disease. Unfortunately a daily intramuscular injection regimen can be painful and tedious while daily subcutaneous injection, manually or via a pump, is a less efficient delivery mode. Orally available insulin would be a positive development in the treatment of diabetes. However orally dosed insulin has not been

developed yet due to insulin's inabilities to survive both the acidic environment of the stomach, as well as be absorbed through the intestinal membrane. Work from this laboratory describes the development of a neutral lipid based vesicle (the Cholestosome™), that uses naturally occurring lipids, for delivery of problematic therapeutics. In this formulation, insulin dose is limited by solubility in the aqueous buffer prior to encapsulation. The present study was undertaken to develop higher dose insulin formulations for Cholestosome™ encapsulation by examination of parameters affecting solubility of insulin. Parameters of pH and ionic strength were systematically tested for effects on encapsulation efficiency in order to optimize insulin dose. Formulations were encapsulated and characterized for size, insulin and lipid content.

THREE MINUTES IN SPACE: MUON DETECTION REACHING THE FRINGES OF EARTH'S ATMOSPHERE. Christopher Demas, Jeff Rizza, Peter Spacher, and Ileana Dumitriu. Hobart and William Smith Colleges, Department of Physics, 300 Pulteney Street, Geneva, NY 14456.

RockSat-C is a NASA program that enabled HWS students to design and build a sounding rocket payload. On June 17th, the HWS team traveled to NASA Wallops Flight Facility base, in Wallops VA, to test and integrate the payload consisting of two muon detectors and a spectrometer into the Orion sounding rocket. The rocket was launched on June 25th, 2015 and recorded visible light spectra and muon flux as it passed through Earth's atmosphere (~72 miles). Muons are generated by cosmic radiation, which originate outside of our solar system, when the high-energy photons and atomic nuclei come in contact with the atmosphere. Muons are negatively charged particles, 200 times heavier than an electron. Our research investigated the flux of muons at various layers in the atmosphere using two detectors: a solid-state scintillator detector and a Geiger-Müller detector. Our research strived to determine the baseline of muon flux in the upper atmosphere and determine if a muon flux exists in space, an area of interest that had yet to be investigated until this project. The instrument successfully collected data throughout the rocket's ascent and descent. Due to the high speed of the rocket and the limited time spent in each layer of the atmosphere, it was difficult to get an accurate muon flux baseline at all altitudes. However, the data collected from both detectors indicate that there is a difference in muon flux throughout the atmosphere and in space.

CURCUMIN AND CURCUMIN DERIVATIVE BIOAVAILABILITY ENCHANCEMENT AND CHOLESTOSOME™ ENCAPSULATION. Jasmine Hinaman[1], Fraser McArthur[2], Julie Hughes[1], J. Schentag[2], F.H. Sarkar[3], L. M. Mielnicki[1], and M. P. McCourt[1]. [1]Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109. [2]Department of Pharmacy and Pharmaceutical Sciences, State University of NY at Buffalo, Buffalo NY 14214. [3]Department of Pathology, Barbara Ann Karmanos Cancer Institute, Wayne State University, School of Medicine, 740 HWCRC, MI, 48201.

Curcumin is a lipophilic polyphenol derivative of turmeric, isolated from the plant Curcuma Longa. This phytochemical has become of particular interest to researchers due to its anti-inflammatory, antioxidant, anticancer, and anti-infectious effects on the body. Due to its multiple mechanisms of action, it has been touted as a potential treatment for many disorders, from inflammation to cancer. The major problems with this molecule however are its poor aqueous solubility, rapid degradation, and minimal absorption; all of which contribute to its poor

bioavailability. Curcumin is practically insoluble in aqueous solution at physiological pH. Enhancing the solubility could potentially increase this molecule's bioavailability. In the present study, the solubility of both Curcumin and Curcumin Difluoride (CDF) was increased at elevated pH in 1xPBS. Curcumin and CDF solutions were prepared at pH 12.5 and encapsulated in neutral lipid vesicles called Cholestosomes$^{TM.}$ The effects of Cholestosomes^{TM} encapsulated pH 12.5 Curcumin and CDF were compared to conventionally (DMSO) solubilized compounds using normal immortalized 184B5 breast epithelial cells and MCF7 breast epithelial cancer cells.

QUANTIFICATION AND ASSESSMENT OF THE CHEMICAL TRANSITION STATES AND ECOTOXICITY OF CRUMB RUBBER IN ECOSYSTEMS. Andrew W. Layman[1], Jeffrey L. Mills[1], and Sandra J. Connelly[2]. [1]School of Chemistry and Materials Science, 85 Lomb Memorial Drive, Rochester Institute of Technology, Rochester, NY 14623. [2]TH Gosnell School of Life Sciences, 85 Lomb Memorial Drive, Rochester Institute of Technology, Rochester, NY 14623.

High school, college, and professional sports teams are replacing their traditional grass fields with artificial turf fields as a way to reduce the amount of water that is used as well as reducing the overall maintenance cost. However, as the number of artificial fields grows so does public concern for the safety of field users. Generally referenced public health concerns regarding the artificial turf fields range from dermal contact, inhalation of infill particles, and exposure to unknown chemical agents by accidental ingestion to an increased potential for bacterial infections. Studies of these artificial fields have reported that there are no short- or long-term human health effects that can be directly linked to the artificial turf. While these reports have alleviated some of the public concerns, very few studies have investigated the impact that these fields have on the surrounding terrestrial and aquatic ecosystems, and only a handful have considered the increasingly popular "crumb rubber" based fields, made primarily from recycled vehicle tires. Our goal was to identify and quantify the unknown chemicals that may be breaking down and leeching out of the crumb rubber base of artificial turf fields and into the surrounding environment using liquid chromatography-mass spectroscopy (LC-MS) and gas chromatography (GC). Chemicals identified to date will be reported. Future studies will test the ecotoxicological effects of the identified chemicals on the fitness (survival and reproduction) of the common freshwater macroinvertebrate, *Daphnia* spp., and will be expanded to include environmental monitoring of the surrounding ecosystems, as well as the potential bioaccumulation of the identified chemicals in freshwater vertebrate species.

THE USE OF THE FRET EFFECT FOR ENHANCED PHOTOACOUSTIC IMAGING. Ryan Le Tourneau. RIT College of Science, 85 Lomb Memorial Drive, Rochester, NY 14623.

In imaging studies for the detection of cancer, it has been found that externally administered near infrared fluorescent (NIRF) dyes increase the sensitivity of photoacoustic imaging (PAI). However, most of the energy of absorption is lost as fluorescence. Energy lost as fluorescence is energy wasted. It is our hypothesis that by using Forster Resonance Energy Transfer (FRET) a second NIRF dye can be used to absorb the fluorescence of the first NIRF dye and quench the emission of light, and thereby increase the emission of sound as the only means of releasing the energy absorbed. Our proposal is to design a FRET system involving a quencher dye and a fluorescent dye. But to start that process the distance between the two dyes needs to be

optimized to obtain the best FRET effect. In order to find the best distance we propose to use two dyes known to produce a fluorescent FRET effect. We will use a reported polyproline approach, or "spectroscopic ruler", to vary and optimize distance between the dyes. This polyproline will be and be incorporated to our peptide scaffold methodology and the results of fluorescence spectroscopy will be correlated to the distance that we will calculate using molecular modeling.

COMMUNITY INTERACTIONS AND NUTRIENT AVAILABILITY IN CREATED EMERGENT FRESHWATER WETALNDS. Kim Lodge, Christy Tyler, and Nathan Eddingsaas.189 Milburn St. Apt. # 15 Rochester, NY 14607. Thomas H. Gosnell School of Life Sciences Rochester Institute of Technology 85 Lomb Memorial Drive Rochester, NY 14623. School of Chemistry and Material Science Rochester Institute of Technology 85 Lomb Memorial Drive Rochester, NY 14623.

Wetland restoration and creation efforts have become increasingly common to replace critical services lost as a result of natural wetland destruction. However biological communities and biogeochemical cycling in created wetlands often differ from natural wetlands. This shortcoming may be due in part to a lack of understanding of the interactions between biotic and abiotic factors, such as herbivory and nutrient availability, in determining the trajectory of ecosystem development in created wetlands. Our ability to replicate natural ecosystem functions and services is thereby limited. The goal of this research is to evaluate the impact of excluding large herbivores (waterfowl, muskrats, deer) on plant community structure and nutrient availability in two created wetlands in Perinton, NY with differing nutrient availability and flooding regimes. Both sites were formerly used for agriculture, but while the low nutrient site was most recently an old-field successional site and is permanently flooded, the high nutrient site was used for many years for livestock grazing and is not consistently flooded through the summer months. Preliminary results suggest that grazing pressure was highest in the spring, leading to significant decreases in plant cover and species richness in the low nutrient wetland, but not the high nutrient wetland. After one year of herbivore exclusion, denitrification rates, soil organic matter content, and ammonium concentrations were not significantly affected by herbivore exclusion at either site, but there were significant differences in all biogeochemical factors between the low and high nutrient sites. Differences in site history and hydrology likely contributed to the differences in grazing pressure and nutrient availability between the two wetlands. Therefore, practices concerning created wetland management are highly site specific and should be evaluated based on the unique properties of the individual restoration sites.

TUNING CHEMICAL SELECTIVITY TOWARD AN INEXPENSIVE SYNTHESIS OF AURANTIOCLAVINE. Zachary Mariani, Danny Belmona, Alexander Kovacs, and Luis Sanchez. Department of Biochemistry, Chemistry, and Physics, Niagara University, PO Box 2032, Niagara University, NY 14109.

Aurantioclavine is a natural product isolated from *Penicillium aurantiovirens* that gained the interest of the synthetic community for its proposed role in the biosynthesis of the complex polycylic alkaloids of the communesin family. Members of this family display notable bioactivities, including insecticidal properties and cytotoxicity toward leukemia cell lines. Our interest in this important compound lies in its structural resemblance to tryptamine, a derivative of the amino acid tryptophan. Since tryptamine is readily available and hundreds of times less

expensive than the starting materials used in the reported total syntheses of aurantioclavine, we aim at developing a rational reaction sequence to progressively transform tryptamine and access aurantioclavine synthetically. This approach, nevertheless, is bound to involve a series of "unfavored" chemical transformations. We expect to tune the chemical selectivity of these reactions via the functionalization of the indole ring and pendant chain of tryptamine—altering the geometry and electronics of the functionalities involved. Our progress in this endeavor will be presented.

COPOLYESTERS BASED ON LIGNIN DERIVATIVES. Joseph M. Marsico and Massoud J. Miri. School of Chemistry and Material Science, Rochester Institute of Technology, Rochester, NY 14623.

Aliphatic-aromatic copolyesters were synthesized by step growth polymerization of hydroquinone, benzoic acid, dodecanedioiic acid and the lignin derivatives vanillic acid and syringic acid as comonomers. Varying ratios of the comonomers were used to look at physical property changes. By FTIR and H NMR spectroscopy it could be verified that the composition of the copolymers resembled the comonomer composition in the reaction. The melting temperature, T_m, and glass transition temperature, T_g, were measured using Differential Scanning Calorimetry (DSC). It was found that the polymers remained semi-crystalline with an increasing content of the lignin derivatives in the starting materials. With increasing concentration of lignin derivative the melting temperature was found to decrease while the glass transition temperature appeared to increase. Thermal Gravimetric Analysis (TGA) was applied to determine the purity and stability of the polymers. Initial results on the determination of the molecular weight properties of the polymers by Gel Permeation Chromatography (GPC) also will be presented.

PRELIMINARY ASSESSMENT OF INVASIVE SPECIES MANAGEMENT EFFORTS AT LAGOON PARK, CANANDAIGUA, NY. Lauren Miller and Maura E. Sullivan. Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

Lagoon Park, owned by the City of Canandaigua, was formerly part of a significant wetland complex that served as a transitional area between Canandaigua Lake and the natural outlet of the lake. In the 1950s, the area was dredged for fill material for the routes 5 & 20 road project. After over 70 years of a landscape dominated by humans, the Lagoon Park area was devoid of most native vegetation, allowing invasive species to become dominant. The most abundant invasive species is European buckthorn but the site is also host to glossy buckthorn, Asian honeysuckle, autumn olive, and multi-flora rose. Restoration efforts on the site have been focused on transforming Lagoon Park from an area dominated by invasive species into a high quality habitat. Two types of management have been used; on the central island within the lagoon the invasives were cut and remaining stumps were treated with herbicide (Zone 2). In other areas of the park, this cut stump herbicide treatment was complimented with the installation of native woody plants (Zone 1, 3, 4). The goal of this study is to monitor the success of these restoration efforts in reducing invasive species coverage, increasing the abundance of native plants, and increasing plant diversity. A stratified random sampling design was used to quantitatively describe the tree, shrub and herbaceous vegetation in each of these different restoration zones. Sampling began in August 2015 and preliminary results suggest that treatment with the re-vegetation is a more effective management strategy.

CAN NATIVE SHRUBS LIMIT INVASIVE PLANT COLONIZATION DURING FORESTED WETLAND RESTORATION? Kaitlyn Moranz and Christy Tyler. Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Creation of new wetlands in order to compensate for natural wetland destruction has become a common practice in recent decades. Often, however, created wetlands don't meet desired standards of ecosystem function, in part due to rapid colonization by invasive plants. Although limiting colonization of wetlands by invasive plants is a priority for restoration and wetland science, we currently lack an effective strategy to limit invasive plant colonization. This is particularly true in created forested wetlands that are vulnerable to herbaceous invasive plant colonization during establishment of mature trees. This study evaluates planting native shrubs as a method to limit undesirable herbaceous plant colonization during the early stages of forested wetland creation. Experiments were conducted in two created wetlands at the High Acres Nature Area in Perinton, NY, owned and operated by Waste Management of New York, LLC. In 2009 a forested wetland was created and planted with native trees and native herbaceous understory plants. However, the site rapidly filled in with invasive species, particularly *Phalaris arundinacea* (reed canarygrass). In 2012 three native shrub species, *Cephalanthus occidentalis*, *Cornus amomum*, and *Salix sericea* (Buttonbush, Silky Dogwood, and Silky Willow), were planted as live stakes in 150 plots in fully factorial experimental design crossing all possible single species and two-species combinations (5 live stakes per plot) with distances from a creek (0, 2, 5, 10 m) to examine shrub survivorship with respect to local hydrology and the impact on cover of invasive and native herbaceous plants. o Shrub success was evaluated by an index of overall health, leaf counts and survivorship over a three year period. The impact on herbaceous plants was evaluated through comparison with paired plots without shrubs. Our results indicate that shrubs have a positive impact on native species cover. To elucidate the mechanism whereby shrubs decrease invasive plant cover, we conducted a greenhouse experiment with shrubs and *P. arundinacea.* These results suggest that shrubs decrease soil pH, which may contribute to the negative impact of shrubs on growth of neighboring *P. arundinacea*. This study provides important information regarding future restoration successes without creating additional disturbances, demonstrating limits to invasive plants in regards to light, space, and pH when in competition with native shrubs.

BEHAVIORAL CORRELATES OF BRAIN REGENERATION IN SALAMANDERS. Hope Nicyper-Meryman, #523 Hartwick College, 1 Hartwick Drive, Oneonta, NY 13820 and Stanley K. Sessions, Hartwick College Science Dept., 1 Hartwick Drive, Oneonta, NY 13820.

This project interests me since I want to understand how behavior in animals works and how their behavior is affected by structural changes in the brain. Salamanders appear to be an ideal test subject for this question since they have the ability to regenerate many organs such as the heart, limbs, and brain (Araki, 2007). This could help lead to better human care after a brain injury or any other harm to an organ, tissue, or bone (Seifert et.al 2012). Previous research showed that the olfactory lobe does regenerate in Eastern newts (Mataev and Sessions, 2010). Removal of the right olfactory lobe triggers cell proliferation in the adult ependymal layer that thus serves as a regenerative neuro-epithelium and source of new neuronal cells (Maden et.al,

2013). This research did not, however, address the problem of behavioral correlates of olfactory lobe regeneration. The important question that I want to look into is how the animal's behavior is affected by damage and subsequent regenerative repair of specific parts of the brain (Davis et.al, 1990). In this study I will examine the ability of salamanders (Eastern Newts, *Notophthalmus viridescens*) to regenerate the olfactory lobe, focusing on the behavioral correlates of this regeneration. Studies focusing on the genetics have been done (Hayashi et. al. 2013)(Monaghan et. al. 2007), though little is known about the behavioral effect regeneration might have. These are not the only animal that can regenerate parts of its body. Another interesting organism is the Zebrafish (Gemberling et. al, 2012) which can also regenerate (Lenkowski et. al, 2014). The olfactory lobe is used by salamanders to find and identify food items involving a characteristic sequence of steps: 1) visually notice the food, 2) move towards the food, 3) smell the food, 4) examine the food, 5) touch the food, and finally 6) grab the food with its mouth using gape and suck feeding (Marvin and Lewis 2013). In this project I will remove the right olfactory lobe and monitor the newt's behavior as it regenerates the missing lobe. If this sequence is disturbed and the animal is unable to find the food, we will gain information about how the olfactory lobes in Salamanders work and how regeneration affects correlated behavior.

POPULATION TRENDS OF THE RARE BOG BUCKMOTH (*HEMILEUCA* SP1). IN A FEN BEING COLONIZED BY INVASIVE *TYPHA* (CATTAIL). Faith Page, Sandra Bonanno, and C. Eric Hellquist. Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

Silver Lake peatland is notable for harboring one of the few populations of the New York State endangered bog buckmoth (*Hemileuca* sp1). Over the past 17 years, the bog buckmoth flight counts during peak flight time (mid-Sep) have fluctuated from nearly 170 moths/5 minutes to less than 10 moths/5 minutes. Peak flight counts from 2014 and 2015 were the third and fourth highest respectfully since 1998. The bog buckmoth relies almost exclusively on *Menyanthes trifoliata* (bog buckbean) as its larval food source. The increased abundance of *Typha* (cattail) on the peatland mat has the potential to eliminate *Menyanthes* and therefore jeopardizes the long-term viability of the Silver Lake bog buckmoth population. We established research plots in 2012 that were expanded in 2014 to quantify *Typha* encroachment on the peatland mat to determine if detrimental consequences of *Typha* colonization were apparent. *Typha* stem counts increased between 2012 and 2014. Following the removal via cutting of *Typha* in 2014, we predicted stem counts and biomass to be lower in 2015. Preliminary 2015 data suggests that *Typha* regrowth is six times lower in the removal plots than in the untreated plots ($p = 0.0004$). Based on our preliminary data from 2015 and the spatial trend of the *Typha* invasion at Silver Lake, *Typha* litter has not yet reached a level likely to decrease plant species richness. However, in the absence of adequate *Typha* control, we expect *Typha* to continue to increase, possibly altering plant community composition and critical habitat for the bog buckmoth.

OSTEOLOGICAL EVIDENCE FOR THE BIOMECHANICAL FUNCTION OF THE DROMAEOSAURID WING. William Parsons and Kristen Parsons. Buffalo Museum of Science, PO Box 520 East Aurora, NY 14052.

Traditionally, the only convincing and acceptable fossil proof of avian flight has been the presence of aerodynamic feathers. Here we present osteological characters that when examined

as an interrelated set can make a convincing case for avian flight in dromaeosaurids, even when feathers have not been preserved. The dromaeosaurid humerus could not rotate like that of extant avians. The glenohumeral ligament fossa in the dorsal edge of the scapular glenoid on *Deinonychus antirrhopus* indicates the orientation of the head of the humerus faced directly into the glenoid and at 90 degrees to the long axis of the body. This would orient the "cranial" articulating surface of the distal end of the humerus in a craniomedial direction such that the forelimb could fold in a similar direction and also, allow the forelimb to be freely raised and lowered in a vertical flapping arc. The power of this flapping was enhanced by muscles inserted on the broad flat surface of the dromaeosaurid coracoid. Two differences between the dromaeosaurid humerus and that of an enantiornithine are the straightening of the shaft and the differentiation of the sulci for the tendons of the m. humerotricipitis and m. scapulotricipitis in the enantiornithine. In the American white pelican (*Pelecanus erythrorhynchos*), these deep sulci are evidence that these muscles contribute to raising and lowering the forward airfoil edge of the wing, which is necessary to maintain stationary wing positions in gliding and/or soaring. The lack of these sulci on the dromaeosaurid humerus indicate either that dromaeosaurids were poor gliders or that control of the forward edge of the airfoil of dromaeosaurid wings was a function of the manus. The robust feathering on the first manual digit on *Microraptor gui* may have possessed an aileron-type function in the control of the edge of the dromaeosaurid airfoil which was created in part by its exceptionally long, primary, pennaceous feathers. The proximal articulating morphology of the dromaeosaurid first metacarpal, the semi-lunate carpal that allowed for a 190° rotation of the wrist, the wide dorsoventral rotational capacity of distal ends of the metacarpals, and a broad lateral extension of the first manual digit, all would have enhanced a sinusoidal flapping wing movement in the manual region of the forelimb of some dromaeosaurids. The presence of robust manual digits would have enhanced dromaeosaurid wrist rotation by increasing the centrifugal inertia within the lateral rotation of the manus. This same weight would have detracted from the efficiency of any shoulder-based rotation. The loss of manual digits, the last major evolutionary dromaeosaurid/avian morphological modification, would have correlated with the development of avian humeral rotation and increased the efficiency of shoulder-based rotation. All of these functions would have been greatly enhanced by the comparatively enlarged forelimbs found in juvenile specimens of some taxa in Dromaeosauridae. Although the body mass/weight of many of the larger adult dromaeosaurids would have inhibited flight, juveniles of some of those taxa could have been flight capable. The origin of avian flight may have begun through the neotenic retention of the morphology and behavior found within the early growth stage members of some taxa within Dromaeosauridae.

MEASURING THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF CO OXIDIZATION REACTIONS OVER PLATINUM NANOPARTICLES WITH A STRONTIUM TITANATE SUPPORT. Zachary Protich. Rochester Institute of Technology, 74 Lomb Memorial Drive, Rochester, NY 14623.

XPS, XRD, and AFM have been used to characterize the interaction of deposited platinum nanocrystals on $SrTiO_3$ prepared by annealing in O_2 under high temperatures. Introduction of CO gas to these substrates ensue catalytic reactions between the CO and the platinum catalyst altering the morphology of the platinum nanocrystals and the chemical composition of the substrate $SrTiO_3$. The etched surface without gas insertion displays a hexagonal orientation of the platinum nanocrystals and a new chemical formation of SrO_3, the titanium is observed as a

side product. The binding energies and the band gap distances of the O(1s), Ti(2p), and Sr(3d) orbital levels are shown to effect the aggregation and orientation behavior of the Pt(4f) nanocrystals. Substrates prepared with different chemical concentrations of Sr, Ti, and O elements will experience unique electron charge donation and conductivity resulting in unique monolayer orientations. These metal/oxide interactions can prove merit in form supportive semiconductor materials that retain and utilize energy effectively.

MODULAR SYNTHESIS OF TARGETED DUAL MODAL PET-MRI IMAGING AGENTS. Michael Regan, 189 Countess Drive., West Henrietta NY, 14586. Anne-Marie Sweeney-Jones, Department of Chemistry, University of Georgia, 140 Cedar Street, Athens, GA 30602-2556. Chelsea Weidman, Department of Chemistry, Merkert Center, Boston College, 2609 Beacon Street, Chestnut Hill, MA 02467-3860.

A versatile and practical method is for the synthesis of peptide based imaging agents for dual modal Positron Emission Tomography and Magnetic Resonance Imaging (PET-MRI) is described. A labile lanthanide metal, lanthanum (La), is introduced early in the synthesis as both a "placeholder" and a protecting group for 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid (DOTA). The lysine with the preformed metal-chelate complex on the side chain is then carried through a standard peptide synthesis, including deprotection of Fmoc and coupled to the next modular component, a similar lysine with Gd-DOTA. This imaging dipeptide is conjugated to a linker, SMCC which is then conjugated to a targeting peptide. The labile placeholder lanthanide enables transmetallation under mildly acidic conditions, of the placeholder La by a radioactive metal such as copper (Cu) (for PET) while leaving the more stable Gd chelate intact (for MRI).

SOUNDING ROCKET MEDIATED ATOMOSHPERIC SPECTRAL ANALYSIS. Jeff Rizza, Christopher Demas, Peter Spacher, and Ileana Dumitriu. Hobart and William Smith Colleges, Department of Physics, 300 Pulteney Street, Geneva, New York 14456.

The Earth's atmosphere is composed of 4 distinct layers, each with a unique chemical composition and exposure to solar radiation. Spectroscopy is a commonly used method of chemical analysis. Sounding rockets offer a continuous mode of transport through the entirety of Earth's atmosphere. Spectral analysis of Earth's atmosphere has been commonly carried out via high altitude balloon launches, but the ability to collect accurate spectral data via a high speed method of transport is largely unknown. A spectral imaging apparatus, consisting primarily of a spectrometer and Arduino microcomputer, was used to collect light intensity data during the flight of a NASA Terrior-Orion sounding rocket. This data was used to generate spectral images of the Earth's atmosphere at various altitudes. Analysis is currently under way to determine the accuracy of the spectral data and its ability to provide information on rocket dynamics.

X-RAY PHOTOELECTRON SPECTROSCOPY FROM NANO PARTICLE PLATINUM CATALYSIS ON $SRTIO_3$ SINGLE CRYSTAL SUBSTANCES. Ariana Sabzeghabae and Michael Pierce. Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The properties of semiconducting materials, such as $SrTiO_3$, are of considerable interest for producing sustainable energy in photo electrolysis process. One particularly promising way to modify the chemical properties of the system is with the deposition of Platinum nano crystals. In order to study the effects of temperature and gas exposure, X-ray photoelectron spectroscopy (XPS) was used to measure both original and processed samples of Pt on $SrTiO_3$ substrates. XPS is a highly surface sensitive technique. In an ultra-high vacuum (UHV) chamber, x-rays interact with the electrons of the atoms, often ejecting electrons with unique energies set by the chemical composition of the constituent atoms. The stoichiometry and oxidation states of the material were also determined for the samples and in some cases measured as a function of depth. Precise chemical composition leads to better understanding of the catalytic properties of these samples. This could have a significant effect on catalysis properties of these interesting materials.

THEORETICAL AND NUMERICAL ANALYSIS OF A QUANTUM OPTICAL NONLINEAR SIGN-SHIFT GATE. Ryan Scott, 312 S. Goodman st, Rochester NY, 14623. Edwin E. Hach, III, Rochester Institute of Technology, School of Physics and Astronomy, 85 Lomb Memorial Drive, Rochester, NY 14623.

Some of the many challenges surrounding quantum computation today are the ability to create a powerful and scalable computational component and to apply engineering techniques to micro- and nano-scale quantum systems for the purpose of quantum computing. This work focuses on the analysis of a possible quantum system using only linear optical elements and projective measurements. Specifically, the system we consider uses only waveguides directionally-coupled to ring resonators. This talk will focus on the basic quantum optical transport properties of the ring-resonator and its applicability to the nonlinear sign-shift gate, a key element in a leading proposal for universal linear optical quantum computing, the well-known Knill-Laflamme-Milburn (KLM) protocol. In particular, we analyze here the necessary parameters and their constraints needed to make such a device usable.

STUDIES TOWARD THE TOTAL SYNTHESIS OF APLYDACTONE: A MODEL STUDY. Andrew Streit, Austin Kelly, Katherine Valentine, and Christina Goudreau Collison. Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Aplydactone is a sesquiterpene natural product isolated from the sea hare Aplysia dactylomela that is found on the northern coast of Madagascar. Interest in synthesizing aplydactone is driven by its extremely novel and conformationally strained tetracyclic framework. Aplydactone's ring system has bond angles more acute than ever before seen for cyclobutane. Additionally, the carbon-carbon bonds in aplydactone's cyclobutane rings are reported to be longer than average carbon-carbon bonds. As such, the development and execution of a model study leading to the synthesis of this natural product will provide great insight into the compound's biomimetic pathway as well as strategies for the synthesis of similar structures.

BEARS, BEEPS AND BIRTHDAY CARDS: CALCULATING CUB AGES IN WESTERN NEW YORK. John Van Niel and Sasha MacKenzie. Environmental Conservation Department, Finger Lakes Community College, 3325 Marvin Sands Drive Canandaigua, NY 14424.

Responding to a request from the New York State Department of Environmental Conservation (NYS DEC), staff and students from Finger Lakes Community College (FLCC) have estimated

the ages of over 40 black bear cubs since 2010 in order to determine typical parturition dates. We use a mixed regression model published by Bridges, Olfenbuttel and Vaughan (2002) from their work in Virginia.

Each season the NYS DEC locates dens of bears that have been fitted with radio telemetry collars. These dens are visited by a joint team where FLCC staff and students are responsible for collecting cub data including sex, weight and the measurements necessary to estimate their ages. Parturition dates are then back calculated from the date data was taken. According to our results, the majority of black bears in Western New York are born in January.

EXOTIC PLANT SPECIES DOMINATE SUBURBAN GARDENS. Scott Ward and Kathryn Amatangelo. The College at Brockport, SUNY, 350 New Campus Drive, Brockport, NY 14420.

Invasive species are one of the most significant threats to plant communities and ecosystem functions worldwide. Landscaping is an important source of exotic plant species, some of which may become invasive in natural ecosystems. Most often, invasive plant species that cause significant threats to communities and ecosystems can be traced back to horticultural origins. For years now, botanical gardens, plant nurseries and landscaping companies have utilized certain exotic species that can spread and reproduce in neighboring ecosystems. Currently, it is unknown to what extent exotic species are preferred over native species in modern landscaping practices. We sought to answer this question by taking an inventory of all planted species within 104 randomly chosen house gardens in suburbs in the greater Rochester area. On average, 75% of the species per property were exotic or not native to the eastern US. In addition, we determined that plants shown to be invasive in the northeast are often intentionally planted in gardens as well, such as Japanese barberry (*Berberis thunbergii*) which was found at 48% of the properties. We also sought to ascertain if preference for exotic species could be correlated with the age, size, or cost of the property. Results showed that although these three predictor variables helped to determine the total number of species per property, they were poor indicators of whether those species were native or exotic. Overall, landscape trends across property types favor exotic garden plants, many with unknown potential for future spread into natural areas.

CAPABILITIES OF TGA TO DETECT ENZYME ACTIVTITY ON EXTRACTED AND UNEXTRACTED LIGNOCELLULOSE. Courtney Whitney and Robyn E. Goacher. Niagara University, NY 14109.

The need for renewable resources is growing in our modern world. Cellulosic ethanol is a second generation biofuel formed from the inedible components of plants (lignocellulose). Plant matter may be broken down by chemical means or through a potentially more environmentally friendly method of degradation: enzymatic degradation. In order to detect this enzymatic degradation, an efficient instrumental method must be discovered. Thermogravimetric Analysis (TGA) has proven to be useful in the analysis of lignocellulosic degradation. TGA is a solid-sampling instrument that can be used to detect the enzymatic degradation of wood. In this study, the small organic molecules (extractives) were removed from some wood samples, and left in others. Extractives inhibit enzyme degradation because they act as the plants natural barrier to environmental threats. The extractives were removed in order to monitor the change in the rate of degradation between extracted and unextracted wood. The first derivatives of the thermograms were analyzed using curve fitting. Our preliminary results showed that unextracted lignocellulose

thermally degrades at a higher temperature. A more extensive comparison of the unextracted versus the extracted lignocellulose samples will also be discussed.

DOES ORGANIC CARBON AMENDMENT ALTER PLANT COMMUNITY COMPOSITION IN CREATED WETLANDS. Taylor Williams, Christy Tyler, and Kimberly Lodge. Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Creation of freshwater wetlands results in disturbed ecosystems that are inherently susceptible to invasion by non-native plants. In these young ecosystems, native emergent plants may not successfully compete with invasive plant species that are more rapid colonizers capable of taking advantage of disturbed systems that in some cases are also higher in nutrients. Management of invasive plants in wetlands typically involves costly chemical and mechanical control measures, necessitating development of cost-effective and less environmentally damaging management practices to control invasive plants and ensure successful outcomes of restoration efforts. The addition of carbon to wetland soil has been previously shown to decrease nitrogen availability by promoting microbial processes that immobilize nitrogen. We hypothesized that by decreasing nitrogen availability through addition of organic matter, that we would increase the competitive ability of native species that are better adapted to low nutrient environments. To test this prediction, carbon, in the form of leaf litter compost, was added to two created emergent freshwater wetlands in Perinton, NY that differ in nutrient availability. Compost was applied in large (2 x 30 m) transects and the vegetation community composition and soil characteristics monitored throughout the growing season. Our preliminary results suggest that although total invasive plant cover was not decreased after the first field season, there were observed species specific effects. Notably, cover of the pernicious invader *Phalaris arundinacea* (reed canary grass) was reduced in plots with organic matter addition. Our results to date suggest that organic carbon addition may hold promise for reduction of invasive plant colonization in created wetlands.

SAMPLING INTENSITY AND UNCERTAINTY IN LEAF LITTERFALL MASS AND NUTRIENT FLUX IN NORTHERN HARDWOODS. Yang Yang; Ruth Yanai, Craig See, and Mary Arthur. SUNY ESF, 10 Marshall Hall, 1 Forestry Drive, Syracuse, New York 13210.

Designs for litterfall monitoring can be improved by quantifying uncertainty in litterfall mass and nutrient concentration. We compared the coefficient of variation of litterfall mass and chemistry (N, P, Ca, Mg and K) at different spatial scales and across seven years for six northern hardwood species from 23 stands in the White Mountains of New Hampshire. Stands with steeper slopes (p= 0.01), higher elevations (p = 0.05) and more westerly aspect (p = 0.002) had higher interannual variation in litter mass. The spatial variation of nutrient concentrations varied more across stands than within stands for all elements ($p < 0.001$). Phosphorus was the most spatially variable of all nutrients across stands ($p < 0.001$). Litter chemistry varied less from year to year than litter mass, and Ca had the smallest interannual variability. We compared the relative importance of these sources of variation to estimates of nutrient flux by simulating different sampling schemes of one while holding the other constant. In this data set, interannual variability of leaf litter mass contributes more to uncertainty in litterfall flux calculations than interannual variation in nutrient concentrations. Optimal sampling schemes will depend on the elements of interest and local factors affecting spatial and temporal variability.

Poster Presentation Abstracts (alphabetical by first author)

DEVELOPMENT OF INQUIRY-BASED LAB ACTIVITIES WITH PATHOGENS OF WISCONSIN FAST PLANTS. Madeleine R. Adolf, Maryann A.B. Herman, Department of Biology, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Wisconsin Fast Plants® (WFP) are a rapid-cycling species of *Brassica rapa* and members of the Brassicaceae family. Fast Plants serve as an important research tool for improving disease resistance and are an ideal model organism to utilize in science teaching and learning. Two disease systems known to impact New York growers were investigated. Black rot disease is caused by *Xanthomonas campestris* pv. *campestris* (*Xcc*), a bacterial pathogen that is generally considered the most significant disease of brassica crops. The pathogen can spread through infested seeds and transplants or plant-to-plant from insect wounds or water droplets. As completely pathogen-free planting material can be hard to obtain, hot water treatment of seeds can help. This will greatly reduce, but not always eliminate, bacteria in or on the seeds, and it may reduce seed viability and seedling vigor. *Sclerotinia sclerotiorum* is a fungus that causes white mold disease of hundreds of plant species, including WFP. White mold is a soil-borne disease that can develop into a serious and persistent problem when it becomes established in a field. Strains of *Coniothyrium minitans* can be used as a parasitic bio-fungicide against *S. sclerotiorum.* Objectives for this research included: establishment of methodology for creating disease in the laboratory setting on WFP using black rot and white mold, development of a lab activity investigating seed transmission and control of black rot disease, development of a lab activity exploring the use of biological controls of white mold.

SPENT COFFEE GROUNDS AS A VIABLE FEEDSTOCK FOR BIOFUELS PRODUCTION. Saddam Alrobaie[1], Kim Callahan[1],Fatima Zara[1], and Dr. Jeff Lodge[1], [1]Thomas Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

The potential for using spent coffee grounds (SCG) as a viable feedstock for biofuels production is being investigated. Oil from SCGs was extracted using hexane and analyzed for lipid content using thin layer chromatography. The extracted oil contained a large fraction of triacylglycerides (TAG), a small portion of free fatty acids, and some diacylglycerides (DAG). TAGs are the best for producing biodiesel using the transesterification reaction with methanol/NaOH. Oil extracted SCGs were dried and further extracted with 2% sulfuric acid to remove the carbohydrates from the grounds. The extracted carbohydrates consisted mainly of mannose, galactose, glucose, and a small amount of xylose. The total sugar content ranged from 45-70 g/L of which 80% was reducing sugars. This extract was then used as a media for yeast fermentations to produce ethanol. Saccharomyces cerevisiae and Kluveromyces marxanus were used in the fermentation of SCG carbohydrates with both organisms producing ethanol with Kluveromyces producing the most with no other additions to the carbohydrate media. Preliminary results show that spent coffee grounds may be a viable feedstock for biofuels production.

EVOLUTION OF THE NEO-Y CHROMOSOME IN MALE *CAENORHABDITIS ELEGANS.* Karen Alvarado, Department of Biological Sciences, Shineman Center, 30 Centennial Drive, Oswego NY 13126.

Organisms carry different sex chromosomes between the males and females, such as humans; males carry XY chromosomes while females carry XX chromosomes. Studying sex chromosomes is important because they have sex-specific functions and different genes. There are also several sex-linked diseases that affect the males more often than females and vice-versa. Understanding the effects of sex-specific traits caused by certain chromosomes will help discover new information about the evolution of human sex chromosomes. It has been predicted that the new Y chromosomes evolve because of natural selection favoring alleles that increase male fitness. In this experiment, we tested this hypothesis using experimental evolution of *Caenorhabditis elegans* populations with males that carry an artificial neo-Y chromosome. *C. elegans* are microscopic worms and have been used as model organism in the field of genetics. This experiment was done by using worms that have been grown in the lab for over 150 generations and by comparing sperm competition in males that carry the artificial Y chromosome with males with an X0 genotype.

INVESTIGATING REVERSIBLE PROTEIN FOLDING AT NANO- GOLDCOLLOIDAL SURFACES. Jeceaca An and Kazushige Yokoyama, Department of Chemistry, 1 College Circle, SUNY Geneseo, Geneseo NY 14454.

A reversible self-assembly of amyloid beta peptide (Aβ) and alpha-synuclein (α-syn) peptides were investigated over the nano-gold colloidal surface ranging between 10 nm and 100 nm as an external pH was changed between pH 4 and pH 10. An unfolded monomer constructed a dimer or trimer utilizing the oligomeric form under pH 4. The folded monomer successfully escaped the assembly within the rest of the colloidal particles. Both Aβand α-syn exhibited specific size/temperature dependence in the reversible self-assembly process. Over 20 nm gold colloid, a reversible assembly process of Aβmonomer was observed in the temperature range between 5 ^{o}C and 65 ^{o}C. It was concluded that α-syn favored the 60 nm gold colloidal surface to conduct a reversible self-assembly below 65 ^{o}C. The discovery of oligomeric forms offers confirmation that both peptides could successfully undergo fibrillogenesis.

EXPRESSION AND ANALYSIS OF CONNEXIN31 MUTATIONS ASSOCIATED WITH RARE HEREDITARY DISEASES. Rasheed Bailey and I. Martha Skerrett, Biology Department, Buffalo State College, 1300 Elmwood Ave, Buffalo NY 14222.

Connexin 31 is a gap junction protein encoded by the GJB3 gene in humans. Mutations in the gene can lead to non-syndromic deafness or a rare skin disorder known as Erythrokeratodermia variabilis (EKV). EKV is characterized by two morphological features: figurate red patches and general hyperkeratosis. Oocytes from *Xenopus* laevis will be used to facilitate the expression and analysis of human Cx31 mutations associated with skin disease or deafness. Site-directed mutagenesis will be used to create mutations, messenger RNA will be transcribed *in vitro* and injected into the oocytes and electrophysiological techniques will be used to assess function. Analysis will focus on point mutations such as G12D, G12R, R42P, V34M, C86S and F137L. Preliminary results suggest that some of these mutations may induce non-junctional currents across the membrane. My work will involve electrophysiological analysis of both junctional and non-junctional currents, adding to current information obtained after expression of mutants in

cell lines. Overall the results will lead to a better understanding or rare diseases such as EKV and a better understanding of structure-function relationships of Cx31.

DOES THE PRESENCE OF SHELTER INFLUENCE THE BEHAVIOR OF *DESMOGNATHUS OCHROPHAEUS* FORAGING UNDER THE THREAT OF PREDATION? Erica I. Barney, Kristine A. Frey, Sarah L. Gabriele, Lauren M. Weber, Elizabeth G. Yordy and Aaron M. Sullivan, Department of Biology, Houghton College, Houghton, NY 14744.

Many prey species reduce the likelihood of injury or death by engaging in defensive behavior but often incur costs related to decreased foraging success or efficiency. In some cases these defensive responses are mediated through the use of chemical stimuli from predators deposited in the environment. In the current study we attempted to elucidate the impact of shelter availability on the foraging behavior of Allegheny Mountain dusky salamanders (*Desmognathus ochrophaeus*) while exposed to predator kairomones. In this scenario, we hoped to determine how shelter use was influenced by the presence of a predator stimulus and what impact that may have on foraging success. We hypothesized that in the presence of kairomones from *Thamnophis sirtalis,* salamanders would remain in shelters for a longer period of time but at a cost in terms of foraging success. Conversely, in the absence of a predator stimulus, salamanders would spend less time in the provided shelter and consume more *Drosophila* prey. To evaluate our hypotheses, we observed salamander behavior in four different experimental conditions: 1) predator kairomone with shelter, 2) predator kairomone without shelter, 3) water control with shelter, and 4) water control without shelter. To each treatment condition we added 10 *Drosophila* prey and observed their behavior for 10 minutes. Our results indicate no significant differences in shelter use or the number of prey consumed in the different treatment groups. However, we did see a significant negative correlation between foraging efficiency (number of strikes per successful capture) and snout-vent length in the predator kairomone with shelter condition. These results suggest that in the presence of the shelter provided, behavior is generally not affected at least during the timing of the study (early evening).

USE OF ANTISERA AGAINST MOUSE GRP170 TO DETECT THE *CAENORHABDITIS ELEGANS* HOMOLOGUE. Raven Baxter-Christian and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

GRP170 is a molecular chaperone found in the endoplasmic reticulum of all animals. Although antisera against vertebrate GRP170 has been used to study the vertebrate protein, no antibody has been produced against the invertebrate form of the GRP170. My thesis will investigate whether the antiserum produced against the vertebrate GRP170 can be used to study the invertebrate GRP170 of nematodes. I will use western blot technology to test whether the anti-vertebrate GRP170 antisera will specifically recognize and bind the *Caenorhabditis elegans* GRP170 protein. If the antibody does recognize the *C. elegans* protein, I will explore which isoform of the protein it recognizes using nematodes genetically deficient for specific isoforms. I will also use the western blots to characterize expression of GRP170 protein in the nematodes during stress. In addition to the western blot experiments, I will compare the sequences of the C. elegans isoforms of GRP and use computer software to identify possible epitopes of the *C. elegans* GRP170 proteins. Discovery or generation of antibodies that recognize *C. elegans*

GRP170 will provide the tools needed to better understand the physiological role of this protein in the *C. elegans* system.

THE USE OF MCNP SIMULATIONS IN FAST NEUTRON SPECTROMETRY. Ryan Bonk, Christopher Bass, Grant Farrokh, Melissa Schmitz, Joseph Shupperd, and Spencer Stuckey
Le Moyne College, 1419 Salt Springs Road, Syracuse, NY 13214.

In physical experiments in search of rare phenomena such as dark matter events, background interference is a significant factor. One such background event which poses a particularly significant problem for dark matter research is that caused by fast neutrons which penetrate the earth's surface and pass through the underground laboratories conducting such research. This background level of fast neutrons can be characterized through the use of fast neutron spectrometry, therefore allowing researchers to separate out these events. We discuss our research in fast neutron spectrometry including the use of Monte Carlo N-Particle (MCNP) simulations to design and analyze a spectrometer capable of use in dark matter experiments.

JEFFERSON-COMPLEX SALAMANDER ANTIPREDATOR RESPONSES TO NORTHERN BROWN SNAKE SCENT. Rachel Bratek, Cameron Burleson, Caleb Cameron, Bryan McLaughlin, Andrea Pendleton, Annalyse Sullivan, Kristen Swerzenski, Jessica Trotman, and Paul Alan Shipman, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Amphibians display a wide variety of antipredator behaviors when encounters with potential predators. Salamanders, in addition to exhibiting these behaviors in the presence of physical predator cues, have also been observed to display similar behaviors in the presence of chemical predator cues. For Jefferson-Complex salamanders (*Ambystoma jeffersonianum x laterale*), antipredator tail displays have been studied in response to physical predator cues, but little is known about their behaviors in response to a chemical predatory cue. We studied the antipredator responses of a local population of Jefferson-Complex salamanders on the Rochester Institute of Technology (RIT) campus when exposed to a chemical cue from a Northern Brown snake, also captured on the campus. We exposed salamanders *in situ* to a standard threat stimulus that contained the scent of the Northern Brown Snake (treatment), and compared their responses with the behavior of other salamanders given the same standard stimulus with distilled water (control). We also took measurements and made other observations of the morphological characteristics of the individual salamanders, as well as the environmental conditions in which they were tested.

PARALLEL APPROACHES TO GAIN A BETTER UNDERSTANDING OF THE IMPACT OF CANCER. Ashley Brotherton and Laurie B. Cook, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

In order to gain a better understanding of the impact of cancer, we decided to take two parallel approaches: one that tries to correlate experiences with cancer to human exposure (or lack thereof) to carcinogens and the other which provided a cellular approach to understanding how cells turn on and off signals, or basic strategies that work inefficiently in a cancer cell. First, we aimed to determine the correlation between age and experiences with cancer and lifestyle

choices. A survey of 28 questions pertaining to demographics, general experiences with cancer, relationships with an individual with cancer, the impact they felt was made by their experiences and specifically, their experiences with tobacco, alcohol, and UV light exposure was administered through Google forms to students at The College at Brockport. Fifty-eight students completed the survey (mean age = 20 years). We found 96.6% of the sample size knew someone with cancer and 77.6% knew someone who died from cancer. When students were asked how likely an individual felt a person's experience with cancer influenced their lifestyle choices, the most common answers were 3 and 4 (on a scale from 1 to 5). Generally, people felt their experiences with cancer made an impact on lifestyle choices, which correlated with age. However, the causes of cancer are not always environmental, and disruption of cell signaling pathways promotes uncontrolled cell proliferation. In the second part of this project, we investigated two kinases, GRK2 and GRK5, which are thought to modify melanin-concentrating hormone receptors post-translationally, acting to turn off their ability to positively signal appetite. Cells were co-transfected with plasmid DNA coding for MCHR1 and either GRK or empty vector as control. Cell lysates were harvested and SDS-PAGE used to separate proteins by size. Western blots using anti-MCHR1 antibody was used to detect receptor size and relative concentration and anti-GRK antibody was used to verify GRK2 and GRK5 expression. Although we couldn't definitively say MCHR1 was phosphorylated, we did find that MCHR1 co-expression with GRK2 or GRK5 resulted in significantly more GRK protein in the cell. Since GRKs are involved in the control of many signaling pathways, including those leading to human cancers, exploring how receptors influence GRK function rather than just how GRKs influence receptor function is a potentially important angle that needs to be taken in future studies.

FUNCTIONAL ROLE OF ANO2 IN OLFACTION AND VISION. Ashley Brotherton, Erik Knorr, Tali Morse, and Adam Rich, The College at Brockport, Biology Department, Brockport, NY 14420.

The zebrafish has a similar genome to humans which makes it a strong model system to work with to potentially target certain human diseases. To determine the physiological role of anoctamin 2 (Ano2) in zebrafish, our research team used a behavioral assay to determine if Ano2 plays a role in olfaction and vision. We used a T-maze, an amino acid attractant (alanine, cysteine, histidine, lysine, and methionine) and an odorant (cadaverine) to measure smell. We expect that zebrafish will swim towards the attractant and away from the repellent. After reducing Ano2 gene expression using a morpholino oligonucleotide knockdown (MO) injected zebrafish embryo, we expect that zebrafish will not favor attracts and will not avoid repellent. We also are investigating if the zebrafish have a startle response to light and if the Ano2 MO injected zebrafish will withhold this behavior. Preliminary results show an olfactory response visible in 5 days post fertilization (dpf) and 7 dpf fish. Ongoing experiments are refining these assays and will test the effects of Ano2 knockdown on olfaction and vision as soon as larvae are available.

TOWARD A GENERALIZED IMAGE-BASED GUIDE FOR PRODUCING NESTLING AGE ESTIMATES. William P. Brown, Division of Natural Sciences and Mathematics, Keuka College, Keuka Park, NY 14478.

Avian nestling age estimates produced from image-based guides are accurate. Developing an aging guide for every species may not be practical, however, due to logistical and financial

concerns. Although many birds follow a similar pattern of development, indicating that a general guide to nestling age might be useful, phenology differs among species. As a first step in determining the feasibility of developing a general aging guide that could be calibrated to individual species, I evaluated nestling age estimates of Eastern Bluebirds (*Sialia sialis*) produced from an image-based guide of House Wren (*Troglodytes aedon*) nestlings, and vice versa. Ages of nestling bluebirds produced from the wren guide were consistently overestimated and ages of wrens produced from the bluebird guide were consistently underestimated. Although age estimates produced in this manner were not accurate, the consistency of errors indicates that age estimates can be statistically corrected and that future development of a general aging guide is quite promising.

ARROWS, ARROWS, EVERYWHERE IN BIOLOGY DRAWINGS. Jordan Cardenas, Andy Lu, L. Kate Wright, and Dina L. Newman. Thomas H. Gosnell School of Life Sciences, 84 Lomb Memorial Place, Rochester, NY 14623.

In STEM education, scientific representations such as figures, diagrams, and graphs, are essential for communicating ideas to students. Unfortunately, these representations do not always serve their intended purpose in teaching students. Instructors may not realize that there is a difference in novice and expert views of the same image; a figure that makes sense to an instructor may be visually overwhelming or ambiguous for a student. In biology representations, arrows are used liberally to represent many different concepts, and the style of arrow almost never corresponds to a particular meaning. This observation was documented by sorting through all the arrows used in figures in an introductory biology textbook – 636 figures out of 1214 figures contained arrows, or about 52% of the figures. We identified 47 different styles of arrow and 67 different meanings of those arrows. Different arrows are used to depict the same underlying meaning in different figures, and different meanings are depicted using the same style of arrow at times. Often there are multiple arrows in a single figure, which may represent very different ideas, such as combining chemistry-type reaction arrows with those representing movement in space or time. There is almost never a key to explain the meaning of symbols in biology textbook figures (only 1 of the 636 figures containing arrows). We hypothesize that the lack of consistency in the use of arrows in biological representations is confusing to novices, and can prevent students from being able to interact productively with illustrations that are intended to clarify concepts for them. The 67 meanings have been divided into 11 categories based on the general idea they attempt to communicate (reactions, movement, etc.). With the code book, we can begin to develop more standardized styles of arrows to effectively communicate the categories we have found. Future work will involve interviewing students with old and revised drawings of the same concept, applying guidelines of visual communication, to attempt to derive rules for biologists to use in their communication with students.

CHARACTERIZATION OF AN ANOCTAMIN 2 SPECIFIC ANTIBODY IN ZEBRAFISH. Dylan Carnavale, Ignacio Fernandez, Emily Swift, Katherine Vogler, and Adam Rich, The College at Brockport, Biology Department, Brockport, NY 14420.

Anoctamin-2 (Ano2) is a gene that codes for a calcium activated chloride channel. It has been hypothesized to have function in vision and olfaction, and therefore we expect to see Ano2 expression in the olfactory region of the brain and in the retina of zebrafish. To test for expression, immunohistochemistry and fluorescence microscopy will be performed on 2dpf

zebrafish. A primary antibody (anti-ano2) is commercially available but this antibody has never been used with zebrafish tissues. Therefore we are performing experiments to develop an optimal protocol.

A STEREOSELECTIVE APPROACH TO OXIDIZED INDOLE MOIETIES FROM TRYPTOPHAN-BASED BUILDING BLOCKS. Felicia Chandler, Janine Cubello, and Luis Sanchez*, Department of Biochemistry, Chemistry, and Physics, Niagara University, PO Box 2032, Niagara University, NY 14109-2032.

A large number of natural products of current biomedical significance contain structural units based on amino acids. These units typically exhibit molecular modifications not observed in common peptides, such as halogenations, oxidations, or unusual linkages, which have an impact on their biological activities. Using amino acids as the starting point—a surprisingly uncommon approach—could result in the development of an affordable synthetic route toward these valuable compounds. Many bioactive molecules based on L-tryptophan contain an oxidized form of this molecule. The main goal of our project is to utilize L-tryptophan, a widely available and inexpensive material, as a starting point and to unnaturally recreate the types of oxidations that tryptophan-based units undergo in biosynthetic pathways. By combining methods involving cyclized tryptophan units and taking advantage of cyclic stereocontrol, we aim to manipulate its structure in order to produce complex building blocks that resemble the expensive, hard-to-obtain natural products. Our plans and preliminary results will be discussed.

HIERARCHY OF FEMALE WESTERN LOWLAND GORILLAS IN CAPTIVITY. Sydney Chertoff and Elijah Musik, Canisius College, 1901 Main Street, Buffalo, NY 14208-1079.

Female Western lowland gorillas maintain a dominance hierarchy within their troop. The most dominant female will be the one to approach and sexually solicit the dominant male silver-back. Female dominance in the wild is dependent on their mother's rank in the hierarchy, age, time at which the female has joined the troop, and if the female has an infant. Behaviors indicating dominance include: approaches, displacements, directed displays, and groom solicits. We observed these behaviors between the two females--Lily and Sidney--at the Buffalo Zoo. By doing so and looking at the frequency of occurrence of these behaviors, our aim is to determine which of the gorillas is the dominant female. We hypothesize that the dominant female will exhibit higher frequencies of initiating behaviors towards the other female.

DYNAMIC PROBE OF AMYLOID BETA PEPTIDE 1-40 OLIGOMER AT NANOSCLAE INTERFACIAL ENVIRONMENT. Pei Yi Choo and Kazushige Yokoyama, Department of Chemistry, 1 College Circle, SUNY Geneseo, Geneseo NY 14454.

The conformation of amyloid beta peptide 1-40 ($A\beta_{1-40}$) was investigated through picosecond fluorescence dynamics of directly attached fluorescein (Fluorescein attached Amyloid beta 1-40: FAβ) to its N-terminal as they were adsorbed over nanogold colloidal particles. While the components of the band of fluorescence remained constant with or without the presence of $A\beta_{1-40}$, the entire peak intensity has been increased as FAβ weakly bind to gold colloid. For the same gold colloidal size, there was no significant difference in dynamics was found in the presence of

gold colloid. The fluorescence decay time of the excited state of FAβ showed evidence of an increasing trend as a function of nanogold colloidal size adsorbed, and a distinct size dependence of dynamics was confirmed when FAβ was attached over nanogold colloids. The enhancement of fluoresce due to gold colloids closed the channels of nonradiative. The fluorescence intensity and fluorescence decay are inversely proportional to the pH varied between pH 2 and pH 12. The shortening in decay time correspond to the quenching of the fluorescence at highly acidic and basic conditions. This feature was regarded as a general trend for any nanogold colloidal size tested in this work. It is consistent with the decay time of FAβ increased as a function of gold colloidal size.

EFFECTS OF ALLOCHTHONOUS CARBON SOURCES ON FOOD WEB STRUCTURE IN AN URBAN STREAM. Molly Christie[1], Courtney Marlinski[1] and Jonathan O'Brien[1], [1]Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY 14208.

We examined the effects of differing allochthonous organic matter sources on food web characteristics of an urban stream. We deployed 24 rock baskets containing leaves and/or dissolved organic carbon (DOC) diffusing substrata (2x2 factorial design) in Ransom Creek for four weeks. Rock baskets were then retrieved and processed in the lab. We used fatty acid methyl ester (FAME) signatures of dominant invertebrates to establish food web linkages. There was a strong enrichment effect due to the leaf treatment, resulting in significant increases in the densities of Chironomids, *Gammarus* (amphipoda), and *Caecidotea* (isopoda), showing a significant bottom up effect due to leaf inputs. *Hydropsyche* (caddisfly) and *Stenacron* (mayfly) larvae increased in the DOC treatment, resulting in a boost in the %EPT taxa in the community and suggesting strong linkages to the microbial loop. Based on the fatty acid profiles of the dominant invertebrate taxa, there is a degree of resource partitioning among these otherwise generalist consumers. The FAME analysis supports the findings of the basket experiment that taxa show differential responses to food resource additions. These data suggest that while riparian management may help structure invertebrate communities via organic matter inputs, the identity of the organic matter may have a strong effect on the resulting measures of success for stream restoration projects.

UNMANNED AERIAL VEHICLES (UAVs) TO INVESTIGATE EURYPTERID OCCURRENCES IN UPSTATE NEW YORK AND ONTARIO, CANADA. Samuel J. Ciurca, Jr., 2457 Culver Road, Rochester, New York 14609.

Small drones, like the Alias high performance quad-rotor helicopter (herein the drone), are useful in recording data photographically that are difficult to obtain by usual methods. The capability of small drones to manouver over fossil and other geological sites horizontally and vertically allows access to views of sedimentary strata not normally easy to obtain.

During the excavation of the Late Silurian Williamsville Waterlime, for example, bedding planes are often encountered that exhibit rare sedimentary structures (e.g. ripple marks, windrows of eurypterid debris, etc.) and it is useful to record their orientation and distribution for paleoenvironmental studies.

In another example, prolific blocks of biostromal stromatoporoids in a quarry were traced to layers some 40 feet above a quarry floor revealing the source to be the ‘twin biostrome’ beds of

the Lockport Fm. at the Walworth Quarry – a horizon known for fine mineral (crystal) specimens in vugs intimately associated with the fossils constituting the biostromes.

At Chittenango Falls, it is hoped that a drone will provide information on some unusual (and inaccessible) fossil horizons within the Chrysler Fm. in the high cliffs present there. A two-meter waterlime bed is being traced as it is useful as a marker bed and is being studied in the region to correlate sections with sites at Marcellus Falls, Rock Cut Gorge and the Clockville site (Silurian through Early Devonian).

Future work planned is an aerial view of the stromatolite structures within a eurypterid horizon in the old Neid Road Quarry northeast of LeRoy, New York. Many fossil specimens have already been obtained from this site, some of which are now in the collections of the Peabody Museum of Natural History.

Small, inexpensive drones should also be useful in other geological studies as they have proven to be in archaeological research. And there are many waterfalls exposing rock strata that are very difficult to reach and a drone could easily be utilized to take photographs of the sections.

DIVERSE WATER QUALITY AND NUTRIENT PROFILE IN GEOLOGICALLY VARIANT SURFACE WATER AND WETLANDS AT MENDON PONDS PARK.

Padmini Das[1], PhD., Antoine Audet[1], Thomas K. Caraher[1], Meghan E. Denny[1], Chelsea L. Diekvoss[1], Faith E. Downes[1], MaryLynn Eddington[1], Martin M. Glazer[1], Daryn M. Loy[1], Annalissa M. MacPherson[1], Eileen E. Pelkey[1], Max W. Randolph[1], and Daniel J. Tofil[1], [1]Department of Biology; Nazareth College; 4245, East Avenue; Rochester; NY 14618.

This study investigates various water quality parameters in surface water and wetlands in a geologically diverse area in Mendon Ponds Park, Rochester, NY. It also determines the trophic profile of these water bodies in terms of nitrate and phosphate to understand their eutrophication potential. The unique water signatures of these water bodies lie in their geological origin through glacial melting since last ice age. Different pattern of aquatic and wetland flora and fauna indicates variance in their water quality and nutrient profiles. To validate this hypothesis, two water bodies, a pond (Deep Pond) and a kettle pond (Devil's Bathtub) that are separated by an esker; and two wetlands, a vernal pool and a bog (Kennedy's Bog) were selected. Triplicate samples were collected from each of the sample locations, which were carefully selected, based on their accessibility, to attain adequate representation. All samples were analyzed for pH, electrical conductivity (EC), dissolved oxygen (DO), nitrate, and total phosphorus (TP) as a measure of phosphate. The GPS coordinate of each sample location is recorded to maintain the uniformity of repeated sampling at different seasons in future. Results showed unique and diverse characteristics of water at each sampling location. For instance, the pH of the kettle pond is lower but did not vary significantly ($p>0.05$) as compared to the Deep Pond and the vernal pool. However, as expected, the pH of the bog is significantly lower ($p<0.05$) than the rest. DO is significantly lower ($p<0.001$) in the vernal pool as compared to others; this can be explained by the dead leaves covering most of the air-water interface at the surface of the pool. The EC, nitrate, and the TP of the Deep Pond is significantly higher ($p<0.001$) than the kettle pond and the vernal pool, which are segregated by an esker that restricts the input flow from the surrounding land. The bog water also showed its characteristic low nutrient profile. Statistical correlation between these water quality parameters also suggests information about the potential sources of nutrients from the surrounding area. The data generated in this preliminary study are highly encouraging and set base to achieve our long-term goal of studying water quality and

trophic profile of these geologically diverse surface water and wetlands in Mendon Ponds Park, as functions of seasonality and occurrence of big storm events.

STRUCTURE-FUNCTION ANALYSIS OF RECTIFYING ELECTRICAL SYNAPSES. Viviani DaSilva Jardim, Jamal Williams, and I. Martha Skerrett, Biology Department, Buffalo State College, 1300 Elmwood Ave, Buffalo NY 14222.

Electrical synapses are formed by gap junctions, which bridge gaps between adjacent cells creating direct passageways from the cytoplasm of one cell to that of another. Gap junctions allow cells to directly communicate with neighboring cells. A rectifying synapse is a rare electrical synapse that facilitates unidirectional impulse transmission. One example of a rectifying electrical synapse occurs when two transcript variants of the *Drosophila* ShakingB gene are expressed in adjacent neurons of the Giant Fiber System. The resulting synapse plays a role in the jump/flight reflex of the fly. Our research is aimed at recreating a rectifying synapse in an exogenous expression system amenable to analysis of structure-function relationships. The *Xenopus* oocyte expression system is commonly used to understand structure-function relationships of membrane proteins and gap junctions can be studied by pairing oocytes together. It has been shown that two transcript variants of the ShakingB gene produce a rectifying synapse when expressed in oocytes. Voltage clamp methods will be used to record rectifying currents passing between the oocytes, providing a simple system to better understand molecular mechanisms underlying the rare property of electrical rectification.

NagD FROM *Y. PESTIS*, A HOMOLOG TO NagD UMPASE FROM *E. COLI*. Lucinda Dass, Isreal Moreno, and Suzanne O'Handley, School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY 14623.

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 >80% identical or similar amino acids and thus it is predicted to be an UMPase like NagD from *E. coli*. However, the only way to truly know the activity of a protein is to characterize the purified protein. We have cloned the gene, overexpressed the protein and are now in the process of carrying out enzyme assays to assess activity. The next step is to purify the protein and compare its specific activity, pH optimum, and metal ion requirements to those of 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.

RESISTANCE TO ANTIBIOTICS AMONG STAPHYLOCOCCI ISOLATED FROM HEALTHY VOLUNTEERS ENROLLED IN HEALTHCARE OR HEALTHCARE-ASSOCIATED UNDERGRADUATE DEGREE PROGRAMS. Jeremiah J. Davie[1], [1] Department of Biology and Mathematics, School of Arts, Sciences, and Education, D'Youville College, Buffalo, NY 14201.

Undergraduate students preparing for careers in healthcare or healthcare-associated fields frequently complete clinical rotations as part of their education while remaining members of the

general college community. This positions them as possible source of both community-acquired and healthcare-acquired MRSA.

From Fall 2012 to Fall 2013, 153 healthy individuals enrolled in Biology or Allied Health majors consented to the sampling and characterization of bacterial isolates from the anterior nasal nares or skin. Staphylococci were selected for by sequential culture in mStaph broth and mannitol salt agar. Each isolate was assayed for mannitol fermentation and β-hemolysis to provide presumptive species identification. 15 isolates from each presumptive group were subjected to antibiotic-sensitivity profiling according to CLSI guidelines and assayed for coagulase production.

From a total pool of 153 subjects, 27 putative *S. aureus* (18.0%), 107 putative *S. epidermidis* (70.0%), and 17 putative *S. saprophyticus* (11.0%) isolates were recovered. Among the 15 tested putative *S. aureus* isolates, clinically significant resistance to ampicillin was widespread; resistance to other antibiotics was infrequent. Among 15 tested putative *S. epidermidis and S. saprophyticus* isolates, evidence of clinically significant levels of resistance to ampicillin and erythromycin was widespread; oxacillin was infrequent. Clinically significant resistance to ciprofloxacin was not observed in any tested isolate.

A limited number of students enrolled in healthcare or healthcare-associated undergraduate degree programs were identified to harbor Staphylococci resistant to antibiotics, including oxacillin. The relative paucity of colonization by oxacillin-resistant (MRSA) organisms suggests colonization of healthcare workers by MRSA occurs after formal entry into their respective fields. Of equal importance is the observation that normally non-pathogenic, coagulase negative Staphylococci (CoNS) harbor substantial antibiotic resistance and may serve as a source of opportunistic infections in susceptible patients. These findings underscore the importance of emphasizing and re-emphasizing infection control protocol to both undergraduates in healthcare-associated fields as they prepare to undergo clinical training rotation as well as to established healthcare workers.

EVOLUTIONARY RECYCLING: HOW BUTTERFLIES CREATE EYESPOTS. Melisa DeGroot, B.S. and Diane Ramos, Ph.D., 93 Steel Street, Auburn, NY 13021, 4380 Main St., Amherst, NY 14226.

Butterflies are known for their striking and colorful wing patterns but how are those patterns built? Through an evolutionary recycling process, the same tools that build beetle wings and fly legs are repurposed to create totally new pattern elements in butterfly wings. The eyespot pattern, which functions in predator evasion and mate selection, is a stunning example of a new structure created using recycled tools. Here, we test the necessity of Dpp (Decapentaplegic) signaling, known for its role in fly leg development, in the formation of the butterfly eyespot. Painted lady (*Vanessa cardui*) pre-pupae were injected with an inhibitor of Dpp signaling. Eyespot size and color ratios were analyzed on the adult wing. These functional tests may allow us to demonstrate that Dpp has been recycled and acquired a new role in butterfly wing pattern development.

DOSE-DEPENDENT EFFECT OF TRIBROMOETHANOL ON MOUSE BLOOD PRESSURE. Jason Dey and Bernardo Ortega. Department of Biology, The College at Brockport, State University of New York, 350 New Campus Drive, Brockport NY 14420.

Volume Pressure Recording (VPR) is a new Non-Invasive Blood Pressure (NIBP) recording technique that promises to deliver readings similar to those produced by more sophisticated techniques, such as radiotelemetry. Here we validate VPR in female C57/B6SJL mice and analyze the dose-dependent effect of the anesthetic drug Tribromoethanol (TBE) on mouse blood pressure (BP). Average BP (systolic±SEM /diastolic±SEM, in mmHg) in conscious mice was 118±2.8/ 88±2.0, similar to values reported using radiotelemetry for C57/B6SJL mice. TBE (AvertinTM) decreased both BP and heart rate (HR) in a dose-dependent manner, reaching a maximum effect at 250 µg TBE/g of body weight (µg/g). Systolic BP decreased to 80.0±3.6, 76.0±4.6, and 69.1±2.1 using respectively 175, 200 and 250 µg/g. Taken together, VPR was found to be a reliable method for measuring BP in conscious mice. In addition, TBE strongly depressed mouse BP. Thus, usage of this anesthetic should be avoided when studying BP in mice.

THE DEVELOPMENT OF RADIAL SYMMETRY AS SEEN IN THE MUSCULAR AND NERVOUS SYSTEMS OF *OPHIOPLOCUS ESMARKI.* Megan Doolin, Chelsea Yanowiak, and Dr. Hyla Sweet, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester NY, 14623.

Although less conspicuous than other echinoderms for their small size, brittle stars are common invertebrates. Brittle stars, such as *Ophioplocus esmarki*, can undergo an abbreviated form of development that has a shortened larval stage. During development, the brittle star embryos undergo a shift from bilateral to radial symmetry. However, little is known about how the nervous and muscular systems form and make the transformation during abbreviated development. The goal of this research project was to discover how the bilateral and radial symmetries converge through continued observation of how the two systems develop. In order to view the two systems the brittle stars were stained with a muscle marker and a neural marker. Confocal microscopy was used to image prepared slides of *O. esmarki* specimens at the early vitellaria, mid-vitellaria and late vitellaria larva stages, along with the juvenile stage of development. Images taken at the early vitellaria stage indicate a predominantly bilateral pattern to the embryo, with precursor nerves forming at the anterior end. However, images taken of embryos at the mid-vitellaria stage show the formation of early muscular and nervous systems following both the bilateral and radial patterns. By the late vitellaria and juvenile stages both systems follow the radial pattern. The radial nerve ring is clearly visible and almost fully developed, along with the early podia muscles within each of the five arms, at these stages of development. The results show the transition from a bilateral to a radial embryo.

GENOMIC ANALYSIS OF *CAS* GENES ISOLATED FROM *STAPHYLOCOCCI* IN WHITE TAIL DEER POPULATIONS. Eric M. Ebert, Shawn M. Warner, Chris S. Campomizzi, and Mark A. Gallo Ph.D., 5795 Lewiston Rd, Niagara University, NY 14109.

Horizontal gene transfer is one of the most important evolutionary advantages in the archaeal and bacterial domains of life. DNA acquired in such a manner can provide specific selective advantages to these organisms, but can also be quite harmful. Bacteria however, have developed mechanisms of defense against such deleterious transfer. Clustered regularly interspersed short palindromic repeats (CRISPR) loci and associated *Cas* genes are among the most recently discovered of these mechanisms. These elements have mainly been observed in clinically

isolated bacterial strains, but this study aims to characterize CRISPR/*Cas* elements in a novel collection of *Staphylococci* isolated from local white tail deer populations. Through the use of PCR with custom primers, *Cas* genes have been identified in some of these strains. As this collection of bacteria have not been in contact with homologous clinical strains, their resistance patterns, and thus their mechanisms of defense can provide insight to the evolution of these elements. It is also of note that CRISPR/*Cas* loci can provide a mechanism to prevent the development of antibiotic resistance through the aforementioned transfer pathways, providing a possible pathway for bacterial sensitization, and prevention of the transmission of antibiotic resistance genes in bacterial populations.

IS MECHANICAL CONTROL AN EFFECTIVE METHOD FOR REDUCING INVASIVE CATTAIL (*TYPHA*) IN AN OSWEGO COUNTY, NY FEN? Holly Eden, Colleen McLaughlin, Rafael Ottonicar, Irene Putzig, Matthew Wagner, Eric Wilmarth, and C. Eric Hellquist, Department of Biological Sciences, State University of New York Oswego, Oswego NY, 13126.

Species of *Typha* are often invasive colonizers of freshwater wetlands in the Great Lakes region. One of the consequences of *Typha* colonization is the creation of dense stands that have the potential to reduce vascular plant species richness. One mechanism with which *Typha* reduces species richness is through the prolific deposition of leaf litter at the end of each growing season. In 2014, a section of floating peatland mat at Mud Pond, Oswego Town, had *Typha angustifolia* removed via manual cutting at the surface of the peat. In addition, cut *Typha* biomass was removed from the peatland mat. In the fall of 2015, we sampled two areas of the fen. The first area sampled was the 2014 *Typha* removal zone and the second area did not have *Typha* cut or removed. *Typha* stem counts and biomass were both reduced one year following cutting. Both dead stems ($p = 0.006$) and living stems ($p = 0.0004$) were greater (2x and 6x, respectively) in the uncut zone than in the *Typha* removal zone. In the uncut zone, biomass of dead stems was about 2x greater than living stems ($p = 0.04$). Similarly, in the removal zone, biomass of dead stems was about 3x greater than living stems ($p = 0.02$). Based on our data, it appears that cutting may effectively reduce *Typha* density one year after *Typha* removal.

FUNCTIONAL ANALYSIS OF WILD-TYPE LGN AND T450 MUTANTS.
Ryan Elnicki, The College at Brockport, Department of Chemistry and Biochemistry.

The protein LGN, named for the many repeats of the amino acids leucine (L), glycine (G) and asparagine (N), is crucial for mammalian cellular division. Specifically, LGN plays a significant role in cell polarity and alignment of the mitotic spindles and in its absence, the organism ceases to develop. In breast cancer, LGN is upregulated due to phosphorylation of T450 and the knockdown of LGN activity has been shown to suppress growth of breast cancer cells. Furthermore, a mutation to alanine at the 450^{th} position also suppressed breast cancer cell growth. The goal of this project was to explore the biochemistry of both wild-type LGN and the T450 mutant LGN in hope of gaining insight as to how LGN phosphorylation proliferates cancer. LGN was transiently expressed in BHK-570 tissue culture cells using a pCMV-LGN plasmid and LipoD 293 reagent. Protein expression was confirmed by both Western Blot and immunocytochemistry of fixed, permeabilized cells using anti-LGN antibody. Furthermore, the T450A and T450D mutants were generated by PCR and submitted for sequencing analysis. Future experiments will determine the effect of phosphorylation of T450 on LGN function;

specifically additional localization studies of T450A and T450D mutants will be conducted and compared to that of wild-type LGN. Isolation of wild-type and mutant LGN proteins by immunoprecipitation are expected to facilitate X-ray crystal analysis. Characterization of LGN function relative to phosphorylation status of T450 could lead to development of novel treatments for breast cancer.

RESPONSES OF WARBLERS TO FLIGHT CALLS: DOES AGE INFLUENCE RESPONSE RATE? Hannah Elsinghorst and Sara Morris, 827 Bird Avenue, Buffalo, New York, 14209.

Warblers use flight calls in a variety of contexts as a form of auditory avian communication. Our research team is examining the use of flight calls by migrating warblers to determine if flight calls are used for intraspecific and interspecific communication during times of migration. Using a sonogram recording collected in an electrically-shielded and acoustically-isolated recording chamber, we are able to determine if a bird gives a response when it hears a flight call. The most frequent vocalized responses we have observed are flight calls. There may be several factors that determine if a bird responds to a flight call, including the age of the bird. Our data shows that when examining data from spring migration, younger (second year) birds on their first northwards migration respond more frequently than older (after second year) birds that have successfully completed more migratory cycles. Continuing to study the factors that contribute to the rate of response will improve our understanding of birds and their nocturnal migration.

CELL DEATH INDUCTION OF GLYCOLYTIC CELLS OF C2C12 CELLS. Denise Espinoza and Dr. Jolanta Skalska, Alfred University, 660 Powell Campus Center, Alfred, NY 14802.

C2C12 cells like cancer cells use glycolysis as their primary metabolic pathway to produce energy even though they have fully functional mitochondria. It is the acid environment as a result of glycolysis that is required for the survival of these cells. For C2C12 cells this pH is required for the cells to differentiate in order to form myotubes. The cells will be forced to use oxidative phosphorylation (OXPHOS) by α-cyano-4-hydroxycinnmate (CHC) which stops the cells from using glycolysis. Sets of cells will be treated with different concentration of CHC starting from 10-300 µL to test if the cells can be forced to utilize OXPHOS which will lead to the cell death because the essential acid environment is reduced. If CHC cause cell death, then the next step will be to try to reverse this process. This is shed light on a new method to target cancer cells.

ANALYSIS OF CAPILLARY CONDENSATION AND POLYMER BLENDS. Ian R. Evans, Matthew Cohen, Nicholas C. Jira, Julia R. D'Rozario, Marie T. Romano and Carolina C. Ilie, Department of Physics, 254 Shineman Center, SUNY Oswego, Oswego NY 13126.

We explore herein the capillary condensation for planar geometry and cylindrical geometry. Capillary condensation is studied in the presence of van der Waals forces. We derive the grand free energy, and using dimensionless notation and Young's equation we obtain the shape of the meniscus for both geometries, corresponding to a transition between full and film configuration. Capillary condensation plays an important role in understanding the polymer blends, and especially thin film polymer blends. Some applications of capillary condensation include using a diesel exhaust to recycle clean drinking water and controlling the buoyancy within zeppelins while flying to create a smoother landing process. Two polymers, Polystyrene and

Polythiophene, were then tested to compare differences in their energy levels and band gaps. Polystyrene is commonly used to create plastic materials such as protective packaging, containers, lids, bottles, trays, tumblers, and disposable cutlery. Polythiophene is known for its conductivity, and it is used to make solar cells, batteries and other electrical components. HyperChem was used to model both chains of Polystyrene and Polythiophene and then was used to find the corresponding molecular orbitals for both polymers. Origin was then used to plot the energy levels from these different orbitals and to obtain the band gaps.

FABRICATION AND DEVELOPMENT OF AN ECONOMIC GROUND SCANNING LiDAR (EGS LiDAR) UNIT. Alexander Fafard, Dr. Jan van Aardt, and Dr. Robert Kremens, Chester F. Carlson Center for Imaging Science, Rochester Institute of Technology, 54 Lomb Memorial Drive Rochester, New York 14623-5603.

The use of laser light detection and ranging (LiDAR) as an invaluable asset to the understanding of the physical world is well established in large-scale applications that have access to extensive funding. The use of LiDAR technology in lower level applications has been effectively barred due to the relatively high expense of these systems. Recent commercialization of low dispersion laser range finding modules have allowed for the economic development of such a scanning LiDAR. Taking advantage of this state of affairs, a system has been proposed and is currently in development in of or under a budget of $2100. Based on the specifications of the parts that are being considered, it is projected that the system will operate with spatial resolution characteristics which are comparable to conventional systems currently available- albeit with a notably reduced temporal resolution. It would also be possible to easily incorporate an inertial measurement unit (IMU), onboard scan processing, and real time display of results; all novel features which are lacking in the expensive standard models. This system could be suitable for usage in classroom education and stationary object scanning such as in architectural or forest canopy modeling. A system which may be suitable for these more modest applications will have current progress and limitations discussed.

SPATIO-TEMPORAL VARATION IN FATTY ACID SIGNATURES OF LAKE MICHIGAN FISHES. Nicholas Farese[1], Matthew Futia[1], Jacques Rinchard[1], Sara Creque[2], and Sergiusz Czesny[2], [1]Department of Environmental Science and Biology, The College at Brockport - State University of New York, 350 New Campus Drive, Brockport, NY 14420, [2]Illinois Natural History Survey, University of Illinois, 400 17th Street, Zion, IL 60099.

To better understand the nearshore food web structure in Lake Michigan, spatio-temporal variation in fatty acid signatures (FAS) of four fish species (e.g., alewife, round goby, spottail shiner, and yellow perch) collected along the southwestern shore of Lake Michigan during spring, summer and fall 2013 and 2014 were analyzed (n=296 and n= 210, respectively). There were three sampling sites and each differed in regard to habitat complexity; their substrates were characterized as sand (site A), rocky (site B) and coarse sand with intermittent cobble and random boulders (site C). Significant differences in FAS among fish species were detected (ANOSIM, overall R = 0.835), with alewife and round goby presenting the most distinct FAS (27.94% dissimilarity). Fatty acids responsible for the most variation among species included 16:1n-7, 18:1n-9, 20:5n-3 and 22:6n-3. FAS of each species did not differ significantly between 2013 and 2014. Although spatial-temporal variations were observed in some species in 2013,

these differences were not found when fish from both years were combined. We conclude that although within species spatio-temporal FAS variations could exist, among species FAS differences are always consistently larger.

SCRAMBLED EGGS: FEEDING DIFFERENCES IN BROODING ARICAN BLACK-FOOTED PENGUINS. Sebastian Ferlo, Delanie Spangler, Katrina Regan, Hannah Belliveau, Jillian Bastidas, Mallory Farchione, and Paul Shipman, Ph.D., Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Seneca Park Zoo is the only zoo in the state of New York with African Black-Footed Penguins in captivity. When brooding, it is common practice for zoos and aquariums to replace genetically unfavorable eggs with fake eggs to allow the penguin to brood without hatching an unfavorable chick. Nutritional impact on brooding penguins has not been formally studied in the context of egg replacement, and the data provided in this study could alter the protocol for null egg replacement. One year of data was analyzed from Seneca Park Zoo Penguin Program that addressed eight female African black-footed penguins and their dietary intake when brooding both fake and real eggs, and when not brooding at all. The statistical data will show if any significant differences exist between the nutritional intake of penguins brooding fake and real eggs, and may help to improve the penguin breeding programs for zoos nationwide.

LAKE ONTARIO PLASTIC WRACK AND ITS POTENTIAL INFLUENCE ON SPIDER ABUNDANCE IN STRANDLINE COMMUNITIES. Melissa Ferris, Alexis Rank, and C. Eric Hellquist, Department of Biological Sciences, State University of New York Oswego, Oswego NY.

Shoreline habitats are vulnerable to a variety of human disturbances including development, substrate alteration, and pollution. Plastic pollution is being increasingly recognized in shoreline wrack of the Laurentian Great Lakes. Plastic deposition in deposits of shoreline wrack may influence invertebrate communities that rely on the wrack for refuge and foraging habitat. We collected plastics systematically from two different Lake Ontario shoreline locations (SUNY Oswego and Mexico Point). Random sampling was used to collect surface plastics in 5.0 x 2.0 m plots (n=10/location). Smaller plots,0.25 m x 0.25 m (n=20/location), were used to recover plastics and organic matter embedded in cobbles. Plastics were brought to the lab where they were sorted and weighed. We also attempted to determine how plastic matter on a shoreline may affect macroinvertebrates. In the 10 m^2 plots at SUNY Oswego, the mean amount of plastic was 198 g, while the 25 cm x 25 cm plots had an average of 4.0 g of plastics. We also considered how wrack composition may influence spiders. At SUNY Oswego, we used 3 litter bag wrack treatments (n =5 replicates per treatment). Bags contained 100% organic matter, 50/50% plastic debris and organic matter, and 100% plastic debris. Each bag had a sticky card placed on its surface and within the bag to catch invertebrates that may pass over or through the bags. To date, we have recovered 24 spiders from our litter bag experiment with no differences in spider abundance found between our three treatments of plastic and organic matter in the litter bags.

EFFECTS OF (R+) LIMONENE ON FATHEAD MINNOW SWIMMING BEHAVIOR. Matthew P. Finegan, Caitlyn E. Patullo, Curtis A. McConnell, and Dr. Susan Allen-Gil, Department of Environmental Science, Ithaca College 953 Danby Road Ithaca, NY 14850.

As pharmaceutical products are becoming increasingly important in everyday life, they are also becoming more prevalent in the environment. Wastewater treatment methods have been proven ineffective in the removal of these chemicals resulting in accumulation in aquatic environments, which could pose a threat to aquatic life. Studies have shown that certain pharmaceuticals can impact behaviors such as reproduction, predator avoidance, and food acquisition. Similar behavioral changes in fish could negatively impact predator-prey relationships and lead to an unbalanced ecosystem. This research investigates the effects of the compound (R+) Limonene on fathead minnow swimming behavior. (R+) Limonene is a neuroactive compound used in pharmaceutical products, solvents, and fragrances and has been shown to cause effects similar to those found in antidepressants and anticonvulsants. Fathead minnows are tested with water containing four concentrations of limonene: 0.83 μg/L, which is the concentration measured in the effluent of the Ithaca Area Wastewater Treatment Facility, 21.05 mg/L, 42.1 mg/L, and 84.2 mg/L. These concentrations are being used to understand the degree of impact (R+) Limonene has at the current effluent concentration as well as at higher concentrations, which could become relevant if limonene continues to be released. Using the video tracking software Swistrack, the path of the fish as well as the total distance travelled and average velocity were determined to show changes in fish swimming behavior due to exposure to (R+) Limonene. Through this process we should be able to determine whether (R+) Limonene significantly alters behavior in fish and how much is needed to result in such change.

DEVELOPMENT OF CDCI-SHINE, AN R-BASED WEB APPLICATION FOR THE ANALYSIS OF RESULTS FROM THE CENTRAL DOGMA CONCEPT INVENTORY (CDCI). J. Nick Fisk, Christopher Snyder, Dina L. Newman, and L. Kate Wright, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive Rochester, New York 14623-5603.

We have recently developed and tested a 23-question assessment instrument designed to evaluate student understanding of essential concepts of the Central Dogma of Molecular Biology, called the Central Dogma Concept Inventory (CDCI). The CDCI instrument has been rigorously tested with more than 1,700 undergraduate beta-testers. It uses a multiple-select format in order to circumvent many of the problems common to a forced-choice tool (e.g. students using test-taking strategies to correctly guess correct answers) and provide greater insight into student thinking. However, analysis and scoring was labor intensive, complex, and needed to be performed locally, which would not be practical if the tool were adopted widely. To remedy this problem, we are developing a web-application to perform rigorous and varied statistical analyses in R that do not rely on user knowledge of programming or computational statistics. The web-application, CDCI-SHINE, will allow users to upload CDCI data and quickly produce meaningful and easy-to-interpret figures of class performance. For example, instructors could look at their class's performance on each concept in order to better tailor their coverage of topics, or they could compare pre and post test results in order to evaluate the effect of a new pedagogical intervention. In the future, the web-based CDCI-SHINE may be able to be applied to other concept assessment instruments as well.

SPATIO-TEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE TROUT EGGS. Bailey Fogle and Jacques Rinchard, Department of Environmental Science and Biology,

The College at Brockport- State University of New York, 350 New Campus Drive, Brockport, NY 14420.

The objective of this study was to compare spatio-temporal variations in fatty acid signatures (FAS) of lake trout eggs. Eggs were collected during lake trout spawning season (Fall) both in Lake Ontario and Cayuga Lake from 2011 to 2014. Lipids were extracted and measured gravimetrically, whereas fatty acids were determined using gas chromatography/mass spectrometry. Our results indicated spatial differences in the FAS between both locations. Oleic acid (18:1n-9) and docosahexaenoic acid (22:6n-3) were the two major fatty acids responsible for the difference. A higher concentration of 18:1n-9 was found in eggs from Lake Ontario While 22:6n-3 was higher in eggs from Cayuga Lake. We did not observe major temporal changes in egg FAS in either location. As FAS is influenced by the maternal diet following the principle "you are what you eat", we concluded that lake trout diet differed between locations or lake trout prey forage on different organisms in both environments.

INVESTIGATION INTO SLFN11 MEDIATED INHIBITION OF INFLUENZA VIRAL PROTEIN PRODUCTION. Freedenberg Alex[1], Shiv Patel[2], and Stephen Dewhurst[2], Jonelle Mattiacio[1], [1]Biology Department, St. John Fisher College, Rochester, NY, [2]Department of Microbiology and Immunology, University of Rochester School of Medicine & Dentistry, Rochester, NY.

Each year in the United States 5%-20% of people get infected with Influenza A virus (IAV) and this leads to around 200,000 hospitalizations and between 3,000 to 49,000 deaths a year. It is 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 Schlafen 11 (SLFN11), which restricts viral replication through inhibition of viral protein production. This interferon induced protein was found to limit viral protein production of Human Immunodeficiency virus (HIV) in a codon bias manner. A similar codon bias is found in IAV viral genome and therefore, we hypothesized that SLFN11 would have a similar effect on IAV viral protein production. Consistent with this hypothesis, a decrease in influenza viral protein production was observed *in vitro* but not in the context of a viral infection. This initial data suggests that influenza blocks SLFN11 mediated inhibition of viral protein synthesis and overcomes SLFN11's antiviral activity. Current studies are investigating the possible mechanism, which may involve the unique nature of influenza viral mRNA that is produced by the viral polymerase complex.

VISUALIZING THE IMPACT OF VSV INFECTION ON HOST CELL TRANSCRIPTION. Alec Freyn, Raquel Becker, Katie Marquis, and Maureen Ferran, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, New York 14623.

Interferon (IFN) is a protein that cells normally produce in response to viral infection. Once made, IFN is secreted and binds to receptors on neighboring cells and initiates a cascade of events that leads to an antiviral state in these cells. Vesicular Stomatitis Virus (VSV) is a prototype Rhabdoviridae that infects many mammalian species, particularly livestock. To allow successful infection and ensure replication, VSV rapidly represses host transcription in infected cells. It is speculated that the general repression of host cell transcription prevents production of IFN and therefore blocks the IFN antiviral response. However, data gathered in our previous experiments suggests that VSV also specifically limits induction of the IFN gene.

A luciferase reporter assay to measure transcription in VSV-infected cells was performed, and the data collected supports the hypothesis that VSV uses a second mechanism to limit the IFN response. In this study, we are developing a non-radioactive method to measure cellular transcription. Using a nucleotide analog of Uracil, a nucleotide found specifically in RNA, and fluorescent Click-iT Chemistry, rates of host cell transcription in infected L929 cells can be qualitatively and quantitatively measured. We are monitoring the effects of VSV strains 22-20 and 22-25 on host transcription. If both of these viruses repress global host transcription, this would suggest an alternate mechanism for IFN repression, as 22-20 is known to promote an IFN response during the course of infection.

GENERATING PROFILES FOR MicroRNA TARGET PREDICTION USING MACHINE LEARNING. Lucas Galbier and Rongkun Shen, Department of Biology, The College at Brockport, State University of New York, Brockport, NY 14420.

MicroRNAs (miRNAs) are about 21-22 nucleotide long, single-strand, non-coding RNA molecules that are naturally expressed and play important roles in posttranscriptional regulation. MiRNAs down-regulate the translation of their targeting messenger RNAs (mRNAs) by binding to mRNAs leading to the silencing or degradation. Each miRNA might bind to hundreds of mRNA targets and each mRNA target might have multiple miRNA recognition elements (MREs). However, functional assignment of targets to each miRNA still remain in a very small subset of these miRNAs, which leaves the understanding of the mechanism of miRNA-mediated gene regulation largely limited. Although many experimental approaches were reported to identify miRNA targets, they are either low throughput or costly to restrict the wide application. On the other hand, computer algorithms have been developed to predict miRNA target. Most of them do not provide satisfactory accuracy due to using incomplete sequence complementarity and evolutionary conservation of predicted MRE. Machine learning is a specialized artificial intelligence approach that guides the model to learn critical information from the training data and then predict the unknown data. In this project, we generated profiles for miRNA target prediction using a machine learning approach. With the availability of our unique high quality datasets of miRNA direct targets from RISCtrap that published from this lab, we utilize them as the training dataset to build the profiles. The profile contained energy thresholds assessment for complementary matches between miRNA and MRE. We developed and implemented an algorithm to find the MREs on the 3' untranslated region (UTR) of mRNAs (human hg19 RefSeq Genes) based on the human miRNA extended seed sequences (miRBase v20). The matching of MRE and miRNA seed sequences could have some flexibility to allow some minimal mismatches, G:U wobble pairs, or bulge. The matched MRE and miRNA extended seed sequences were used to calculate the free binding energy employing RNAhybrid. After filtering

out the sites of the low binding energy, the remaining MRE will be incorporated into the profiles, which will be further fed into the machine learning model for both training and prediction.

THE EFFECT OF CHC & DCA ON MYOTUBE FORMATION AND THE DMSO PHENOMENON. Sam Gardner.

In an experiment testing the effects of alpha-cyano-4-hydroxycinnamic acid (CHC) and Sodium Dichloroacetate (DCA) on myotube formation we noticed that the solvent DMSO had inhibited myotube formation in the control group and in the group containing only small amounts of the drug CHC. In the samples which contained higher concentration of CHC, myotubes were forming quickly. We concluded that the CHC was reversing the effects of DMSO in the samples with a higher concentration. In an attempt to recreate this phenomenon we tested various concentrations of DMSO with a fixed concentration of both CHC and DCA. In addition we have begun testing the effects of our drugs in larger concentrations on myotube formation, without DMSO to make direct comparisons. We will use western blot tests to confirm our results.

SR45 INVOLVEMENT IN ABA RESPONSE VIA UP-REGULATION OF CYP707A2 IN ARABIDOPSIS THALIANA. Jeff Georgiades, Jennifer Rice, and Xiao-Ning Zhang, Department of Biology, St. Bonaventure University; 3261 W State St, St Bonaventure, NY 14778.

In Arabidopsis, the Cyp707A family of genes encodes hydroxylase proteins that break down Abscisic acid (ABA), a stress hormone. It has been suggested that alternative splicing regulator Sr45 is involved in upregulation of Cyp707A2 gene expression. Cyp707A2 is the primary ABA hydroxylase, so if it is not present, ABA levels should increase. To verify the upregulation of Cyp707A2 by Sr45, pure RNA's were collected from four genotypes: Wild type, *sr45-1* null, and two overexpression lines. This was followed by DNase treatment to eliminate DNA contaminants, then reverse transcription to make cDNA's. These cDNA's were used to verify upregulation of Cyp707A2 expression through qPCR. At the same time, ABA buildup stunts seed germination and root growth in seedlings, so by comparing root development of Wild type, *sr45-1*, and two Cyp707A2 mutants (A2-1, A2-2) in 3 different conditions (Control, Mannitol, and ABA), the effects of Sr45 on ABA stress through regulation of Cyp707A2 are examined.

VALIDATION OF MO KNOCKDOWN OF ANOCTAMIN 2 EXPRESSION IN ZEBRAFISH. Katherine Gerich, Shanley Richards, Aimee Sangiorgi, Ashlee Wills, and Adam Rich, The College at Brockport, Biology Department, Brockport, NY 14420.

Anoctamin 2 (Ano2) codes for a calcium activated chloride permeable ion channel which is thought to be involved in many functions including olfaction, vision, brain activity and GI motility. Morpholino oligonucleotides (MO) are chemical tools that are used to block gene expression. MO are designed target specific genes. However, it is necessary to validate MO specificity to be certain that the gene of interest is not expressed. The objective of this work is to validate the MO knockdown of Ano2 in zebrafish by showing altered expression of Ano2 mRNA in MO injected embryos compared to non-injected and sham-injected embryos. Embryos will be injected shortly after fertilization and 2 days later total RNA will be isolated, cDNA will be synthesized, and PCR will be performed using primers that surround the region of Ano2 mRNA that is predicted to be altered by the MO. It is expected that MO injected embryos will have a

shorter PCR product reflecting excision of exon 3. Validation of MO specificity is essential to confirm loss-of function with Ano2 knockdown.

INTERLEUKIN-33 IS REPRESSED BY TGF-β IN EPITHELIAL AND MESECHYMAL CELLS. Megan Gervasi[1], Souvik Chattopadhyay, and Andrei V. Bakin[2], [1]Deparment of Math and Natural Sciences, D'Youville College, Buffalo, NY 14201, [2]Department of Cancer Genetics, Roswell Park Cancer Institute, Buffalo, NY 14263.

Infections, autoimmune reactions or mechanical injury can induce damage to the cellular components of tissue such as fibroblasts, epithelial and endothelial cells. Proper repair of this damage is important to restoration of tissue homeostasis. TGF-β and the IL-1 family of cytokines have been implicated in the regulation of tissue homeostasis and tissue response to injury. During wound healing TGF-β cytokines provide anti-inflammatory and pro-fibrotic inputs while the IL-1 family of cytokines promote inflammation via activation of the immune responses. Imbalance between the functions of these cytokines during tissue repair can lead to the development of human diseases such as fibrosis, asthma and cancer. Our studies identify a novel role for TGF-β in repression of the IL-1 family member IL-33. IL-33 acts as an alarmin alerting the body to tissue damage. Increased levels of IL-33 have been implicated in a number of diseases including psoriasis, colitis, and inflammatory joint disease. Investigation of this regulation revealed that repression of IL-33 is dependent on the TGF-β canonical pathway of signaling. A better understanding of the mechanism of regulation of IL-33 by TGF-β could provide insight into the pathology of several disease as well as identification of possible therapeutic targets.

COMBINED EFFECTS OF TAIL AUTOTOMY AND PREDATOR KAIROMONES ON THE FORAGING OF *DESMOGNATHUS OCHROPHAEUS*. Emilia A. Gildemeister, Wesley I. Payette and Aaron M. Sullivan, Department of Biology, Houghton College, Houghton, NY 14744.

Caudal autotomy is a defensive mechanism utilized by a number of plethodontid salamander species to decrease the likelihood of being captured by predators. Despite the possible fitness benefits of autotomy, potential costs include decreases in locomotor speed, energy storage and mating opportunities. In addition, several plethodontids including the Allegheny Mountain dusky salamander (*Desmognathus ochrophaeus*) can detect predator kairomones to further decrease the threat of predation. Here we present data from two behavioral assays that focused on the combined effects of caudal autotomy and exposure to predator kairomones on foraging by *D. ochrophaeus*. In our first study, individuals were exposed to predator kairomones from the predatory salamander *Gyrinophilus porphyriticus* one day after the induction of tail autotomy while number of strikes at prey and the number of prey captured were recorded over a 10-minute time period. In our second study, individuals were exposed to predator kairomones from the snake *Thamnophis sirtalis* 17 days after the induction of tail autotomy while the same two foraging behaviors and the latency to first strike were observed. In both studies, salamanders with intact tails exposed to the water control showed an increase in the number of strikes and captures. Additionally, intact individuals in the second study showed a significant decrease in the latency to strike when exposed to the water control. In general, animals that experienced caudal autotomy and those exposed to kairomones from the predators exhibited suppressed foraging behavior. Based on our findings, the detection of the predator chemical stimulus and the

simulated predation event leading to autotomy appear to be functionally equivalent in a foraging context. This may be the result of an increase of reliance on other antipredator behaviors such as crypsis or immobility in autotomized animals until tail regeneration is complete. This reduction in behavior may lead to a decrease in foraging efficiency and explain the foraging suppression in autotomized animals.

STARRY STONEWORT (*Nitellopsis obtusata* L.) INVADES CANANDAIGUA LAKE. Bruce Gilman, Department of Environmental Conservation and Horticulture, Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, New York 14424 and Emily Staychock, Invasive Species/Watershed Educator, Yates County Cooperative Extension, 417 Liberty Street, Penn Yan, New York 14527.

Canandaigua Lake can now add a new name to its growing list of invasive aquatic species – starry stonewort. Observed during an aquatic vegetation training event along a northern shoreline two years ago and this year at the south end of the lake near the West River, starry stonewort is now estimated to be covering at least 30 acres of the lake bottom. Native to Europe and western Asia, this invasive species was first observed in the St. Lawrence River in 1978, presumably released in ballast water. It was discovered in the Great Lakes in 1983 and spread to inland lakes shortly thereafter.

Starry stonewort is a macro-algae, a simple multi-celled organism descended from some of the earliest lifeforms on the planet. It resembles a vascular plant but the main body consists of large stem-like cells, up to 30 cm long, together with branch whorls resembling leaves that radiate upward from nodes of smaller cells. It is anchored by colorless rhizoids that contain several star-shaped bulbils, vegetative propagules with a long dormancy. Rhizoids as well as the entire surface of the organism can absorb nutrients. Starry stonewort can grow to 2 meters in height but is often smaller creating dense, mounded colonies in the littoral zone of lakes and slow flowing rivers. Dispersal to adjacent waters is likely by fragments moved on boats as well as oocytes attached to bird feathers and fur of aquatic mammals. Local spread after establishment is likely by bulbils.

Starry stonewort thrives in marl sediment of alkaline lakes. It establishes under oligotrophic to mesotrophic conditions with a Carlson Trophic State Index (TSI) ranging from 38-46. TSI is generally lowered after invasion from water clarity improvements associated with less sediment resuspension and less phytoplankton due to competitive interactions with starry stonewort. Scientific studies report that starry stonewort releases allelopathic substances that reduce the occurrence of native submerged vegetation. Dense colonies impede fish movement, alter their spawning beds and fry habitat. Water flow may be restricted, and passage by recreational vessels negatively impacted.

Control by manual pulling is difficult due to fragile nature of the plant. Dormant bulbils left in sediment after hand pulling will rapidly recolonize the site. Chemical herbicides will only kill the upper portions of dense stands, allowing regrowth from beneath. No effective biological controls are known at this time.

Starry stonewort has been observed by the authors in Sodus Bay, Oneida Lake, Keuka Lake, Cayuga Lake, Seneca Lake and Owasco Lake. It should be searched for elsewhere and documented on *i*MapInvasives. Accurate distributional records are critical for future management of this impending threat.

WEED DIVERSITY AT KING FERRY VINEYARD, KING FERRY, NY. Ashley Gingeleski, Niamh O' Leary, and Thom Bechtold, Wells College, 170 Main Street, Aurora, NY 13026.

Weeds grow beneath the grapevine trellis systems at King Ferry Vineyard in King Ferry, NY. Appropriate weed management is informed by knowledge of weed diversity and abundance. In September 2015, weeds in a total of 17 rows of trellises were surveyed in 4 block sections, comprising a total of 68 blocks, 3 meters each in length. Species and abundance of broadleaf weeds were recorded, and assessments were made of grass coverage using a 0 to 4 abundance scale. Quantum sensor readings for photosynthetically active radiation were recorded in µmol m^{-2} s^{-1} for each of the blocks to measure the amount of sunlight reaching the areas below the trellis system. Two rows in the study assess weed diversity within blocks of the cover crops *Cichorium intybus* (chicory) and *Fagopyrum esculentum* (buckwheat). A total of 53 weed species have been identified to date; further investigation is in progress. A determination of weed diversity at the vineyard will offer insight to the establishment of different species and can be compared to historical data to reveal changes over time.

PHLOEM STEROIDS OF C-8,7 STEROL ISOMERASE KNOCKDOWN IN ARABIDOPSIS THALIANA. Alexis Grebenok*, Olivia Schoenfeld*, Ivy Chen#, Spencer Behmer#, Keyan Salzman# and Robert Grebenok*, * Canisius College, Department of Biology, Buffalo, NY 14208, # Texas A&M, Departments of Entomology and Molecular Biology, College Station, TX 77843.

Insects lack the ability to synthesize sterols *de novo* and therefore must acquire sterols from their diet to meet basic developmental needs. Cholesterol is the chief sterol found in most insects, but in plant vegetative tissue cholesterol (usable sterol) makes up only a small fraction of the sterol profile. All herbivorous insects must convert dietary phytosterols into useable forms (chiefly cholesterol) to support their growth and development. Not all phytosterols are readily converted to useable forms, and some structures are deleterious when ingested above a certain level. In recent studies we have genetically knocked down the expression of the C-8,7 sterol isomerase in *Arabidopsis thaliana* and thus modified the chemical structure of the plant sterol by causing the retention of the C-8,9 double bond in the phytosterols. We report that aphids and the diamondback moth demonstrate reduced fecundity and altered longevity when reared on these plants. Considering that aphids are phloem-feeding insects we examined the contents of the phloem obtained from several lines of transgenic plants. The phloem contained steroid variations in comparison to wild type controls. The ability of altered steroids to support growth and development of herbivorous insects is discussed.

HONEOYE LAKE STATE OF THE ART LAKE MAPPING. Terry Gronwall, Honeoye Lake Watershed Taskforce, Honeoye, NY 14471.

This research project used the new ciBioBase lake mapping service to create new bathymetric, bottom hardness, and macrophyte maps of Honeoye Lake. The bathymetric and bottom hardness maps were created by spending over 30 hours on the lake collecting GPS coordinates and depth

readings using a Lowrance GPS/Depth Finder every 5 seconds while traveling at 5 MPH along East West transects spaced approximately 200' apart. These maps will be invaluable for future Honeoye lake research projects. The macrophyte maps have been used to make Honeoye Lake's aquatic vegetation harvesting operation more efficient by concentrating efforts on areas in the lake that have aquatic vegetation growing through most of the water column. This is shown as the red zone on the aquatic vegetation maps. The effort to create new Honeoye Lake macrophyte, bathymetric, and bottom hardness maps was sponsored by the Honeoye Lake Watershed Task Force and supported by grant funding from the Ontario County Water Resources Council in 2014 and 2015.

DEVELOPING TARGETED MOLCULAR IMAGING AGENTS (TMIAs) TO DETECT PROSTATE CANCER. M. Hamzah Megat[1], Amanda L. Murray[4], Christian A. Gordillo[1], A. Karim Embong[1], Aflah Hanafiah[1], John T. Mold[1], Rebecca Walden[1], Henry D. Ophardt[1], Hans F Schmitthenner[2,3], and Irene M. Evans[1] [1]Gosnell School of Life Sciences [2]School of Chemistry and Materials Science, [3]Center for Imaging Science, [4]Biomedical Engineering, Rochester Institute of Technology, Rochester, NY, USA 14623.

The use of targeted molecular imaging agents (TMIAs) that bind to biomarkers on cancer cells provides a new technology to identify, treat and hopefully eradicate cancer cells. Improved treatment of cancer requires knowing where the tumor is located as well as its outlines and metastases. The goal of this research is to develop and evaluate specific targeted molecular probes for detecting prostate cancer. Multimodal targeted molecular imaging agents (TMIAs) would be advantageous if the TMIAs bound well to cancerous cells illuminating them and bringing in molecules that provided better images using different imaging modalities. The focus of our research has been the development of near-infrared fluorescent peptide inhibitor and photoacoustic contrast TMIAs. Using sensitive screening techniques, the best imaging agents have been selected. In order to compare the binding and uptake of TMIAs such as ones which target prostate specific membrane antigen (PSMA) on prostate cancers, 2D cell models were compared with 3D cell models to see how the TMIAs bind and are internalized into the cells. An ever increasing body of literature indicates significant differences in cell morphology, gene expression, proliferation, and migration between 2D and 3D cultured cells, with 3D culture more accurately representing live animal models *in vivo* and human tumors. The binding of Cy5.5 near infrared reagent (NIR) conjugated with an inhibitor against prostate-specific membrane antigen (PSMA) has been evaluated using LNCaP-C42B (PSMA positive) and PC3 (PSMA negative) prostate cancer cell lines grown in two-dimensional (2D) and threesdimensional (3D) cultures. Our results show the presence and cellular location of the TMIA which is seen present on the surface of the cells as well as endocytosed into the tumor cells. TMIA agents penetrate 3D cancer models and stain cells buried inside the spheroid tumor model indicating the agents tested had good penetrability characteristics. We conclude that the use of 3D cellular models which mimic more closely *in vivo* tumors should facilitate development of TMIAs and result in molecules which target to metastatic tumors illuminating their presence, size, and structure thus allowing better clinical treatment and hopefully enhanced cancer survival.

GENETIC DIVERSITY OF *DAPHNIA.* Samuel Harbol, Kaitlin Bonner, and Michael Boller, 82 Sanford Street, Rochester, NY 14620, 3690 East Ave, Rochester, NY 14618.

Daphnia, commonly called water fleas, are an important component of freshwater ecosystems. The life cycle of *Daphnia* is very unique as for a majority of their life, when conditions are favorable, they are parthenogenic and reproduce asexually. When conditions become unfavorable, particularly in the winter, they begin to reproduce sexually creating resting eggs. These resting eggs remain dormant until conditions once again become favorable. Typically *Daphnia* will reproduce asexually from spring to fall, then late fall begin to produce resting eggs. The egg bank in the sediment serves as the source population the following spring. Genetic diversity is expected to increase from as the late fall population to early spring due to sexual reproduction and the resulting resting eggs. Also, the diversity seen in the egg bank is expected to be reflected in the new spring population. To date is it unknown if this change from asexual to sexual reproductive strategies results in population genetic differences from the late fall population to the spring population. The goal of this study is to determine if allelic distribution and abundance varies from the late fall population to the egg bank to the newly hatched spring population. Collections will be made during the late fall in November when the population is still reproducing asexually, early winter to collect resting eggs, and early spring when individuals are just hatching out of the egg bank. To access the genetic variability of the populations, common molecular methods will be used, such as PCR and genotyping of 6-12 microsatellites developed by *Colbourne et al.* (2004). DNA extractions of both resting eggs and live specimens will be completed using HotShot protocol (Montero-Pau, Gomez, and Munoz (2008). The genotyping will be analyzed using Geneious (v.6.1.7). Allelic distribution and diversity will be assessed using Genepop (Raymond and Rousset (1995), Rousset (2008), GenAlEx (Peakall and Smouse (2006), Peakall and Smouse (2012), and Structure (Pritchard, Stephens, and Donnelly (2000).

THE IMPACT OF SELECT SIGMA LIGANDS ON THE ACTIVITY OF THE C-8,7 STEROL ISOMERASE IN TOBACCO. Joshua Harkins*, Michael Warren*, Alyssa Tzetzo*, Mary Zittel*, Ivy Chen#, Spencer Behmer#, Keyan Salzman# and Robert Grebenok*, *Department of Biology, Canisius College, Buffalo, NY 14208, # Texas A&M University, College Station, TX 77843.

Insects lack the ability to synthesize sterols de novo and therefore must acquire sterols from their diet to meet basic developmental needs. Cholesterol is the chief sterol found in most insects, but in plant vegetative tissue cholesterol (usable sterol) makes up only a small fraction of the sterol profile. All herbivorous insects must convert dietary phytosterols into useable forms (chiefly cholesterol) to support their growth and development. In recent studies we have genetically knocked down the expression of the C-8,7 sterol isomerase in *Arabidopsis thaliana* and thus modified the chemical structure of the plant sterol by causing the retention of the C-8,9 double bond in much of the accumulated phytosterol. These modified plants resist insect herbivory and decrease sucking insect's fecundity. Previous work in our lab has demonstrated that various sigma ligands will biochemically inhibit the C-8,7 sterol isomerase. Tobacco was exposed to Verapamil and Haloperidol at varying concentrations to demonstrate the replication of the transgenic phenotype to validate the genetic silencing phenotype of the enzyme. The impact of sigma ligands on the activity of the C-8,7 sterol isomerase is discussed.

MOLECULAR CLONING OF VESICULAR STOMATITIS VIRUS (VSV) M GENE, SEQUENCING OF VSV L AND G GENES. Cody J. Hastings, Rachel L. Becker and Maureen

C. Ferran, Thomas H Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, New York.

Vesicular Stomatitis Virus (VSV) has an 11 kilobase genome which contains five genes that encode for the following proteins: Matrix Protein (M), Nucleocapsid protein (N), glycoprotein (G), polymerase (L), and phosphoprotein (P). The VSV M protein is a very cytotoxic viral protein and plays a major role in inhibition of cellular gene expression. The M protein is also involved in the suppression of the cellular interferon (IFN) antiviral response. It has been suggested that the M protein limits this antiviral response solely by limiting host transcription. In support of this conclusion, all VSV strains that suppress cellular transcription also limit IFN production; while all mutant strains that do not suppress host transcription induce interferon. However we propose that there is a second mechanism used by VSV to limit the production of IFN. To investigate this further we are analyzing two unique strains of VSV (22-20 and 22-25) that were isolated from an infected cow. Similar to wt VSV, 22-25 limits production of IFN, while 22-20 induces expression of this protein. Importantly, our preliminary work indicates that both of the viruses suppress cellular transcription. If confirmed we would have separated inhibition of host transcription from suppression of the IFN response. These two virus strains might therefore hold the key to identifying the viral proteins responsible for the regulation of IFN.

In this study we are in the process of completing the sequencing of these two viral genomes. We did identify a mutation in the M protein of 22-20 (D52G), however this mutation does not appear to impact the viruses ability to inhibit host transcription. To investigate this further we are cloning the VSV M gene from 22-20 and 22-25 into a cloning plasmid. Once the proper clones are isolated, the M gene will be subcloned into a eukaryotic expression vector to be used in the future experiments.

CRYOPRESERVATION OF CHLAMYDOMONAS REINHARDTII. Bridget Healey and Noveera Ahmed, Department of Biology, St. John Fisher College.

Chlamydomonas reinhardtii, a unicellular protist, is a model organism used to study photosynthesis, chloroplast genetics, cell division, cytoskeleton proteins, and flagellar assembly and regulation. Many small institutions and high schools utilize this organism as a research and teaching tool. The aim of the project is to identify a cost-effective protocol for the long term and genetically stable storage of this organism. Current protocols require expensive equipment and techniques, such as liquid nitrogen storage, or expensive commercially available kits. In order to create a cost effective protocol, novel cryopreserving agents that yields high viability during long term storage at -80°C will be identified and tested. It has been shown that cell density effects viability of *C. reinhardtii* and the organism releases an injurious organic compound before freezing or after thawing, therefore cell densities must kept relatively low (<2.5 x 10^6) (Piasecki *et al.* 2009). Cryopreserving agent(s) (CPA) used pre or post freeze may increase viability by quenching these injurious compounds, changing membrane dynamics to reduce damage, or inhibit the formation of ice crystals. Antioxidants such as TPGS, N-acetylcysteine, and vitamin B12 have been used in preliminary tests in our lab as these reagents may help protect the cells from the injurious compounds they release when frozen or thawed. Initial tests using the Research Center Protocol and Cryopreservation Kit were also conducted. The Resource Center protocol at a cell density of 9.8 x 10^5 yielded 0.01% cell survival after a 24 hour freeze.

Test protocol data collected from cells that had been frozen for 48 hours and a week yielded 0% survival, based on Evan's Blue Dye test. Current research includes comparing percent viability following the Research Center and Cryopreservation Kit Protocols to the Test Protocol using TPGS, N-Acetylcysteine and vitamin B12.

CHARACTERIZING DECAY OF THE TOXIC RNA THAT CAUSES MYOTONIC DYSTROPHY. Megan L. Helf, Mark Gallo, Niagara University, Annie Zhang, Carol J. Wilusz, Colorado State University.

Type 1 myotonic dystrophy is a multisystem inherited disease caused by the expansion of CTG repeats within the 3'UTR of the DMPK (Dystrophia Myotonica Protein Kinase) gene. The CTG repeats are transcribed into long CUG repeats that sequester RNA binding proteins (RBPs) and result in accumulation of both the mutant DMPK mRNA and its associated RBPs in nuclear foci. It was thought that the mutant DMPK mRNA is restricted to nuclear foci but recent findings from the Wilusz lab suggest that some mutant transcripts are transported into the cytoplasm. The long term goal of this project is to test the hypothesis that the extended 3'UTR in the mutant DMPK mRNA triggers nonsense-mediated decay in the cytoplasm and prevents accumulation of the transcript in that compartment. Nonsense-mediated decay happens in the cytoplasm and triggered by premature stop codon, leading to decay of mRNAs. The goal of my project was to knockdown an essential factor of the nonsense-mediated decay pathway, Upf1, in mouse myoblasts. Plasmids encoding small hairpin RNAs (shRNAs) that target Upf1 were transfected into the cells. Upf1 knockdown was observed by the use of western blot and qRT-PCR. Upf1 expression was reduced by 50-70% at the mRNA level. Future experiments will aim to determine whether the half-life of reporters bearing the wild type or mutant (700 CUG repeats) DMPK 3'UTRs is impacted by Upf1 knockdown. Targeting mutant DMPK mRNA for decay is a promising method to treat myotonic dystrophy. Understanding the natural route of decay will support development of this type of therapy.

CITRATE CONTENT OF BONE: A POTENTIAL MEASURE OF POST-MORTEM INTERVAL. Shawn Hennessy[1], Charles Froome[1], Rebecca Gerling[1], Ann Bunch[2], Michael Brown[1], [1]Department of Chemistry and Biochemistry, The College at Brockport, SUNY, Brockport, NY, 14420, [2]Criminal Justice Department, The College at Brockport, SUNY, Brockport, NY, 14420.

The post-mortem interval (PMI) of skeletonized remains is a crucial piece of information that can help establish the time dimension in criminal cases. Unfortunately, the accurate and reliable determination of PMI from bone continues to evade forensic investigators despite concerted efforts over past decades to use qualitative and quantitative methods. Schwarcz et al. developed a method based on the analysis of citrate content of bone.[1] They reported that the citrate content of bone decreases with an increase in PMI and that the rate does not depend significantly on storage conditions.[1] Kanz et al.[2] performed an external validation study of this method on bones with PMIs ranging from ~27 to 52 years. Their results suggested that the "accuracy of PMI determination was unsatisfactorily low."[2] The main objective of our research is to externally validate the citrate content PMI method and optimize where needed. More than 50 samples from the University of Tennessee Knoxville Forensic Anthropology Center and the Onondaga County Medical Examiner's Office were analyzed in this research. The bone samples were prepared

using the procedures utilized by Schwarcz et al. with slight modifications to improve method performance. The citrate content (wt%) of each bone sample was determined by a UV-Vis enzyme assay and by high-performance liquid chromatography (HPLC). Initial studies focused on the assessment of method accuracy, precision, detection limit, spike recovery and the determination of citrate for samples with PMI with 2 years or less. Results from analyzing samples with PMI greater than 2 years suggest that the theoretical correlation between citrate content of bone and PMI is much weaker than reported by Schwarcz et al. though is similar to the results of Kanz et al. This method may still serve as a technique to sort ancient from more recent skeletal cases, after further, similar validation studies have been conducted.

This project is funded by the National Institute of Justice Grant #2013-DN-BX-K031.
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CARBON FLUX BY LEATHERLEAF (*CHAMAEDAPHNE CALYCULATA* (L.). MOENCH FROM A SIMULATED BOG ECOSYTEM. Samantha Herrick, and James Wolfe, Department of Biology, Houghton College, Houghton, NY 14744.

Scenarios of increases in carbon flux under scenarios of global climate change and nitrogen pollution have been proposed by various researchers. We measured concentrations of ammonium and nitrate in two local bogs in Allegany County – Moss Lake and Hanging Bog. We also set up a simulated bog ecosystem in the college greenhouse to examine carbon flux from leatherleaf (*Chamaedaphne calcyulata*), the main structural component of the bog mat. Field sampling from the two bogs showed low levels of nitrate and ammonia. When we added N^{15}-labeled potassium nitrate to the simulated bog ecosystem, we found that night-time flux of carbon dioxide increased significantly ($p < 0.03$) from 29 to 60 ppm. We did not see an change in C:N ratios (35.3), but these values similar to those reported in the literature. Changes in labeled nitrogen in the leaves of leatherleaf were not found. We conclude that nitrate addition to leatherleaf can increase carbon flux and suggest that further field experiments be done to confirm our lab findings for a field setting.

A SURVEY OF THE TUNDRA FLORA OF MOUNT FAIRPLAY IN ALASKA. Samantha Herrick, Lauren Weber, and James Wolfe. Department of Biology, Houghton College, Houghton NY 14744.

Surveys of the flora of Alaska have focused mostly on federally protected areas. In June 2015, we surveyed the flora of Mount Fairplay, a 5,499 foot mountain on state land in close proximity to the Taylor Highway in central southeastern Alaska. Most of the mountain is covered with alpine tundra. A total of 76 taxa were recorded and herbarium specimens collected, representing 20 different plant families. The Ericaceae were the most common family represented but we found genera in the Lycopodiaceae, Scrophulariaceae, and Polygonaceae. Some species were common (e.g. *Betula nana*) while others were locally rare (e,g. *Polygonum viviparum*). While there are no maintained trails to the summit, the area is used by local residents for hunting,

hiking, and berry collecting. A brochure is in preparation for use by the Alaska Fish and Game office in Tok. This checklist of flora can also serve as a baseline for reference for future studies of possible ecosystem change with a changing climate.

GROWTH AND OPTICAL PROPERTIES OF $YBFE_2O_4$ THIN FILMS. Josh Hinz and Ram Rai, Physics Department, SUNY Buffalo State, 1300 Elmwood Ave., Buffalo, NY 14222.

Research on thin films of functional materials is important for the development of future technologies. A material of interest studied here is Ytterbium-Iron-oxide ($YbFe_2O_4$), which is expected to show multiferroic properties that arise due to an even distribution of Fe^{2+} and Fe^{3+} valance states found within the triangular lattice structure. The goal is therefore to investigate the unique properties of $YbFe_2O_4$ thin film by probing the optical spectra of the material at various temperatures. Using a solid state reaction $YbFe_2O_4$ compound was achieved. The material was then deposited on Sapphire substrates using an electron beam deposition technique to produce 100 nm thick film samples. Measurements of absorption, reflectance, and transmittance of the $YbFe_2O_4$ films were conducted in the temperature range of 10 – 450 K. The optical spectra showed evidence of Fe d to d on site transitions as well as O 2p to Fe 3d, Yb 6*s*, and Yb 5*d* charge-transfer transitions. In addition, the optical spectra exhibit a strong temperature dependence of the energy gap associated with the Fe d to d transitions, indicating a structural distortion as well as a possible magnetic transition at ~240 K. Further investigation of $YbFe_2O_4$ films is needed to capture the full set of properties of this material.

CONVENIENT SYNTHESIS OF BIODEGRADABLE GLYCOPOLYMERS. Grace Hollenbeck, Sarah Rexroad, Ethan Kent, Jason Orlando, and John Rowley, Chemistry Department, Houghton College, Houghton, NY 14744.

Glycopolymers are a particularly interesting class of materials as they contain chemical functionalities that mimic signaling receptors on the surface of cells. Biodegradable glycopolymers that can degrade or be absorbed by the body have potential applications in drug-delivery, tissue engineering, and biomedical research. This report describes preliminary results for the synthesis of this class of materials via post-polymerization modification of polycarbonates with thiol-functionalized sugar moieties.

DENNING ACTIVITY OF BLACK BEARS IN THE FINGER LAKES REGION. Abbey Holsopple, Emily Jackson, Josh Vandervoort, and Nicholas Anderson, Environmental Conservation Department, Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

Denning is an important component of the black bear life. In Northern climates, dens provide shelter and protection during periods of low food availability and harsh weather. In this study, camera traps were used to capture pictures of three denning sows and their cubs as they emerged from their winter dens. These photos were used to qualify and quantify bear activity.

As data was analyzed, twelve distinct activities were documented for sows and cubs including some that are rarely reported in the literature. Final emergence dates were determined for each sow and suggestions are made for further research.

LIGHT, GOLD, AND LIPIDS: LIPOSOMAL PERMEABILITY STUDIES USING SURFACE PLASMON RESONANCE. Sandra Hunt-Yik, 67 Rand Avenue Upper, Buffalo, NY 14216 and Derek Beahm, 1300 Elmwood Avenue, Buffalo, NY 14222.

I am modifying surface plasmon resonance (SPR) techniques to develop a medium-throughput assay that will be used in the identification of compounds affecting membrane channels and transporters. SPR is a label-free technique that shows high sensitivity to mass changes on a surface and is widely used in the pharmaceutical industry to identify and characterize binding events between proteins and drug candidates. However, it has yet to be successfully applied to membrane proteins because it is difficult to immobilize enough of the protein on the sensor surface to detect one-to-one binding of small molecules. My intention is to overcome this limitation by making use of the fact that a single channel or transporter can facilitate the transport of many molecules into a vesicle. This allows for the indirect assay of inhibitor binding by measuring the effect the inhibitor has on total vesicle mass. This poster presents my experimental strategy and initial results in demonstrating the ability to detect mass changes in vesicles using SPR techniques. Specifically, I demonstrate the successful capture of biotinylated lipid vesicles onto a neutravidin surface and interpret changes in SPR signals in terms of excluded volume when vesicles are exposed to hypertonic solutions of membrane impermeable molecules, such as sucrose. Next, I show the time dependent increases in vesicle mass that occurs when exposing vesicles to membrane permeable molecules, such as glycerol or d-xylose. Finally, I show that d-xylose permeability is dependent on vesicle cholesterol content in a predictable manner. This experimental design allows for membrane permeability measurements and will be used to measure the facilitated transport of molecules by protein channels or transporters that have been reconstituted into the vesicle membrane.

STUDIES TOWARD AN AFFORDABLE PREPARATION OF D-VINYLGLYCINE. Samer Isa, Rebecca Ford, Ethan DeCicco, and Luis Sanchez* PO Box 2032, Department of Biochemistry, Chemistry, and Physics, Niagara University, Niagara University, NY 14109.

While life on earth is exclusively based on L-amino acids and D-sugars, it has recently been found that D-amino acid-containing molecules do exhibit a variety of important bioactivities. Natural antibiotics involving D-amino acids units have been isolated from bacteria and many reports have revealed the participation of D-amino acids in certain biological processes and cell functions. D-amino acids possess “unnatural” chiral centers that make them attractive as building blocks for the synthesis of bioactive compounds. Incorporation of D-amino acids into peptide chains and cyclic peptides can severely affect their interactions with biological targets and their slower degradation compared to the corresponding L isomers can be of great use in therapeutics.

D-amino acids are most commonly obtained via racemization of natural L-amino acids followed by chiral separation; however, production of commercially viable amounts is still complicated and expensive. In the specific case of vinylglycine, racemization is not a viable option due to isomerization. This project aims at developing a unique, inexpensive approach to synthesizing D-vinylglycine from L-serine as starting material. Given the exploitable reactivity of vinylglycine, ready synthetic access to the D enantiomer will provide the material needed to study its incorporation into peptides for late-stage site-specific structural modification and the synthesis of complex D-branched amino acid-like moieties.

SPINDLE FIBER ORIENTATION IN *LYTECHINUS VARIEGATUS* AND *EUCIDARIS TRIBULOIDES.* Whisper Jackson and Hyla Sweet, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester, New York 14623.

The complete cleavage in the eggs of sea urchins, making them holoblastic, and the radial cleavage patterns, making them isolecithal, give them a unique and symmetrical divide during the development of their embryos. Sea urchins experience a full and even cleavage, until the gastrulation stage, which varies little for different species. *Eucidaris tribuloides* is a species that shared a common ancestor with *Lytechinus variegatus* around 250 million years ago. They have clear embryonic differences, such as development time, micromere and skeletal formation. The purpose of this study is to determine if they also have differences in the first few hours of cleavage. Specifically, we tested whether the embryos of *Eucidaris tribuloides* and *Lytechinus variegatus* have distinct patterns within their mitotic spindle fiber arrangement. This would allow for the cells to split in very specific directions, resulting in the different appearances within the early embryos. The sea urchin eggs for both species were fertilized and the embryos were fixed in increments of 30 minutes. The mitotic divisions were observed by staining the embryos for chromosomes (DAPI), actin filaments (BODIPY-FL Phallacidin), and mitotic spindle fibers (anti tubulin). The stained embryos were then viewed under a confocal microscope where consistencies and discrepancies for mitotic spindle divisions were noted.

EVIDENCE OF STUDENT LEARNING WITH INTERACTIVE VIDEO VIGNETTES IN BIOLOGY. Jazrina Mohd Jasmi[1], Jean Cardinale[2], Robert Teese[3], L. Kate Wright[1], and Dina L. Newman[1], [1]Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623, [2]Department of Biology, Alfred University, 1 Saxon Dr., Alfred, NY 14802, [3]School of Physics and Astronomy, Rochester Institute of Technology, 54 Lomb Memorial Dr., Rochester, NY 14623.

The "Interactive Video Vignette" (IVV) is a new genre of learning tools in the form of interactive online video with tutorials. We have created a series of IVVs targeted to students undertaking foundational biology courses for prior-to-class priming activity with in-class follow-ups of particular biology concepts. This study aims to evaluate students' understanding of a biology concept before and after watching the IVV. Introduction to Biology I students (N=111) were given a pre-course assessment containing items specific to concepts discussed in seven different IVVs. They were then assigned to watch the IVVs at times appropriate to the material being covered in the course. Regular course exams include the same questions to evaluate learning after exposure to IVVs. IVVs were designed to target areas of known difficulty for students, and pre-test data confirms that introductory biology students struggle with these ideas. To date, both pre and post test data have been collected only for the first IVV ("Why is my Phenol Red Yellow?" on the topic of buffers), but student participants did show improved understanding of the core concepts after watching the IVV. Further analysis indicated that some assessment questions might be reworded for clarity and that some concepts might be less clear than others. Future work will include developing follow-up activities addressing gaps of understanding of a particular biology concept identified from the analysis and testing of the six remaining IVVs.

RESPONSE OF LEAF LITTER PRODUCTION TO NUTRIENT ADDITIONS IN NORTHERN HARDWOOD FORESTS. Panmei Jiang, Yang Yang, and Ruth Yanai, Forestry, Forest and Natural Resources Management, SUNY ESF, 1 Forestry Drive, Syracuse, NY 13210.

Temperate forest productivity is assumed to be more limited by nitrogen than phosphorus, but this assumption has rarely been tested and anthropogenic N deposition is likely to tip the balance towards P limitation. We measured leaf litter production, which is greater than wood production or belowground production, in response to N, P and NP additions in 11 northern hardwood stands in the White Mountains of New Hampshire. Leaf litter was collected in 2005, 2009 and 2010 pre-treatment and from 2011 to 2014 post-treatment. We tested treatment effects in total litter production and litter production by species. We found that in mature stands at both Jeffers Brook and Hubbard Brook Experimental Forest, there was greater litter production in 2014 in plots amended with N but not P. We are in the process of exploring patterns in the longer time series, controlling for differences in pre-treatment litter production.

THEORETICAL ANALYSIS OF PLASMONIC SOLAR CELLS. Nicholas C. Jira, and Carolina C. Ilie, SUNY Oswego, Department of Physics.

Thin film solar cells are an ideal form of solar cells, utilizing the sun's energy with a reduced amount of materials and cost. However, their extreme wafer-thin build lacks the absorption efficiency needed to make them a viable energy source. One particular light trapping method employed involves depositing metallic nanoparticles on the cell's semiconductors surface, harnessing the power of Localized Surface Plasmons (LSPs). The LSPs scatter incoming light off nanoparticle sizes smaller than the wavelength of light. Here in, the properties of plasmons and their applications to increasing the optical length of thin film solar cells are discussed in detail. The characteristics of different nanoparticles were theoretically analyzed using plasmon frequency for dispersion curves. In addition, the theoretical scattering cross sections of nanoparticles embedded on a silicon substrate were done using a Boundary Element Method (MNPBEM toolbox) in MATLAB. The resulting calculations show the unique properties of each metallic nanoparticle due to LSPs.

MICROWAVE SYNTHESIS OF METAL-ORGANIC FRAMEWORKS. Adam J. Johnson, Aubree G. Schrader, and Carly R. Reed, 350 New Campus Drive, Department of Chemistry and Biochemistry, The College at Brockport, Brockport, NY 14420.

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

The synthesis of a series of metal-organic frameworks was explored via microwave irradiation. It was found that product yield depended on ramp time, hold time, cool time, temperature, as well as solvent. The products will be characterized using elemental analysis, infrared spectroscopy, and x-ray crystallography.

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CHOLESTOSOMES: A NOVEL APPROACH OF ANTIBIOTIC DELIVERY AGAINST METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS.* Jennifer[1] Kahi, Julie Hughes[1], Fraser McArthur[2], Mark Bryniarski[2], David Jacobs[2], Patricia Holden[2], Jerome Schentag[2] Mary McCourt[1], and Lawrence Mielnicki[1], [1]Niagara University, Department of Chemistry, Biochemstry and Physics; [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences.

Prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in the world continues to rise. A novel treatment strategy for MRSA is to develop a more effective delivery method for the current battery of antibiotics. Here, we describe Cholestosomes (CH), a novel delivery method to enhance the uptake of vancomycin (V) into cells.

CH were made from cholesteryl myristate and cholesteryl laurate by a modified reverse phase evaporation method using ether and aqueous antibiotic. Uptake into mammalian cells was assessed after incubation of MCF7 cells, with free or encapsulated, fluorescently labelled (FITC-V) for 24 hours. Cells were then washed and imaged. The minimum inhibitory concentrations (MICs) of free FITC-V and cholestosome encapsulated FITC-V (CH-V) were determined by standard microbroth dilution on four clinical isolates of MRSA.

CH-V, (0.83 µg/mL) entered cells within 24 hours of incubation. In contrast, free FITC-V at 83 µg/mL was hardly detectable within the same time frame. Thus, CH appear to enhance intracellular delivery of the drug 100-fold. MICs were obtained to assess whether enhanced drug uptake conferred increased potency for V against MRSA. CH-V had MIC values of 0.5-4.0 µg/mL against the same MRSA strains that had free-V MICs of 1.0-8.0 µg/mL.

V was encapsulated within a novel lipid particle, leading to enhanced cellular uptake. Encapsulation did not reduce the antimicrobial activity of V. In fact, this method has the potential to boost intracellular action of CH-encapsulated antibiotics. CH encapsulated contents may also be taken into chylomicrons. This may enable passage of the GI tract and oral delivery via lymphatics. This delivery method has been applied to ceftaroline, fosfomycin and tobramycin, as well as larger molecules and genetic materials, all of which have been successfully incorporated into CH. The ability to increase cellular uptake without loss in potency can be a game changer in antimicrobial drug delivery.

IDENTIFYING NEONATE AND JUVENILE ARCHOSAUR (REPTILIA; ARCHOSAURIA) MICROVERTEBRATE FOSSILS FROM GHOST RANCH, NM, USA. Robert Katz, Department of Biological Sciences, Shineman Center, 30 Centennial Drive, Oswego, NY 13126.

Adult skeletal features of vertebrates commonly do not fully develop until sexual maturity. As such, it is difficult to assign juvenile specimens to specific species and higher groups. A lack of identified neonate and juvenile archosaurs from microvertebrate fossil matrix likely reflects upon the effort in examining such material, rather than an absence of these taxa from such samples. The Hayden Quarry (HQ) preserves three ancient river channels that, due to high rates of sediment deposition, are a fruitful source of small, disarticulated archosaur material. Specimens from HQ were isolated from surrounding matrix using screenwashing techniques and a high-powered microscope, and then were catalogued by unique identification number, quarry, and collection date. Diagnostic characters were determined by comparing new specimens to known taxa from museum collections at the American Museum of Natural History and Stony Brook

University, as well as from descriptions and photographs in the literature. Additionally, possible ontogenetic features in juveniles are identified that can be correlated with structures in adult bones. So far, over 60 specimens have been isolated and identified as members of Dinosauria, Phytosauria, Drepanosauridae, and Tanystropheidae. The results of my research show that small archosaur material is present in microvertebrate samples, and can be identified at least to major group and, in some cases, less inclusive clades. The diversity of taxa present in samples from HQ captures both common and enigmatic groups, and preserves previously poorly known smaller taxa in three-dimensional detail.

PHENOTYPIC AND COMPLEMENTATION STUDIES OF PHO13 ACTIVITY IN BUDDING YEAST. Courtney Kellogg[1], Kimbria Blake[1], Suzanne F. O'Handley[1], and Austin U. Gehret[2], [1] School of Chemistry and Materials Science,
[2] Department of Science & Mathematics, National Technical Institute for the Deaf, Rochester Institute of Technology, Rochester, NY 14623.

PHO13 in *Saccharomyces cerevisiae* (bakers yeast) is a paranitrophenylphosphatase (pNPPase) within the haloacid dehalogenase (HAD) superfamily. The natural substrate for *PHO13* is currently debated but the enzyme has been identified in our lab to possess specific phosphatase activity to 2-phosphoglycolate, making it a phosphoglycolate phosphatase (PGPase). In photosynthetic organisms, 2-phosphoglycolate is generated by the oxygenation reaction of RuBisCO in the Calvin Cycle. To be recycled back into general metabolism, a photosynthetic PGPase must convert 2-phosphoglycolate to glycolate. In non-photosynthetic yeast, 2-phosphoglycolate must be generated by some other mechanism, possibly by oxidative damage to DNA. Regardless of its origin, 2-phosphoglycolate must be catabolized due to its ability to inhibit triose phosphate isomerase (*TPI*). Yeast cells lacking functional Pho13p (*pho13Δ)* are being investigated for a growth phenotype that supports *TPI* inhibition by elevated 2-phosphoglycolate: the inability to grow in the absence of exogenous inositol. In an effort to increase intracellular levels of 2-phosphoglycolate, yeast cells are being treated with hydrogen peroxide to induce DNA strain breaks and 2-phosphoglycolate generation.

THE EFFECTS OF TRICLOSAN ON CONDITION, FUNCTION AND ANTI-MICROBIAL RESISTANCE OF EPILITHIC BIOFILM. David Kerling and Jonathan O'Brien, Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY 14208.

Triclosan is the active ingredient in antibacterial hand soaps and can reach detectable levels in many waterways. Because of its antimicrobial nature, triclosan is expected to have an impact on microbially mediated ecosystem processes. We assessed the effect of triclosan on epilithic biofilms collected from Cattaraugus Creek. Biofilms were incubated for 3 weeks at four concentrations of triclosan (0.0, 0.1, 1.0 and 10 □g/L), representing the full range of concentrations observed in rivers and streams. Biofilm condition (chlorophyll a and AFDM) and function (including photosynthesis, respiration, nitrate and phosphate uptake, and extracellular enzyme activities) were measured at the end of the incubation. Triclosan significantly reduced the chlorophyll content and autotrophic index of the biofilms relative to control, but did not appear to affect measures biofilm function. Interestingly, bacteria from the biofilms did not show triclosan resistance regardless of the treatment level (i.e. most bacteria in the biofilm are still susceptible to the antimicrobial effects). Subsequent assays indicate that culturable bacteria from the biofilms did not show reduced growth until triclosan concentrations reached 100 □g/L. Our

data indicate that triclosan concentrations at observed levels may not be sufficient to reduce biofilm growth and function in rivers and streams.

EFFECT OF NANOSIZE DOPANTS TO THE SOLVENT DIFFUSION THROUGH A SILICA SOL-GEL MATRIX. Sungah Kim, Kun il Chung, and Kazushige Yokoyama, Department of Chemistry, 1 College Circle, SUNY Geneseo, Geneseo, NY 14454.

Effective delivery and direct injection of a drug to a targeted region of living cells is a challenging issue, especially, the efficiency of a drug can be significantly reduced by a damage caused by the strongly acidic or basic conditions. Therefore, an acid/base resistant drug-carrying device needs to be designed and studied. Silica based sol-gel is regarded as an excellent heat resistant material that fits the above mentioned chemical environment. Aiming to design a drug delivering capsule with controlled diffusion rate at highly acidic (or basic) condition, the diffusion rate of the solvent (acid or base) reaching into the cavity of the silica based gel material was investigated. Instead of a drug, a fluorophore, thioflavin T (ThT), was used as a "host" to probe the condition inside the silica based sol-gel cavity through a measurement of fluorescence decay time. The change in lifetime of the ThT was measured as the solvent penetrated into the sol-gel matrix. The dynamics of the host particle was sensitively changed as the size of the guest gold nanoparticles (dopants) ranged between 10 and 100 nm. The diffusion rates and the guest particle sizes did not exhibit simple linear relationship, however, the rate maximized when the guest particle size was around 15 nm.

CHRONIC NITRATE CONCENTRATIONS ALTERS THE COMPOSITION AND FUNCTION OF RIVER BIOFILMS. Ryan Koch[1], David Kerling[1], and Jonathan O'Brien[1], [1]Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY 14208.

Nitrogen transport by streams and rivers contributes to eutrophication and hypoxia in downstream lakes and marine areas; however in-stream nitrate (NO_3^-) processing by river biofilms can slows the rate of transport. We assessed the effect of chronic NO_3^- loading on epilithic biofilm characteristics. Cobble substrates were collected from Buffalo Creek (western NY) and incubated for 3 weeks at four nitrate loads (0.05, 0.5, 5 and 25 mg/L) in laboratory mesocosms. Increased chronic NO_3^- led to the formation of thicker, algae dominated biofilms, demonstrated by greater rates of photosynthesis and chlorophyll contents. The resulting increase in autotrophic index and P:R ratios indicate a shift of the algal biofilm towards a more autotrophic state. In this transition, biofilms shifted from a diatom dominated community, to one dominated by green algae and cyanobacteria. Nitrate also increased heterotrophic activity of the bacteria, increasing the rates of extracellular enzyme activity and rates of heterotrophic respiration. While NO_3^- uptake rates did not change substantially across treatments, our results show that chronic nitrate loading decreased the biofilm's affinity for nitrate per unit of biological activity (photosynthesis, respiration). The increasing NO_3^- loads caused a change in the algal community, the physiology of the biofilm, and lastly the relationship between the algae and bacteria. Taken together, these results provide a set of potential mechanisms for the efficacy loss pattern.

ANALYZING EASTERN HELLBENDER HABITAT. Megan Kocher, SUNY at Buffalo State.

The Eastern Hellbender (*Cryptobranchus alleganiensis*) is a large salamander that is native to North America. Hellbenders are fully aquatic, inhabiting cool rivers and streams, and depend heavily on the conditions of these waters. Large flat rocks lining the streambed provide shelter and protection for these animals and therefore the salamanders are very sensitive to substrate size and composition. Although the importance of large shelter rocks to hellbenders is well-established, little is known about the role of finer sediments in hellbender habitat suitability. Local populations of hellbenders in New York State have been declining over the past several decades, particularly in the Susquehanna watershed. Increasing our understanding of substrate characteristics in hellbender habitat would improve conservation efforts for local populations. Surveys were completed to characterize substrate at sites of potential hellbender habitat. Pebble counts, along with visual estimates of substrate size and embeddedness, were conducted in seven sites in the Susquehanna watershed, three of which are thought to still have hellbenders present. One additional survey was conducted in the Allegheny watershed, where hellbender populations are more stable. Overall, results showed a wide range of substrate conditions, but boulders and larger rocks that make streams habitable for hellbenders were present at low densities in most sites. Many of the larger rocks were found to be either completely embedded by surrounding substrate or not embedded enough to be used for shelter. Better understanding of the substrate characteristics in these sites will help to improve hellbender conservation efforts in New York and beyond.

PHYLOGENETIC CHARACTERIZATION OF BACTERIAL BIOFILMS FROM THE NIAGARA RIVER. Matthew Lanning and Dr. Mark Gallo.

This study analyzes the early formation of biofilms on plastic in freshwater environments. Six plastic types (Polyethylene Terephthalate, PET; High Density Polyethylene, HDPE; Polyvinyl Chloride, PVC; Low Density Polyethylene, Polypropylene, and Polystyrene) were placed into the lower Niagara River in Lewiston, NY. At the end of each trial the samples were removed from the river and DNA was isolated for 16s rRNA. Pyro-sequencing was then performed and statistical analyses were carried out based on the acquired operational taxonomic units.

CONSTRUCTION OF A PSEUDOMONAS AERUGINOSA NARI DEFECTIVE MUTANT. Danny Lee, Nicholas Gregorio, Lori Kim, and Johanna Schwingel, PhD, Department of Biology, St. Bonaventure University, St. Bonaventure, NY 14778.

Pseudomonas aeruginosa is a bacteria that is found widespread in the environment and can cause a variety of infections. Patients with cystic fibrosis are especially susceptible to P. aeruginosa. This bacteria utilizes a nitrate reductase pathway during anaerobic respiration. This pathway is important in biofilm formation and growth. P. aeruginosa biofilms can increase virulence during infections. Nitrate reductase is made up of a series of membrane associated proteins and functionally utilizes a molybdenum cofactor (MoCo). Our team postulated that the MoCo biosynthetic pathway utilizes the nitrate reductase membrane association as a docking site during biosynthesis. Through previous experiments, it was shown that nitrate reductase proteins, NarG and NarH, were not required to localize the MoCo pathway to the membrane. Therefore, we hypothesized that NarI, an integral membrane protein, might be the protein that keeps the MoCo protein complex together and localized to the membrane. To test this, we need to construct a narI mutant. We began by TA-cloning the narI gene and flanking upstream and

downstream regions into pGEM-T. This plasmid underwent restriction digest, removing narI, resulting in the mutant construct. The narI mutant construct was then cloned into pEX18Ap, a P. aeruginosa gene replacement vector. This resulting narI mutant construct plasmid will be electroporated into wild-type P. aeruginosa for mutant selection. The localization of MoCo biosynthetic proteins in a strain lacking NarI can then be studied in vivo.

THE ROLE OF THE NUCLEAR GENES *CLU1*, *RTD1* AND *DNM1* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN SACCHAROMYCES CEREVISIAE. Nate Leisenring, and Dr. Ray Sia, Nate Leisenring- 32 Chesterton Rd., Rochester, N.Y, 14626.

Mitochondria are vital organelles to organisms that obtain energy through the oxidation of various carbon sources. Mitochondria are membrane bound organelles, in which the process of oxidative phosphorylation is localized. Oxidative phosphorulation is the most effective method of producing energy for most heterotrophic organisms. Some organisms, such as facultative anaerobes, can alternate between anaerobic and aerobic respiration, depending on the resources available to them at the time. *Saccharomyces cerevisiae* aka budding yeast, the model organism used for the purpose of carrying out this research, has the ability to switch between fermentation, which is its preferred method of producing energy, and oxidative phosphorylation. When the necessary carbon sources needed for the yeast cells to carry out fermentation are not available, however, the yeast will switch to using an alternate carbon source, such as glycerol, to undergo oxidative phosphorylation. Mitochondria contain their own set of DNA, which encodes for the necessary RNA and proteins needed to carry out the process of oxidative phosphorylation. The role of various nuclear-encoded genes were examined, to determine whether they played a role in the mitochondrial genome stability in budding yeast. *CLU1*, *RTG*1 and *DNM*1, were the mitochondrial genes in question for the case of this research. The *CLU*1 gene encodes for a protein that associates with the core complex of elF3, also known as the eukaryotic transcription initiator factor 3, which plays a role in the initiation of the translation of mRNA. The phenotype of the *clu1*Δ deletion strain results in a clustered mitochondria, rather than a spread out, interconnected network. *RTG1* encodes for a transcription factor, which is responsible for inter-organelle communication and also contributes to communication between the mitochondria, peroxisome, and nucleus, through the mitochondrial retrograde signaling pathway. The final gene, *DNM*1, is involved in mitochondrial fission. Five mutant deletion strains of were tested, *clu1-3* and *clu1-5* containing *clu1*Δ gene knockouts, *rtg1* gene deletion strain, and *rtg1 dnm1* double deletion strain. Each mutant strain was tested on either the media YPD, which contains dextrose as the carbon source, or YPRaff, which uses raffinose as the carbon source. They were then plated on YPGlycerol +0.2% Dextrose, in order to determine the percentage of yeast cells that lost the ability to switch to oxidative phosphorylation, once all of the dextrose was used up and only glycerol was left in the media. Petite colonies observed, had lost the mitochondrial stability in the absence of the target gene, and thus lost the ability to undergo oxidative phosphorylation and ceased growth. It was found that all of the strains grown on both YPD and YPRaff displayed an increase in spontaneous respiration loss. Each strain grown on YPRaff, in most cases showed a notably higher rate of spontaneous respiration loss, than when the same strains were grown on YPD. This shows that each of the nuclear-encoded genes studied plays an essential role in maintaining the mitochondrial stability in budding yeast.

SURFACE MODIFICATION OF THE LANDFILL WASTE POLYSTYRENE WITH VACUUM UV PHOTO-OXIDATION AND GRAFTED WITH POLY(ACRYLIC ACID).
Xinyun Li[(a)], Marc Toro[(a)], Fei Lu[(a)], Jung On[(a)], Alla Bailey[(a)], Thomas Debies[(b)], Michael Mehan[(b)], and Gerald A. Takacs[(a)], [(a)] School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, New York 14623, USA, [(b)] Xerox Analytical Services, Xerox Corporation, Webster, New York 14580, USA.

Polystyrene (PS) is one of the most widely used thermoplastic polymers and is often not recycled because of its lightweight and low scrap value. The discarded PS in landfill sites has limited capacity for water adsorption, and physical and chemical properties that make it relatively inert and virtually unaffected by naturally occurring degrading agents and sources. Pretreatment of the surface of PS to increase its wettability and introduce reactive functional groups may make the waste more susceptible to degradation and useful for technological applications [1, 2].

This research modified PS surface with Vacuum UV (VUV) photo-oxidation using the wavelengths 104.8 and 106.7 nm emitted from excited argon atoms. X-ray photoelectron spectroscopy (XPS) detected an increase in the atomic % of O on the surface up to a saturation level of *ca.* 20 at%. Initially, C-O and carbonyl groups are observed by XPS due to the formation of alcohol, ethers, esters, and ketones. The hydrophilic (poly)acrylic acid was grafted onto modified PS surface.

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[2] E. Al Abdulal, A. Khot, A. Bailey, M. Mehan, T. Debies, and G. A. Takacs, "Surface Characterization of Polystyrene Treated with Ozone and Grafted with Poly(acrylic acid)", *J. Adhesion Sci. Technol.***,** DOI:10.1080/01694243.2014.970833.

THE ROLE OF THE ARYL HYDROCARBON RECEPTOR IN ORAL CANCER TUMOR GROWTH AND CHEMORESISTAMCE.
Elizabeth L. Lindsay, Dr. Elizabeth Stanford, and Dr. David Sherr, SUNY The College at Brockport, Boston University, School of Medicine, School of Public Health, Environmental Health.

The aryl hydrocarbon receptor (AHR) has been shown to play a role in cancer initiation and progression in oral squamous cell carcinomas (OSCC), and other cancers. The AHR is activated by environmental toxins, including polycyclic aromatic hydrocarbons, which are commonly found in cigarette smoke. It is hypothesized that activation of the AHR by these environmental toxins can contribute to the growth and chemoresistance of OSCCs. Nude mice tongues were injected with a human OSCCs cell line, SCC2s, and treated with an AHR antagonist at 25mg/kg daily via oral gavage. Primary tumor growth was measured via calipers and IVIS imaging. RT-qPCR analysis of the harvested tongue tumors and livers was used to examine the activity of the AHR by quantifying the expression levels of *Cyp1b1* and *Cyp1a1*. Based on the results of the *in vivo* experiments, continued testing was conducted to examine the role of AHR inhibition in chemoresistance. Using MTT cell viability assays coupled with dosing of commonly used chemotherapeutics, the effects of the AHR on the chemo-resistance of SCC2s was tested. Three commonly used chemotherapeutics were tested at various dose ranges: Cisplatin (0-10uM), doxorubicin (0-1uM), and 5-Fluorouracil (0-10uM). In addition, cells were co-treated with an

AHR antagonist (5uM CH223191) and the chemotherapeutic to determine if decreasing AHR activity increased chemotherapeutic efficiency. ANOVAs were used to evaluate the significance of AHR activity on the effectiveness of the chemotherapeutics. It was determined that AHR antagonism with CB7993113 significantly affected OSCC primary tumor growth *in vivo*. Additionally, it was found that both *Cyp1a1* and *Cyp1b1* expression decreased after treatment with CB7993113 when compared to vehicle alone in the tongue. In the liver, it was found that both *Cyp1a1* and *Cyp1b1* expression also decreased after treatment with CB7993113 when compared to vehicle alone. Interestingly, we also found that decreasing AHR activity with an AHR antagonist CH223191 in addition to treatment with a chemotherapeutic lead to a significant increase in cell death when compared to treatment with the chemotherapeutic alone. This phenomenon was observed in three different frontline OSCC therapeutics. These novel findings implicate the AHR in OSCC initiation and growth, also supporting the development of AHR modulators as potential chemotherapeutics. Overall, these findings support the hypothesis that the activation of the AHR is linked to tumor growth of oral squamous cell carcinomas as well as contributing to the potential chemoresistance of these cells.

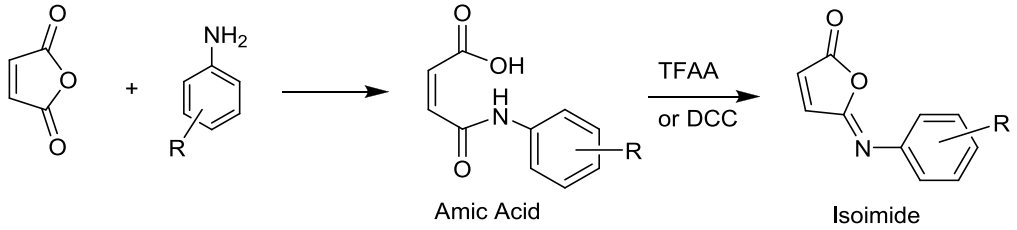
PLASMID CHARACTERIZATION IN *STAPHYLOCOCCI* ISOLATED FROM WHITE TAIL DEER. Bianca Marrara and Mark Gallo, Niagara University Department of Biology, Niagara University, NY 14109.

Staphylococcus, a well-characterized gram-positive bacteria, can be found in a multitude of environments including on skin, hair, respiratory and gastrointestinal tracts. These bacteria are found on many warm-blooded animals, including white tail deer, *Odocoileus virginianus. Staphylococcus* has a diverse genetic composition, and many species, sub-species and strains have been identified. The differences in the phenotype of the bacteria can be attributed to genome composition. Knowing that this bacteria can act as an infectious agent causing a wide-number of diseases and illnesses such as MRSA, it is intriguing to ask questions regarding the location of the genes responsible for its pathogenicity and virulence. By collecting samples from local deer, unique strains of *Staphylococcus* were obtained and used for comparison of antibiotic resistance mechanisms typically found to be located extra-chromosomally on plasmids. To address this idea, plasmid isolation and characterization, as well as PCR were performed as initial steps in the characterization of the genes present within the isolated plasmids.

SYNTHESIS AND REACTIVITY PROFILE OF ISOIMIDES : TOWARDS A STRUCTURE REACTIVITY RELATIONSHIP FOR POLYISOIMIDR MATERIALS. Alexander Mazanek, John Kreuz, and David G. Hilmey, 3261 W. State Road, St. Bonaventure University, Department of Chemistry.

Polyimides, such as the DuPont polymer Kapton®, are widely used compounds in materials science for their general non-reactivity. However, this stability results in poor solubility, making the polyimide utility limited. Polyisoimides, are more reactive than polyimides, but have increased overall solubility, and can be easily converted to polyimides. In an attempt to study the polyisoimide reactivity, we are synthesizing isoimide model compounds with different substituents, and then testing their reactivity when exposed to nucleophilic water and base. The reaction progress is tracked via ^{1}H NMR analysis with internal reference peaks. Results currently show that electron donating groups decrease the reactivity of the isoimide. Ultimately,

a structure-activity relationship will be developed to help identify more stable, useful isoimides for practical polymer use.



ROLE OF THE NUCLEAR GENE *RAD55* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE*. Kyle McAtee and Dr. Rey Sia, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Mitochondria are organelles present in eukaryotic cells. Through the process of cellular respiration mitochondria produce ATP. This high-energy molecule is vital for the completion of many cellular processes. Therefore, mitochondria are essential for the survival of eukaryotic cells. Uniquely, mitochondria contain their own DNA (mtDNA) separate from the DNA housed in the nucleus of the cell. Mutations in mtDNA have notable connections to several human pathologies. Specifically, mtDNA mutations are thought to play a role in various neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene *RAD55* in maintaining mtDNA in budding yeast, *Saccharomyces cerevisiae*. The protein product of *RAD55* cooperates with several other proteins to bring about the recombinational repair of DNA double-stranded breaks (DSBs). Specifically, *RAD55* is a member of the *RAD52* epistasis group that functions as a heterodimer with Rad57p. The Rad55p/57p heterodimer, which is subject to regulation by DNA damage checkpoints, promotes Rad51p filament assembly on single-stranded DNA (ssDNA) through the formation of nucleation sites on ssDNA at resected DSBs. Once assembled, Rad51p filaments displace Replication Protein A (RPA) from ssDNA and its recombinase activity is initiated. To determine the effects *RAD55* has on the stability of mtDNA, two assays were performed. The first assay was performed to measure the percent of spontaneous respiration loss in *rad55*Δ mutants. The lab observed that *rad55*Δ mutants did not show a significant increase in spontaneous respiration loss compared to that of the wild type. An additional direct repeat-mediated deletion (DRMD) assay was performed to determine if Rad55p plays a role in stabilizing the mitochondrial genome from mutations caused by recombination events. It was discovered that the rate of DRMD events for the nuclear genome increased nearly five-fold compared to that of the wild type. Additionally, the lab found that the rate of DRMD events for the mitochondrial genome decreased by approximately two-fold compared to that of the wild type.

DIVERSITY IN *VACCINIUM OXYCOCCOS* L. AND *SARRACENIA PURPUREA* L. IN BOGS OF THE NORTHEASTERN UNITED STATES. Rachel McClatchey and James Wolfe, Department of Biology, Houghton College, Houghton. NY 14744.

In the northeastern United States, ombrotrophic *Sphagnum* bogs are widely scattered and geographically isolated. Little wetland habitat connects these bogs. Many of the plants in these bogs either spread clonally or disperse seeds by water, so populations are liable to become

genetically isolated from each other. The genetic intraspecies relatedness of *Vaccinium oxycoccos* L. (Bog Cranberry) and *Sarracenia purpurea* L. (Purple Pitcher Plant) was evaluated using RAPD analysis of 8 different polymorphic primer locations. Samples were collected from Moss Lake and Allenberg Bog in western New York, Lake Colby in the Adirondacks of New York, and Bear Lake in northern Michigan. Pitcher Plant samples were also collected from Hanging Bog in western New York. For *V. oxycoccos,* the dendrogram based on Nei's genetic distance indicated that Moss Lake and Allenberg Bog populations were most closely related, followed by Lake Colby and Bear Lake. Thus, the genetic relatedness seems to be geographically correlated, as expected. The genetic diversity among the populations was fairly high (H_s = 0.4198 ± 0.0615), as confirmed by Nei's unbiased genetic identity of 0.8124 (±0.0687) and Shannon's information index (I = 0.6090 ± 0.0669). Genetic diversity within the Allenberg Bog population was moderate (H_s = 0.3223 ± 0.2272, I = 0.4544 ± 0.3185), and within the Moss Lake population higher (H_s = 0.4573 ± 0.0409, I = 0.6492 ± 0.0434), surprising because of the tendency of *V. oxycoccos* to reproduce clonally or to self-pollinate when setting seeds. Contrary to expectations, diversity within populations was not found to be significantly different from diversity among populations. As a species, however, *V. oxycoccos* in bogs of the northeastern United States was found to be strikingly genetically diverse.

For *S. purpurea*, the genetic diversity among the populations was moderate, and lower than for *V. oxycoccos:* (H_s = 0.2716 ± 0.1362), as confirmed by Nei's unbiased genetic identity of 0.8744 (±0.1061) and Shannon's information index (I = 0.4239 ± 0.1944). Pitcher plant genetic diversity within the Allenberg Bog population was very low (H_s = 0.0618 ± 0.1689, I = 0.0859 ± 0.2348), but within the Moss Lake population moderate (H_s = 0.3437 ± 0.2068, I = 0.4879 ± 0.2923). Despite being known as an outcrossed species, *S. purpurea* was less genetically diverse than *V. oxycoccos.*

METHOD DEVELOPMENT FOR ANALYZING PHARMACEUTICALS IN DRINKING WATER USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY. Christopher McMullen, Department of Chemistry, SUNY Oswego, Oswego, NY 13126.

In the 21st century many plastics, drugs, waste products and other manufactured materials come into contact with water in some way. One of the recent concerns in the Unites States is the presence of a variety of pharmaceuticals in drinking water. Regardless of the possible presence, there should be consistent monitoring of the levels of pharmaceuticals in drinking water, as the cocktail effect multiple compounds may have on humans but also the environment is unknown.

The goal of this project was to develop an analytical method to detect and measure the trace amounts of pharmaceuticals in drinking water. In this method, Solid Phase Extraction, SPE, was used for extracting and pre-concentrating the pharmaceuticals of interest from water samples and analyzed by High Performance Liquid Chromatography, HPLC, with UV/Vis detection. The pharmaceuticals that were specifically detected for included: acetaminophen, acetylsalicylic acid (aspirin), ibuprofen, caffeine, clofibric acid, and metformin. The results of this experiment consisted of achieving isolated detection of each pharmaceutical from a mixture all with an HPLC mobile phase consisting of 20% acetonitrile to 80% ammonium acetate. SPE was used prior to HPLC to lower the detection limit to ppb levels. As a preliminary step towards future analysis of water, a raw water sample was analyzed using the developed method, detection of one drug, metformin was identified. But further analysis needs to be done on multiple and recent raw water samples before a claim for the presence of metformin in raw water is made.

THE EFFECT OF SEED IDENTITY AND HABITAT STRUCTURE ON SEED SELECTION BY GRANIVOROUS ANIMALS AT RICE CREEK FIELD STATION (OSWEGO, NEW YORK). Kathryn McWilliams, Kayla Smith, and C. Eric Hellquist, Department of Biological Sciences, State University of New York at Oswego, Oswego, NY 13126.

Nutritional value can be a deciding factor in seed removal and predation by granivorous animals. In seasonal environments, like those of New York, organisms often shape their diets based on available food sources. We studied how seed foraging may change depending on location along a stone wall and within deer exclosures. We randomly located plots along a stone wall as well as 5 m and 10 m away from the wall (n = 5 for all locations). To study the magnitude of seed predation by deer, we placed a series of plots inside (n = 5) and outside (n = 10) a deer exclosure at Rice Creek Field Station (Oswego, NY). Corn (1.4 calories per corn kernel), peanuts (2 calories per peanut) and sunflower seeds (0.43 calories per sunflower seed) were used to test whether there was a nutritional preference by seed predators. Since a stonewall could provide a potential refuge for small granivores from predators, we expected that the seeds placed along the stone wall would be consumed more than in the plots farther from the wall. If seed predators removed seeds based on nutritional value, we expected to see the peanuts consumed more often. We also hypothesized that deer will have an effect on seed removal, with more seeds consumed outside the fenced exclosures. Preliminary data analysis suggests that distance from stonewalls does not have a significant effect on seed removal ($p=0.61$). Our data also suggest that deer are not having a significant effect on seed removal ($p=0.19$). Preliminary data indicate that there is a significant difference amount of seeds that are removed based on species identity ($p=0.01$). The corn kernels and peanuts were removed almost equally and the sunflower seeds are removed last.

DIGGING DEEPER INTO THE RELATIONSHIP BETWEEN SR45 AND GPX7 IN *ARABIDOPSIS THALIANA*. Sarah Metcalfe, Alicia Worthylake, and Xiao-Ning Zhang, PhD, Department of Biology, St. Bonaventure University, 3261 West State Rd, St. Bonaventure, NY 14778.

GPX7 is an antioxidant enzyme that catalyzes the reduction of H_2O_2 that is produced. Research has suggested that GPX7 helps protect against photooxidative stress and limits PCD due to pathogen invasion. SR45 is a splicing factor involved with alternative splicing and RNA metabolism. RNAseq analysis showed that GPX7 is upregulated by SR45. The goal of this experiment is to further study the relationship between GPX7 and SR45. We hypothesize that basal H_2O_2 levels will be higher in *gpx7* and *sr45-1* mutants compared to WT seedling. Also, it is expected that *GPX7* transcript levels will be lower in the *sr45-1* mutant than in the WT and transgenic lines. To begin this investigation, total RNAs were extracted, purified, and converted to cDNA with RT from an SR45 null mutant (*sr45-1),* two SR45-GFP transgenic lines (OX_1-1 and OX_1-9), along with the Col-0 wild-type. Primers were designed to study *GPX7* expression in each genotype using qPCR. The primers had an optimal temperature at 57.3°C and an efficiency of 58%. To investigate the change of expression levels in the different genotypes qPCR with *GPX7* primers was compared to qPCR with *GAPDH* primers, from this the relative fold increase in *GPX7* was calculated. The H_2O_2 levels of different genotypes in normal and stress conditions

were observed in seedlings from Col-0, *sr45-1*, and *gpx7* mutants (SALK_072007 and SALK_023283) using a DAB stain and compared to the WT coloration.

HOST GENOTYPE OVERSHADOWS INOCULATION TREATMENT EFFECTS ON FUNGAL ENDOPHYTE COMMUNITY STRUCTURE IN WHITEBARK PINES: A TEST OF THE COMMUNITY PHENOTYPE HYPOTHESIS. Ehren Moler[1,2], Keith Reinhardt[1], Ken Aho[1], [1]Department of Biological Sciences, Idaho State University, Pocatello, ID, USA; [2]Current address: Division of Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY, USA.

Whitebark pine (*Pinus albicaulis*), an ecologically important keystone tree species restricted to sub-alpine habitats of western North America, is faced with potential extinction due to the white pine blister rust disease. Inoculation with beneficial fungal endosymbionts has been shown to confer pathogen resistance to some plants. We tested the efficacy of an inoculation trial of whitebark pine seedlings with an endophytic fungal biocontrol using barcoded amplicon sequencing of rDNA. Endophyte communities from five replicated host genetic-families were investigated in Oregon, USA, four years after inoculation with the beneficial fungal biocontrol *Myrothecium roridum*. Inoculated seedlings were compared to non-inoculated control seedlings for differences in foliar fungal community structure and assemblage resulting from inoculation treatments and host genetics. Indicator species associated with inoculated seedlings were not detected in control seedlings, but no significant differences were found in measures of community structure between inoculated and control groups. When considered as the sole predictor of fungal community measures, host genotype explained 31% ($F_{4,74}$=1.43, p=0.021), 20% ($F_{4,74}$=4.65, p=0.002) and 19% ($F_{4,74}$=4.34, p=0.003) of the variation in multivariate endophyte community structure, diversity, and richness, respectively. Differences in phyllosphere communities remained significantly correlated with host genetics after controlling for spatial autocorrelation, micro-site, and physiological host-plant variables. Our results indicate that factors controlling community assembly differ across host pedigree, leading to similar seral assemblages of endophytes within host genetic families.

ROLE OF UBIQUITIN CHAINS IN MITOPHAGY INDUCTION IN YEAST SACCHAROMYCES CEREVISIAE. John Montemarano, Anas Awan and Eric Cooper, Department of Biology, Hartwick College, 1 Hartwick Drive, Oneonta, NY 13820.

Mitochondria numbers are regulated by both their biogenesis and their destruction. The latter is due to a process called mitophagy, in which mitochondria are specifically taken up into lysosomes and digested. There is increasing evidence that mitochondria are "tagged" with a chain consisting of the protein ubiquitin before being destroyed, but the exact function and type of ubiquitin chain is unclear. In addition, certain individuals with early onset Parkinson's disease have inherited a defective version of the gene encoding the protein Parkin, which is a ubiquitin ligase enzyme that flags mitochondria for degradation. We are studying the mechanism of ubiquitin-dependent mitophagy in the yeast Saccharomyces cerevisae. We obtained yeast mutants incapable of assembling ubiquitin chains through particular lysine residues to assess whether these types of polymers are necessary for mitophagy. For our experiments, we introduced a gene encoding a fluorescently-labeled version of the mitochondrial protein OM45 into these strains to monitor whether they can efficiently perform mitophagy.

POLLINATION BIOLOGY OF *SCAEVOLA PLUMIERI* IN VIEQUES, PUERTO RICO.
Adriana Morales, Colette Piasecki-Masters, Danielle Bucior and Susan Witherup, Ithaca College, 953 Danby Road, Ithaca, New York.

Scaevola plumieri is a Caribbean native species, occupying coastal dune habitats in the Greater and Lesser Antilles. We are interested in documenting the occurrence of populations in Puerto Rico and associated islands and exploring the possible impact of an invasive congener, *Scaevola taccada*, on the number, range, and genetic diversity of the native populations. As part of this research project, we have investigated the pollination biology of both species. Observational data including both identity and frequency of different insect visitors suggests that the native *Scaevola plumieri* attracts a greater diversity of pollinators than does *Scaevola taccada*, and additionally, *S. plumieri* attracts native species whereas *S. taccada* attracts generalist pollinators. We have also identified and quantified the pollen carried on different insect visitors to these species. This analysis suggests that some pollinators carry pollen from both species while others carry pollen from primarily *S.taccada*. We have also analyzed the pollen found on the stigmas of open-pollinated flowers of each species. The analyses are based primarily on data from the island of Vieques, P.R., and we aim to conduct similar analyses on the main island of Puerto Rico and on the island of Culebra.

CHARACTERIZATION OF THE IMPACT OF CARBON SOURCE ON BIOFILM FORMATION BY *ACETOBACTER* sp. DsW_54.
Sofia Magalhães Moreira[1] and Peter D. Newell[2], [1]smagalha@oswego.edu and [2]peter.newell@oswego.edu.

Drosophila suzukii is an invasive pest insect that feeds on ripening soft fruit in its larval stages causing an estimated $500 million damage in the USA each year. One contributor to the spoilage of fruits infested with *D. suzukii*may be the microorganisms associated with the insect. To learn more about these microbes, the bacterium *Acetobacter*sp. DsW_54 was isolated from the midgut of *D. suzukii* captured in a commercial raspberry field. This bacterium is capable of forming biofilms *in vitro*. Investigating the factors that affect biofilm formation, we aim to comprehend how the bacterium colonizes the host animal and spreads between hosts and infected fruits. The carbon source plays an essential role in the bacterial metabolism; therefore, it is expected to affect the biofilm formation. Biofilms were grown in a 96-well plate under static culture conditions for 24 hours. The basal medium contained 0.5% peptone and 0.5% yeast extract, and was also used as a positive control. The carbon sources used were: 1% acetate, 1% ethanol, 2% glucose, 1% lactate, and 2% mannitol. Bacterial growth was quantified by reading the optical density (OD) at 600 nm. Crystal violet was used as a stain to reveal the biofilm. Attached biofilm biomass was quantified by dissolving the stain from each well and reading the OD at 550 nm. The bacterial growth was high either with basal medium itself or when it was supplemented with ethanol, glucose, or mannitol. However, the growth was lower when the acids were added. The basal medium itself and supplemented with mannitol had the biggest biofilm formation. On the other hand, with the addition of acetate and glucose, the biofilms were not formed. With ethanol and lactate, the formation was intermediate. These results demonstrate that the carbon source has influence on the biofilm development, with glucose acting as an inhibitor and the basal medium a facilitator. As fruits vary in the type and concentration of sugar they contain, further studies are

necessary to elucidate how the inhibition of biofilm formation in the presence of glucose affects the *Acetobacter* transmission between hosts and infected fruits.

Keywords: *Acetobacteraceae,* colonization, invasive pest, *Drosophila suzukii,* glucose.

ANALYZING FOR CLOTHIANIDIN IN THE BIODEGRADATION OF THE NEONICOTINOID PESTICIDE, THIAMETHOXAM, BY *PSEUDOMONAS FLUORESCENS* AND *PSEUDOMONAS PUTIDA*. Janelle Muuse and Dr. Stephanie Zamule, 4245 East Avenue, Rochester NY, 14613.

Neonicotinoids—a class of widely used insecticides—are believed to be linked to colony collapse disorder (CCD) in honeybees. While the biodegradation of neonicotinoid pesticides has been studied, there has been little focus on toxic metabolites potentially generated through this process. In this experiment, we investigated whether the toxic metabolite clothianidin could be detected as a result of the degradation of thiamethoxam by *Pseudomonas putida* and *Pseudomonas fluorescens.* Cultures containing these bacteria were grown in half-strength nutrient broth containing 60mg/L of thiamethoxam for a 19 day period at 30°C. Samples were taken at days 1, 4, 7, 10, 12, 19 of incubation and were analyzed for both thiamethoxam and clothianidin with the use of High Pressure Liquid Chromatography (HPLC). The results showed that over this time period, *Pseudomonas putida* and *Pseudomonas fluorescens* took up approximately 50% of the thiamethoxam in the media, confirming previous findings. Clothianidin was not detected in any samples, however the presence of some unknown metabolite was detected that could be subjected to further research. The results of this experiment suggest that bioremediation of thiamethoxam by Pseudomonas putida and Pseudomonas fluorescens do not produce the toxic metabolite, clothianidin.

ROLE OF MATERNAL GRP170 CHAPERONES IN THE LARVAL DEVELOPMENT OF THE NEMATODE *CAENORHABDITIS ELEGANS*. Bradley Nesbitt and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

The nematode *Caenorhabditis elegans* has two loci encoding the large ER chaperone GRP170, the grp170a locus and the grp170b locus. Worms homozygous for a deletion allele of grp170a develop slower and show constitutive induction of the stress related Unfolded Protein Response (UPR), which suggests that loss of GRP170a results in defective protein folding. Nematodes homozygous for a deletion allele of grp170b develop normally and do not induce the UPR. A previous Buffalo State student, Kripa Asrani, demonstrated that homozygotes for deletion alleles at both loci can complete embryogenesis and hatch from eggs. These worms survive for several weeks but never mature past the first stage of larval development. Our hypothesis is that the dihybrid hermaphrodites which produce these embryos provide a maternal store of GRP170a and GRP170b in the eggs. This maternal GRP170 allows the double deletion homozygotes to complete embryogenesis. We further hypothesize that the maternal GRP170 reserves are diluted or lost as the *C. elegans* grow and without zygotic GRP170, the worms cannot develop into adults. However, Asrani's study did not determine whether maternally supplied GRP170a and GRP170b are equally important to embryogenesis at early larval development. To test this hypothesis I will investigate whether grp170a and grp170b have a different maternal effects. I will generate *C. elegans* that are heterozygous at one locus and homozygous for deletion alleles

at the second locus (grp170a$^{+/\Delta}$grp170b$^{\Delta/\Delta}$ and grp170a$^{\Delta/\Delta}$grp170b$^{+/\Delta}$). The development of grp170a$^{\Delta/\Delta}$grp170b$^{\Delta/\Delta}$ offspring from these heterozygotes will be compared to analyze the maternal effects of functional GRP170a versus GRP170b alleles. The goal of this study is to distinguish roles of the two grp170 loci during embryogenesis in *C. elegans*.

THE ROLE OF GRP170 CHAPERONES IN REGULATING SENSITIVITY OF *CAENORHABDITIS ELEGANS* TO PROTEIN FOLDING TOXINS. Nancy T. Nsengiyumva and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Chaperones, like the large ER chaperone GRP170, help maintain homeostasis and promote the health of cells by facilitating protein folding. Typically, loss of ER chaperones increases sensitivity to agents that disrupt protein folding such as the antibiotic tunicamycin which interferes with normal protein folding by blocking glycosylation. However recently, the GRP170b chaperone of the nematode *Caenorhabditis elegans* was shown to increase sensitivity to tunicamycin. Genetic deletion of the GRP170b locus makes the nematode more resistance to tunicamycin. Understanding how loss of GRP170b decreases sensitivity to unfolding proteins may provide insight into the role of this chaperone in normal protein metabolism. For my MA Thesis research, I will explore what types of protein folding poisons have enhanced toxicity due to GRP170b. I will investigate the original observation that worms lacking GRP170b are more resistant to the glycosylation toxin tunicamycin. I will extend this research to explore if other agents that cause protein misfolding in the ER also are affected by the loss of GRP170b. These will include agents that interfere with disulfide bridge formation, glycosylation and early chaperone interactions. The goal of my thesis research is to understand where GRP170 functions in the complex metabolism of ER protein synthesis, modification and folding.

LINKING ANTHROPOGENIC LAND USE WITH URBAN FOREST ECOLOGY. Michael Olejniczak and Dr. Robert Warren, SUNY Buffalo State, SAMC 123, 1300 Elmwood Ave, Buffalo, NY 14222.

Urban forests are poorly defined as ecological communities. Several parameters have been used to define urban forests, but substantive links between anthropogenic characteristics and forest ecology are lacking. ‘Urbanness’ is commonly defined by human population density or land use classification schemes, but their use is inconsistent throughout the literature, and none link with ecological processes. Land use classification needs a standard set of urban parameters to disentangle the effects of potential urban drivers on forest ecology. Much work has been done along urban to rural gradients to further elucidate the effects of urbanness on forest dynamics, but there is limited evidence for the actual existence of such trends. I link proximate urban drivers (such as “Industrial/Commercial,” “Residential,” “Paved,” “Agriculture”) with forest recruitment (tree seedling establishment) as indicators of urban forest stability. I conducted land use surveys of 52 national parks across the eastern US using digital satellite imagery by measuring eight urban land cover types. I then conducted field surveys of 22 local parks along three urban-rural gradients in Western NY. Finally, I used digital satellite imagery for land use surveys of the 22 local parks to link field data with urban drivers. Preliminary field data shows tree seedling establishment is highest in parks with increasing size and distance from city center, whereas seedling establishment is poor or altogether absent in small, highly urban parks.

Invasive species and woody shrub cover also tend to increase in small, urban parks, which may inhibit tree seedling establishment.

GENOMIC CHARACTERIZATION OF ANTIBIOTIC RESISTANCE IN *STAPHYLOCOCCUS* SPP. Sonja Opper and Mark Gallo Ph.D., Niagara University Golisano Center for Integrated Sciences, Niagara University NY, 14109.

Antibiotic resistance is growing problem in the medical and agricultural fields. Methicillin resistant *S. aureus* (MRSA) is of particular concern to doctors and patients alike. In addition, these strains of *Staphylococci* commonly possess resistance to other antibiotics. Antibiotic resistance has been studied in isolates from human disease. *Staphylococcus* is found in many environments including the natural flora of many warm blooded mammals.

In this study, Staphylococcal isolates were obtained from the nasal passages of white tail deer, *Odocoileus Virginianus*. Metabolic and antibiotic resistance profiles were determined for the strains. Degenerate primers were created based on information from previously characterized strains of *Staphylococcus spp*. and were subsequently used to amplify regions of the genome from these newly-isolated strains.

BIO-REMEDIATION OF NEONICOTINOID PESTICIDES: DETERMINATION OF NEGATIVE CONTROL BACTERIA IN THE DEGRADATION OF THIAMETHOXAM. Gbassey Oteme and Stephanie Zamule, Ph.D., Department of Biology, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

Neonicotinoids are a class of insecticides whose chemical structure and mode of action is similar to that of nicotine. They include a variety of insecticides such as thiamethoxam, imidacloprid, clothianidin, and thiacloprid that are commonly used to control plant pests. These compounds are referred to as systemic insecticides due to their highly hydrophilic character and high absorption rate through plant tissue. Neonicotinoids usage has been identified as a co-acting factor associated with the phenomenon known as Colony Collapse Disorder (CCD), a large-scale loss of individuals in the honeybee population in the United States. These chemicals have been linked to CCD mainly due to their ability to slow down the insects' metabolism, rendering them vulnerable to pathogenic infections and starvation.

Bacterial species have been isolated that are able to effectively take up the chemicals thiamethoxam and imidacolprid, significantly reducing their concentration in growth media. These species include organisms naturally occurring in soil and water environments such as *Pseudomonas, Alcaligenes, Bacillus, Rhizobium,* and *Breviabcterium.*

Because all of the species we have evaluated thus far are capable of taking up thiamethoxam, in this experiment we sought to identify a species that was incapable of thiamethoxam uptake, and thus could serve as a negative control in our experiments. To this end, we assessed the ability of *Escherichia coli* to take up thiamethoxam at concentrations as high as 60 mg/L, the relevant environmental concentration determined by environmental agencies. The bacterial species was able to take up as much as 71% of the thiamethoxam present in the media by the end of the 22 days incubation period. Although unexpected, these findings suggest that *E.coli* is capable of thiamethoxam uptake, and suggest a possible mechanism for thiamethoxam degradation in the mammalian gut.

FATTY ACID SIGNATURES OF FISH AND CRAYFISH FROM CAYUGA LAKE. Thomas Palmer and Jacques Rinchard, Department of Environmental Science and Biology, The College at Brockport- State University of New York, 350 New Campus Drive, Brockport, NY 14420.

The objective of this study was to compare fatty acid signatures of fish and crayfish collected from Cayuga Lake. Three hundred and forty six samples, comprising of 24 species (e.g, bluegill, bluntnose minnow, brown bullhead, eastern banded killifish, eastern black nose dace, fantail darter, fathead minnow, gizzard shad, Johnny darter, largemouth bass, longnose dace, mottled sculpin, pumpkinseed, redside dace, rock bass, rusty crayfish, slimy sculpin, smallmouth bass, spotfin shiner, spottail shiner, striped shiner, white sucker and yellow perch), were captured during fall 2014 and spring 2015. Whole fish lipids were extracted and measured gravimetrically. Fatty acid concentrations were then determined using gas chromatography/mass spectrometry. The results indicated that fatty acid signatures significantly differed among species. Major fatty acids contributing to the differences were 22:6n-3, 18:1n-9, 16:1n-7, 20:5n-3, 18:0, and 18:3n-3. These differences may be attributed to feeding habits, as fatty acids are conserved from prey to predator.

GENE EXPRESSION AND REGULATION IN FOOD RESTRICTED MICE. Vivien Pat, Preet Sohal, and Douglas J. Guarnieri, Department of Biology, 3261 West State Road, St. Bonaventure, NY 14778.

While it has been widely recognized that mild food restriction enhances learning and motivation, the neural mechanisms underlying this adaptation are not well defined. Previous research from this lab utilized microarray technology to determine the effect of food restriction on gene expression in the mouse brain. The result was a list of common genes found to be up-regulated in different brain regions, including the prefrontal cortex and other regions involved in mediating food reward. Surprisingly, many of the genes on this list had been previously shown to be stress responsive in peripheral organs. We are assessing the role of the glucocortiocid receptor (GR) in mediating many of these observed changes in gene expression, with a focus on *Cdkn1a* and *Mertk*. The purpose of our current research is to assess gene expression in other animal models of stress, such as acute restraint stress. In addition, gene expression in peripheral organs such as the liver and kidney, and a comparison of male and female expression are underway. We are using bioinformatic and molecular strategies to clone putative GR genomic regulatory sequences that may be critical for the observed up-regulation. These ongoing studies will better characterize the transcriptional response to food restriction and eventually will allow us to address the role of mild and chronic stress regarding long-term behavioral outcomes.

FATTY ACID SIGNATURES OF FISHES COLLECTED FROM LAKE ONTARIO AND SURROUNDING WETLANDS. Ann Patterson and Jacques Rinchard, Department of Environmental Science and Biology, The College at Brockport- State University of New York, 350 New Campus Drive, Brockport, NY 14420.

The objective of this research project was to compare fatty acid signatures (FAS) of wetland and lake fishes (e.g., round goby, alewife, yellow perch, bluegill, bullhead catfish) collected from three locations in and around Lake Ontario – Buck Pond, Buttonwood Creek, and Hamlin Beach. Fish were collected in the spring of 2014 and 2015. Lipids were first extracted from fish and

measured gravimetrically. Then, FAS were determined using gas chromatography-mass spectrometry. FAS differences were found among species; the most prominent fatty acids responsible for these differences being palmitoleic acid (16:1n-7) and α-linolenic acid (18:3n-3). These results indicate that different species have different diets based on where they live.

BEHAVIORAL SIGNALING AND SOCIAL ALLIANCES AMONG YOUNG-ADULT BOTTLENOSE DOLPHINS (*TURIOPS TRUNCATUS*) AT THE INSTITUTE OF MARINE SCIENCES IN ROATAN, HONDURAS. Nathan Perez and Elizabeth Balko, 570 D Calm Lake Circle, Rochester, NY 14612, 1159 Connors Rd., Auburn, NY 13021.

In the fission-fusion societies of Atlantic bottlenose dolphins (*Turiops truncatus*), there exists social alliances among different individuals. To further examine these complex interactions, six young-adult dolphins were observed at the Roatan Institute of Marine Sciences in Roatan, Honduras to evaluate the frequency of different affiliative and aggressive behaviors that each of them exchanged to other individuals in regards to age and sex groups. Based on the frequency of affiliative behaviors and specific interactions that were observed throughout the study, there is evidence to suggest that affiliative behaviors between dolphins can be used to establish a dominance hierarchy.

EVIDENCE OF N AND P INTERACTIONS IN FOLIAR NUTRIENT RESORPTION. Kara Phelps and Ruth Yanai, SUNY College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210.

The nutrient cycles, and therefore, the productivity of natural ecosystems can be altered by human activities, such as pollution and fertilization. We examined the effects of fertilization with nitrogen and/or phosphorus on resorption, the process by which trees reabsorb foliar nutrients prior to leaf abscission in the fall. Previous studies attempting to link soil nutrient availability of single elements with that element's resorption in the tree have been inconclusive; other studies point to multiple element limitation driving resorption. Resorption can be measured as proficiency (the concentration of an element in the litter) and as efficiency (the ratio of green leaf concentrations to the amount resorbed, expressed as a percentage). We collected green leaves and litter of five species (American beech, pin cherry, red maple, white birch, and yellow birch) in the White Mountains of New Hampshire. We compared proficiency in three stands and efficiency in one stand of eleven elements (C, N, Al, Ca, Na, K, Mg, Mn, P, Sr, S). Nitrogen proficiency and efficiency were better in plots fertilized with P, while trees in plots fertilized with N were more proficient and efficient at P resorption, indicating a process driven by multiple elements. Sulfur concentrations were correlated with many elements. A better understanding of interconnected nutrient cycles and the feedback mechanisms they affect can assist recognition of the influences of anthropogenic nutrient additions on ecosystem productivity.

THE INFLUENCE OF THE CELLULAR ENVIRONMENT ON Z-DNA FORMATION. Pakinee Phromsiri and Joshua M. Blose, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

In the cell, nearly 40% of the volume is occupied by macromolecules and smaller, chemically diverse solutes known as osmolytes accumulate in response to environmental stresses. To add to

the understanding of how the crowded environment inside the cell affects nucleic acid folding and function, we investigated the influence of cosolutes on the transition from B-DNA to Z-DNA in model DNA duplexes. Distinct from the familiar, right-handed B-DNA helical conformation, Z-DNA is a left-handed double helical structure with its phosphodiester backbone arranged in a pronounced zig-zag pattern. This conformation is unique to Z-DNA. Moreover, due to the correlation between Z-DNA formation potential and regions of active transcription, Z-DNA is believed to serve a vital role in the transcription process. We monitored the B-Z transition of our model DNA duplexes using circular dichroism (CD) spectroscopy. Spectral analyses revealed that osmolytes (PEG 200) and crowders (PEG 8000) both promote the formation of Z-DNA and decrease the *in vitro* the salt concentration required for Z-form stabilization. These results suggest that the cellular environment may facilitate formation of Z-DNA *in vivo*.

FUNCTION AND REGULATION OF SESA1 IN *ARABIDOPSIS THALIANA.*
Anna Pleto, Kevin Sidoran, and Xiao-Ning Zhang, PhD, Biochemistry Program, St. Bonaventure University, 3261 W State Rd, St Bonaventure, NY 14778.

SR45 is a splicing activator that has been shown to downregulate SESA1 with RNAseq data. We aim to assess the function of Seed Storage Albumin 1 (SESA1) in *Arabidopsis thaliana* given its bifunctional trypsin/α-amylase inhibitory domain, and its involvement in lipid storage, as well as confirm the SR45 downregulation. We hypothesize that SR45 aids in the nutrient breakdown of amylose by downregulating SESA1 inhibiting amylase activity thus promoting the breakdown of amylose. Total RNAs were extracted from wild type (Col), overexpression lines (OX1-1 and OX1-9) and mutant (*sr45-1*), and purified using DNase. Total RNAs were reverse transcribed to provide cDNAs for *Taq* PCR amplification. Expression of SESA1 in Col, OX1-1, and OX1-9 were compared to the null mutant *sr45-1* by qPCR. We report that ideal qPCR conditions for the SESA1 gene are a re-annealing temperature of 56.3°C, and a concentration 1/50 of the amplified cDNA. We report that GXL Polymerase has proved to be the most effective at amplifying the full-length SESA1 cDNA. The goal of this study is to express the SESA1 protein and assess its α-amylase inhibitory function with a reducing sugar assay, to support the involvement of SR45 in nutrient reserve activity.

DOES THE UNFOLDED PROTEIN RESPONSE COMPENSATE FOR THE LOSS OF A GRP170 CHAPERONE IN *CAENORHABDITIS ELEGANS*? Lysander Pope and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Misfolded proteins are toxic and can lead to cell death. Several fatal diseases are caused by protein misfolding, including Alzheimer's Syndrome and mad cow disease. To aid normal protein folding, cells produce a complex set of chaperones, which are proteins that help other proteins fold. If a cell accumulates dangerous levels of unfolded proteins in the ER, they induce a stress response called the Unfolded Protein Response (UPR). The UPR increases expression of many chaperones, which refold the misfolded proteins and thus allow the cell to survive. My research involves the largest of the cellular chaperones, GRP170, which is found in the ER of all eukaryotic cells. In the nematode *Caenorhabditis elegans*, deletion of a gene encoding GRP170 is not lethal; but worms with this deletion are shown to constitutively induce the UPR. My hypothesis is that this overexpression of these UPR chaperones is what allows the worms to

survive and reproduce without the missing GRP170. To test this hypothesis, I will use worms with a deletion allele of the UPR regulatory gene xbp-1, which therefore, are unable to induce the UPR. If my hypothesis is correct, I predict that worms unable to induce the UPR will not be able to survive if they also have deletion alleles of GRP170. I will report on my current progress on this project, including development of a molecular genotyping assay for an xbp-1 allele, the generation of males containing the xbp-1 mutant, and the initial dihybrid crosses to generate nematodes homozygous deficient for both xbp-1 and GRP170.

ANALYZING HEAVY METAL CONTENT OF LOCAL FRUITS AND VEGETABLES. Hilda Posada, James Calvert, and Vadoud Niri, Department of Chemistry, SUNY Oswego, Oswego, NY 13126.

Heavy metals have characteristics that include not biodegradable, they can accumulate in certain organs and have long biological half-lives. Because of pavement roads, vehicles and fertilizers these heavy metals contaminants can be absorbed by the root of the plants and trees and stored in the tissues of the vegetables and fruits. The purpose of this project was to determine heavy metals such as lead (Pb), copper (Cu), zinc (Zn), nickel (Ni), cadmium (Cd), iron (Fe), manganese (Mn), and magnesium (Mg) in selected local grown (Oswego, NY), store, and organic fruits and vegetables using atomic absorption spectrometry (AAS). Among the heavy metals that where analyzed, three metals where detected in the samples. These metals were present in all three types of products but the concentrations were different because of the use of different soil and water for growing the products.

ANALYZING MACROINVERTEBRATE COMMUNITIES IN HELLBENDER SITES. Shelby Priester, 101 Harris Court, Cheektowaga, NY 14225, Robin Foster, 105 Wilkeson Quad, Geography, University at Buffalo, Buffalo NY 14260, Dr. Amy Mcmillan, 1300 Elmwood Ave, Biology, SUNY Buffalo State, Buffalo NY 14222.

The eastern hellbender (*Cryptobranchus alleganiensis*) is an aquatic salamander endemic to the eastern United States. Recently, hellbender populations have been declining. The causes of this decline are poorly understood. Benthic macroinvertebrates, as a biological indicator of water quality, may be related to the presence of hellbenders in a stream. The diversity of macroinvertebrate communities in hellbender sites was examined in this study. It was hypothesized that macroinvertebrate diversity and abundance will be positively related to the presence of hellbenders. Invertebrates were collected using a kick sample method and identified to order. Macroinvertebrate abundance was highest in sites with current populations of hellbenders. There is no apparent difference in diversity and water quality indices between sites, however further taxonomic refinement will be needed to better understand the relationship between hellbenders and macroinvertebrates.

SPECIES RICHNESS OF MICROSCOPIC COMMUNITIES WITHIN INTERSTITIAL WATER OF *SPHAGNUM* MOSSES IN OSWEGO, NY. Jeremy Purce. Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

The genus *Sphagnum* are the dominant mosses of low nutrient peatlands. *Sphagnum* can hold up to 26 times the amount of water as their dry weight. *Sphagnum* is therefore able to sustain

diverse communities of micro-organisms in the wet, humid microenvironments surrounding its stems. Communities of organisms found among *Sphagnum* include algae, protists, rotifers, cladocerns, and mites. Amoebae, especially testate amoebae, are an abundant group in *Sphagnum*. These rhizopods are characterized by the presence of a test, or a hard shell, found in many marine animals. My objective was to survey the microscopic communities of *Sphagnum* mosses, with a focus on testate amoebae. I quantified testate amoebae in three different *Sphagnum* species (*S. papillosum*, *S. capillifolium*, and *S. fuscum*) by collecting samples (n=3) of each species along a transect in an Oswego County intermediate fen. *Sphagnum* collections were then strained through a mesh-lined funnel. Distilled water was added to each moss sample after it was placed in the funnel, which was then drained overnight into a 50 mL centrifuge tube. The contents were then placed into a beaker and boiled at 135 ºC for approximately 15 minutes. After boiling the sample, approximately 30 mL of water was analyzed from each *Sphagnum* preparation. Each organism encountered by systematic searching was counted and an identification was attempted using a key to *Sphagnum* micro-organisms. My preliminary data indicate that *Sphagnum papillosum* has a more diverse community than *Sphagnum capillifolium* or *Sphagnum fuscum*. Groups encountered so far include at least three species of testate amoebae, *Sphagnum* mites, nematodes, and chironomid larvae. Differences in community composition may be due to different pH levels, conductivity, or water retention of the three *Sphagnum* species sampled.

CHEMICAL ANALYSES OF WATER AND AQUATIC MACROPHYTE TISSUE IN YELLOWSTONE NATIONAL PARK. Irene J. Putzig, Zachary W. Gerber, Martha L. Miller, Paul Tomascak, and C. Eric Hellquist, State University of New York at Oswego, Department of Biological Sciences, Oswego, NY 13126.

The tendency of moose (*Alces alces*) to forage on aquatic macrophyte species such as *Myriophyllum* spp, *Potamogeton* spp, and *Utricularia vulgaris* has been linked to nutritional imbalances in their diet. Aquatic macrophytes provide essential nutrients for herbivores but they can also concentrate trace metals such as Cd, Zn, Cu, Pb and Ni that have toxic effects. Yellowstone National Park (YNP) spans a diverse geological landscape with unusual water chemistry conditions that are frequently influenced by geothermal features. Water samples and tissue samples of aquatic macrophytes (especially *Potamogeton* spp. and *Myriophyllum* spp.) were collected from locations throughout YNP. Water samples were analyzed to determine pH, conductivity, alkalinity, as well as inorganic ions and trace metals. Plant samples were ground, combusted, and dissolved in hydrochloric and nitric acids for trace metal analysis in an Ionically Coupled Plasma Mass Spectrometer (IC-PMS) to determine trace metal abundance. With these data, we intend to analyze how water chemistry may influence the elemental composition of macrophyte tissues. Previous work in YNP has shown that most aquatic plant species were located in waters with moderate to high alkalinity, moderate to high conductivity, and circumneutral to basic pH. Our summer 2015 samples currently being analyzed will increase our understanding of how water chemistry influences aquatic plant community composition in YNP. The nutritional value of aquatic macrophytes will have implications for the forage quality of plants used by moose and waterfowl in YNP.

HYDRODECHLORINATION OF ARYL CHLORIDES IN IONIC LIQUIDS. Anthony C. Raymond and Margaret E. Logan, The College at Brockport, SUNY Department of Chemistry/Biochemistry, 350 New Campus Dr., Brockport, NY 14420.

Aryl chlorides, in the form of polychlorinated biphenyls (PCB's), are extremely toxic, long lived pollutants; however, aryl chlorides can also be useful intermediates in synthetic organic chemistry. In each case, replacement of the chlorine atom with hydrogen could be desirable, leading to less toxic compounds in the former case, and removing the chlorine when it is no longer needed in the latter case. The work presented describes synthetic and mechanistic aspects of the hydrodechlorination reactions of aryl chlorides using palladium catalysts, with sodium formate as the reducing agent. The catalysts were prepared from palladium acetate and a ligand. These studies were conducted in phosphonium salt-based ionic liquids as the solvent. The impact on the rate of reaction of the following variables was explored: the ionic liquid anion, water content of the solvent, reaction temperature, level of oxygen saturation in the solvent, manufacturer of palladium acetate used, and steric effects of the ligands. The reactions were monitored through periodic sampling, and NMR spectral analysis. Characteristic peak ratios were used to calculate conversion of reactants to products. The results and conclusions are described.

BIOME INVASION: EXOTIC ANT DOMINATES URBAN FOREST COMMUNITY. Katelyn Reed and Robert Warren, Buffalo State, 1300 Elmwood Ave., Buffalo, NY 14222.

Invasive species can severely impact native habitats with overwhelming numbers and no apparent limitations by habitat or other species. Moreover, mutualisms with other invasive species can facilitate these invasions. Here I explore the changes in a European ant population two decades after it invaded Tifft Nature Preserve in Buffalo, NY, USA. I also investigated the interactions between the ants and native and invasive plants. I hypothesized that the *M. rubra* population boundaries had not changed in 20 years due to moisture limitations (desiccation) and that its presence would be enhanced by an abundant invasive plant at Tifft, *Fallopia japonica* (Japanese Knotweed). I measured *Myrmica rubra,* the European Fire Ant, populations by placing sugar bait stations at the same points and times of year as used in 1994 to census the ants. I collected data on soil moisture and temperature to determine limiting factors, and I conducted transect survey to further explore *M. rubra* habitat limitations. Finally, I simulated herbivory on a native nettle plant and the invasive *F. japonica,* the latter known to produce nectar rewards for ants when damaged, to test whether *M. rubra* populations were affected by the plants. I found *M. rubra* more in warmer, moist areas at the preserve, with low moisture appearing to be its strongest limited factor. Additionally *M. rubra* occurred more frequently with invasive plants, particularly *F. japonica* plants that were experimentally damaged.

TOWARD THE CHARACTERIZATION OF AEROBACTIN BIOSYNTHETIC ENZYMES IN HYPERVIRULENT KLEBSIELLA PNEUMONIAE. Matthew R. Rice, Dr. Mark A. Gallo, Niagara University, Niagara University, NY; Daniel C. Bailey, Dr. Andrew M. Gulick, Hauptman-Woodward Institute, Dept. of Structural Biology, SUNY at Buffalo, NY.

Since it was initially described in the mid-1980s in the Asian Pacific Rim, a hypervirulent strain of *Klebsiella pneumoniae* (hvKP) has since disseminated throughout the globe (1). In

contrast to classical strains of *Klebsiella pneumoniae* (cKP), hvKP is able to cause serious life-threatening infections in previously healthy individuals in the community (1, 2). There is fear among professionals in the medical community that convergence of this hypervirulent pathotype with increasingly problematic strains of drug-resistant KP could lead to the evolution of a true "superbug" that would likely require novel therapeutics to combat (3). Recent work by the Russo and Gulick Labs at UB have demonstrated that the enhanced virulence of hvKP is, above all, mediated by overproduction of the siderophore aerobactin (2). Siderophores are small molecule iron-chelators that allow the bacteria to acquire sufficient quantities of this vital nutrient in the severely iron-limited host environment. We hypothesize that inhibition of aerobactin biosynthesis could be a viable therapeutic target that could potentially become a novel class of antibiotics for the treatment of infections with hvKP and other pathogenic bacteria that rely on this siderophore. Toward targeting aerobactin biosynthesis for chemical inhibition, we aim to lay the ground work by structurally and functionally characterizing the four enzymes required to synthesize aerobactin (IucA-D). In the current study, we focused on the expression and purification of IucB and IucD, as wells as the co-crystallization of IucA with its ligand ATP for X-ray crystallographic studies. We were able to express and purify IucB by using a construct tagged with a chaperone (SUMO), which was shown to be active by the Ellman's Assay. In order to further optimize the production of these two enzymes, we developed a construct (pCDFDuet-1) for the co-expression of IucB together with IucD, as well as an IucD construct (pET15b) tagged with an *N*-terminal β-galactosidase sequence. In future work, we aim to use these constructs to produce protein for X-ray crystallographic and kinetic analysis.

DIFFERENTIAL REGULATION OF THE TWO GRP170 PARALOGUES OF *CAENORHABDITIS ELEGANS*. Antonio Rockwell, Yuanyuan Li, and Greg Wadsworth, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Chaperones are essential proteins which help prevent newly synthesized polypeptides from aggregating and help fold these polypeptides into functional three dimensional structures. *Caenorhabditis elegans* has two loci encoding the large eukaryotic molecular chaperone Grp170, grp170a (T24H7.2) and grp170b (T14G8.3). To compare the physiological roles of the two loci, phenotypes associated with deletion alleles at each loci were compared. Nematodes deficient for grp170a developed 32% slower and display 6.9% more embryonic arrest than control strains. Alternatively, nematodes deficient for grp170b did not differ significantly from the control strain for either of these traits. To investigate expression of the two *C. elegans* grp170 loci during ER stress, the Unfolded Protein Response (UPR) was induced with the glycosylation inhibitor tunicamycin. Levels of grp170a mRNA did not significantly change in response to tunicamycin treatment while the levels of grp170b mRNA increased 6-fold.

To investigate whether loss of either grp170 loci induces UPR, the expression of another UPR responsive gene, hsp-4, was analyzed. In nematodes lacking grp170b, expression of hsp-4 mRNA was not affected. However, in nematodes lacking grp170a, the UPR responsive hsp-4 mRNA was up-regulated 38 fold.

Next, the genotypic expression of grp170 mRNA was compared between nematodes deficient for either grp170 loci and the standard laboratory strain. Expression of grp170a mRNA was unaffected by the loss of grp170b. In contrast, grp170b was induced 83 fold in nematodes deficient for grp170a. These data suggest that while grp170a plays a critical role in ER protein folding, it is not itself inducible by the UPR. On the other hand grp170b seems to play a less

critical role in protein folding under non-stress conditions, it is the grp170 locus which is induced by the UPR.

MOTILITY DEFECTS IN *CHLAMYDOMONAS REINHARDTII.* Lydia Rossi and Noveera Ahmed, Department of Biology, St. John Fisher College.

Motile flagella and cilia are cellular organelles used to propel an organism, move material in a lumen, or sense the environment. These structures are composed of structural element, which includes the 9+2 double microtubule scaffold, motor elements, which consist of a set of outer row and inner row dyneins, and regulatory elements that control when the motors are active. Flagellar assembly and regulation has been extensively studied using the biflagellate, unicellular protist *Chlamydomonas reinhardtii*, which is capable of switching between a symmetric (flagella-like) beat and asymmetric (cilia-like) beat.

To identify new proteins needed for flagellar assembly or regulation, insertional mutagenesis was performed and five slow-swimming mutants were selected. Western Blots on mutant flagellar fractions showed wild type outer arm dynein levels, implying that the phenotype is not due a disruption in this large motor complex. The current project is focused on amplifying the insertion site using TAIL-PCR with one primer against the insert and one degenerate primer, followed by identification by sequencing. Preliminary findings indicate that one mutant may have a disruption in a novel protist-specific protein.

THE INFLUENCE OF PLANTS ON HABITAT STRUCTURE AND INSECT ABUNDANCE IN PRE-EXISTING AND NEWLY ESTABLISHED GARDEN BEDS. Sandy Sanchez, Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

Plants provide food and habitat structure that attracts insects and other animals. Gardens can be viewed as successional communities where species composition of plants is determined by humans, Species choices by gardeners will then influence what insects are attracted to the human-mediated plant community. At SUNY Oswego, the newly established (2014) Permaculture Living Laboratory (PLL) garden is attempting to merge ecological principles with sustainable gardening practices. My research examines the newly and partially planted PLL in comparison to a long established herb garden (2010) on the SUNY Oswego campus. I predicted that the established herb garden would have a greater diversity of insects due to its older, more complex plant community compared to the PLL. Within the PLL, I also predicted that the most insects would be recovered in beds with the highest number of plantings. I used pit-fall traps that were placed randomly in flower beds (n=4) to assess insect diversity. I also measured soil moisture within and between flower beds along a shallow elevation gradient at the PLL. I speculated that some plants with large foliage could provide a nurse plant effect. To address the nurse plant question, randomly sampled plants had soil moisture measured 2.5 cm and 25 cm from each plant. Soil moisture also was measured in each bed to determine if there were local differences in water availability to each bed. My initial analyses indicate that insects are abundant in both gardens and that there are no differences in soil moisture associated with the plants. This project illustrates how gardens can be used as model systems to illustrate concepts of community succession.

SYNTHESIS AND CHARACTERIZATION OF LONG-CHAIN LITHIUM CARBOXYLATES FOR USE IN LIQUID ORGANIC SCINTILLATOR FAST NEUTRON DETECTORS. Melissa Schmitz[1], Joe Shupperd[2], Ryan Bonk[2], Spencer Stuckey[2], James Gayvert[2], Gabriel Adams[2], Christopher Bass[2], 615 James St., Apt. 702, Syracuse, NY 13203[1], 1419 Salt Springs Rd., Physics Department, Syracuse, NY 13214[2]

Fast neutron spectroscopy can be performed using lithium-loaded organic liquid scintillators. Typical loading involves emulsifying an aqueous solution of a soluble lithium compound into a commercial scintillator cocktail. The resulting loaded scintillator suffers from emulsion instabilities and poor optical clarity at loading fractions above a few percent of lithium by mass. Our proposed alternative to emulsion-based lithium-loading involves dissolving a long-chain lithium carboxylate salt directly into an organic scintillator, which could avoid the deleterious effects of emulsification. We discuss the synthesis and characterization of lithium dodecanoate, lithium octanoate, and lithium hexanoate in both xylene isomers and Ultima Gold AB (a commercial scintillator cocktail) in terms of solubility and light transmittance properties.

CREATINE SUPPLEMENTATION INCREASES SPRINT PERFORMANCE IN *DANIO RARIO*. Halie Schoff and Dr. Kathleen Savage, St. John Fisher Biology Department, 3690 East Ave., Rochester NY 14618.

Creatine monohydrate is the number one supplement being studied in the exercise science world today. Creatine increases an athlete's performance by a process called creatine phosphorylation: a phosphate group is stripped off of creatine and then added to ADP (adenosine diphosphate) thus producing ATP (adenosine triphosphate) in the muscles. This gives more energy during short bursts of intense exercise. An indicator of increased performance in sprint testing is measure by testing one's VO2max. VO2 max is the calculation of the amount of oxygen (liters) that an athlete can uptake during intense exercise. Comparable to VO2, scientists use similar types of testing in *Danio Rerio* termed the Umax value. Both values are tested during sprint-like running/swimming test in which the time is compared with distance traveled. The faster the time and distance, the higher the value. The higher the VO2/Umax, the higher cardiovascular shape (fitness level) the test subject is in. *Danio Rerio* are tested for their increase in sprint performance (Umax) with the supplementation of creatine (0.00025 g/day) for a week period. Testing will be conducted in a swimming flume. There is a propeller that is calibrated for allowing an increase in speed by using velocity and voltage output by the swim trainer. An initial sprint testing value, Umax, will be obtained prior to supplementation. After the fish had been supplemented for one week there will be a post supplementation Umax testing session. Those who ingested creatine are likely to have increase their value much like a human would have an increased value in their VO2 max with the ingestion of creatine for a period of time.

DESIGN OF A FAST NEUTRON SPECTROMETER FOR MEASUREING BACKGROUND RADIATION. Joseph Shupperd, Christopher Bass, Ryan Bonk, Grant Farrokh, Melissa Schmitz and Spencer Stuckey, Le Moyne College, 1419 Salt Spring Road, Syracuse, NY 13214.

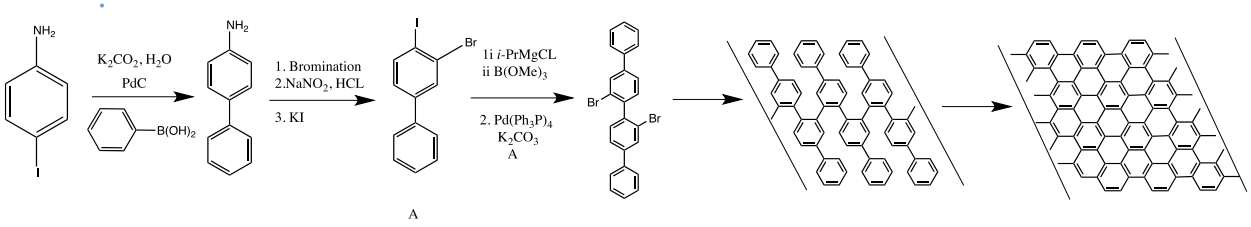
Experimental searches for rare event physics phenomena often have significant backgrounds. Some of these backgrounds can be suppressed by detector design or through analysis, but other

backgrounds mimic the same experimental signature as the rare physics event. For direct detection of WIMP dark matter, fast neutrons pose the latter type of background. An in situ measurement of the fast neutron fluence and energy spectrum could enable simulations of the expected fast neutron signal in dark matter detectors, thereby increasing the sensitivity of these searches. We discuss our fast neutron spectrometer research program and our efforts to design and construct a spectrometer for use in support of dark matter searches.

POLYARYL PRECURSOR SYNTHESIS FOR BOTTOM-UP GRAPHENE NANORIBBON FABRICATION AND INTEGRATION INTO THE ORGANIC LABORATORY CURRICULUM. Sameer Singhal, Lloyd Abraham, Lori Kim, Brian Shultz, Sarbajit Banerjee†, and David G. Hilmey*, †Department of Chemistry, Texas A&M University, *Department of Chemistry, St. Bonaventure University.

Nanotechnology is becoming increasingly important in scientific applications, from industrial uses to the biological as well, as cancer theranostics and potential allergic hypersensitivity treatments. There is a subsequent need for better defined nanochemical physical properties and functions. Graphene nanoribbons (GNR) are extremely thin, single layers of graphite less than 10 nm wide which have properties dependent on edge patterns and width. Our precise bottom up fabrication utilizes dibrominated precursors, prepared through basic aromatic chemistry, which can then be converted to potential nanoribbons of different widths and edge properties through surface-assisted coupling and cyclodehydrogenation.

A selected three step sequence was incorporated into the second semester organic laboratory, merging research and organic instruction. Research based synthesis of additional dibrominated polyaromatic precursors is being performed to create GNR precursors from terphenyl derivatives. Additionally, syntheses involving nitrogen-containing polyaromatic precursors are being explored to investigate resulting GNR properties, strength, and conductivity.



PURIFICATION OF LGN PROTEIN FOR X-RAY CRYSTALLOGRAPHY. Autumn H. Smith, Laurie B. Cook, and Brandy M. Sreenilayam, 350 New Campus Dr. Brockport, NY 14420.

G-protein signaling modulator 2, GPSM2, better known as LGN, is a protein present in mammalian cells that is important for alignment of mitotic spindles in mitosis. It has been found to be overexpressed in breast cancer cells. When the mutation T450A is present, there is suppression in breast cancer cell division. The goal of this project is to attain 95% purity of wild-type and mutant LGN and solve the protein crystal structures. Crystallizing both wild-type and mutated LGN would potentially show the open versus the closed confirmation of this protein. Solving the structure of a protein speeds up the process of designing drugs and therapies that target the protein. Overexpression of LGN in *E. coli* cells was attempted, but without success. LGN has been successfully overexpressed in mammalian BHK cells and isolated by

immunoprecipitation using a rabbit GPSM2 polyclonal antibody and Protein A/G Plus-Agarose beads. Addition of a synthetic GPSM2 peptide releases LGN from the antibody. SDS-PAGE and Western blotting techniques are used to assess the purity and verify the presence of LGN. Mammalian BHK cells are promising for purification of LGN and ultimately, crystallization of the structure.

TARGETING GLYCOLYSIS IN MYOBLASTIC C2C12 CELLS TO INDUCE CELL DEATH.
Brittany Snyder and Jolanta Skalska, Department of Biology, Alfred University, 1524 Powell Campus Center, Alfred NY 14802.

Data suggests that highly proliferating cells (such as cancer cells) use aerobic glycolysis to harvest energy rather than oxidative phosphorylation. After glycolysis, the end product (pyruvate) is converted to lactate by lactate dehydrogenase (LDH). To keep the cellular pH homeostasis, the lactate acid is exported into the external environment, and keeps it in reduced state.

It is hypothesized that myoblastic C2C12 (undifferentiated) cells use lactic acid produced via glycolysis to reduce cell surface proteins and prevent differentiation. If critical glycolytic checkpoints are targeted, the external protein reduction state should decrease, which would therefore stop the proliferation, initiate differentiation, or induce the cell death. The goal of this project is to shift glycolysis towards oxidative phosphorylation in C2C12 cells. The inhibitor of monocarboxylic acid transporter system MCT-4, the α-cyano-4-hydroxycinnamate acid (α-CHC) will be used. To sensitize the cell to oxidative stress, the cell s will be treated with hydrogen peroxide, and the effect of CHC will be measured. To assess the cell death, the measurements of cytoplasmic enzyme leakage (LDH) will be performed, and then the discrimination between apoptotic and necrotic cells death will be observed with the various caspase activation assays.

THE IMPACTS OF VIBURNUM LEAF BEETLE ON FRUIT QUALITY OF ARROWWOOD AND EUROPEAN CRANBERRYBUSH AT BRADDOCK BAY BIRD OBSERVATORY.
Solan Sooriakumar, Kristine Konyk, and Susan B. Smith, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Many species of migratory passerine birds use the shore of Lake Ontario as a resting and refueling site during their fall stopovers. During this time, foraging and feeding on foods like native fruits is vital in providing the necessary amount of energy needed for these birds to successfully complete their migrations. In the spring and summer of 2014, defoliation by the Viburnum leaf beetle (*Pyrrhalta viburnihas*) was observed on Arrowwood Viburnum (*Viburnum dentatum*) shrubs in this area, and this plant provides one of the primary native fruits that that are consumed by migrating birds in the fall. Arrowwood fruits contain high levels of fat and energy and thus represent a high-quality food resource for frugivorous migrants. The goal of our study was to assess the impact of beetle defoliation on the nutritional quality of Arrowwood fruits and the fruits of European Cranberrybush (*Viburnum opulus)*. Fruits were collected in fall 2015 at the Braddock Bay Bird Observatory, the site of a long-term migration monitoring station near the lake shoreline in Rochester, NY. Fruits were dissected to remove seeds, and then the pulp and skin were freeze-dried and homogenized prior to analysis. Nutritional analyses included bomb calorimetry to test for caloric content, fat extraction to measure crude fat content, fiber and mineral content, and total phenol analysis of fruit extracts using a microplate spectrophotometric

protocol. Preliminary analyses suggest that Arrowwood fruits had lower fat content in the fall of 2015 following defoliation than they have in the previous years. Future work will incorporate analysis of the physiological condition of frugivorous thrushes captured at the station in fall of 2015 to examine chronic stress levels and plasma indicators of refueling rates.

EARLY CLEAVAGE PATTERNS OF *EUCIDARIS TRIBULOIDES.* Bryan Spizuco and Dr. Hyla Sweet, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester, NY 14723.

Cidaroid and euechinoid sea urchins diverged approximately 250 million years ago, and little is known about the early development of the cidaroid embryo. The ultimate goal of this research is to determine how the plane of first cleavage in *Eucidaris tribuloides* embryos corresponds to the anterior-posterior (AP) and oral-aboral (OA) axes of the larva. The relationship between the plane of first cleavage and the AP axis has three potential configurations: (1) parallel, in which the cleavage plane will vertically bisect the embryo through the anterior and posterior poles, (2) oblique, in which the plane of first cleavage will be at an angle relative to the AP axis, and (3) perpendicular, in which the cleavage plane will horizontally bisect the embryo into anterior and posterior halves. The relationship between the plane of first cleavage and the OA axis has similar potential orientations: parallel, oblique, or perpendicular. However, if the cleavage pattern is perpendicular to the OA axis, it can divide the embryo into either left and right halves or oral and aboral halves. To determine the relationship between the plane of first cleavage and the larval axes, one blastomere at the 2-cell stage in *E. tribuloides* embryos was injected with a fluorescent dye. These embryos were then imaged at the early gastrula, the late gastrula, and the larval stages using confocal microscopy. The results indicate that the plane of first cleavage, with respect to the AP axis, has a parallel orientation most frequently, an oblique orientation second-most frequently, and a perpendicular orientation rarely. More analysis must be conducted in order to properly determine the relationship between the plane of first cleavage and the OA axis.

SYSTEMATIC MUTAGENESIS OF A MEIOTIC RECOMBINATION HOTSPOT. Walter W. Steiner and Steven J. Foulis, Department of Biology, Box 2032, Niagara University, NY 14109.

Meiosis is a form of cell division found in all sexually reproducing organisms. During the process of recombination, genetic information is exchanged at a high frequency through the breakage and rejoining of chromosomes. Recombination hotspots are sites where these recombination events occur preferentially. In the fission yeast *Schizosaccharomyces pombe,* one such hotspot is the ade6-4095 motif, the sequence of which is 5'-GGTCTGGACC-3', which was found multiple times in a screen of larger 15-30 bp random sequences, so it is not clear if all 10 bp of the hotspot is required. In the present study, each of the ten bases of this sequence will be systematically mutagenized in order to elucidate the necessary sequence to maintain hotspot activity.

MODIFICATION OF AN ENDURANCE TRAINING PROGRAM FOR ZEBRAFISH. William Sterriker, Kathleen Savage PhD., Department of Biology, St. John Fisher College, 3690 East Avenue, Rochester, New York 14618.

Fish exercise testing has been used in aquaculture to evaluate environmental and health conditions of the fish that are subjected to exercise training. Zebrafish are common models for

exercise training because they are hardy, healthy, and have high fecundity; also, their entire genome has been sequenced allowing for genetic modifications and protein analysis based on genomic differences. Furthermore, Zebrafish are ideal model organisms because they are inexpensive and easy to handle. Zebrafish swimming endurance will be measured by their Ucrit values, which is a measure of endurance performance. The Ucrit test will consist of increasing the water flow speed by 10cm/s every 10 minutes until the fish lingers in the back third of the training tube for ten consecutive seconds, which will be considered fatigue resulting in the completion of the initial testing session. Training sessions will begin after one day of rest and the water flow will be set to 60% of initial Ucrit value of each zebrafish for 2 hours per day every other day for a total of 5 training sessions. A post-training Ucrit test will be performed for each zebrafish. The pre-training Ucrit and post-training Ucrit values will be analyzed using a paired T-test.

SPATIAL GENE EXPRESSION IN THE EMBRYOS OF *EUCIDARIS TRIBULOIDES.* Jonathon Stone and Hyla Sweet, PhD, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester, NY 14623.

Sea urchins are divided into two subclasses, Euechinoidea and Cidaroidea, and diverged approximately 250 million years ago. Of the two, euechinoids are more commonly studied and are diverse, containing both regular and irregular sea urchins. In comparison, cidaroids, or pencil urchins, are less diverse and have fewer species. Previous studies have shown important developmental differences between euechinoids and cidaroids. The purpose of this study is to document spatial gene expression in the cidaroid sea urchin *Eucidaris tribuloides*. Candidate genes were chosen based on the gene regulatory network of a euechinoid sea urchin. Total RNA was extracted and reverse transcribed. This cDNA was amplified using gene specific primers. The resulting PCR products were used as template for *in vitro* transcription to make RNA probes for whole mount *in situ* hybridization. This study is important because it will identify differences in gene expression responsible for differences in embryo morphology.

LOADING OF ORGANIC SCINTILLATOR WITH ENRICHED Li-6(95.0%) LiCl FOR USE IN FAST NEUTRON SPECTROMETRY. Spencer Stuckey, Melissa Schmitz, Joe Shupperd, Ryan Bonk, and Christopher Bass, 8502 RTE 289 PO Box 14, Belleville New York 13611.

To determine the ideal loading level of lithium chloride in an organic scintillator (Ultima Gold AB), data was collected based upon optical properties of the emulsions. Aqueous lithium chloride (natural) was loaded into Ultima Gold AB at different percentages by mass percent of lithium with respect to its molarity. Each sample was characterized quantitatively by its respected optical transmittance via UV-Vis spectroscopy. The optimum loading level was decided based upon analyzed quantitative data. Enriched lithium-6 was then made to the optimum molarity, and loaded into the organic scintillator. One liter optical cells were filled with the loaded scintillator to be coupled to PMT's.

SURFACE MODIFICATION OF PEN TREATED WITH OZONE AND UV PHOTO-OXIDATION. Marc Toro[(a)], Entesar Al Abdulal[(a)], Alla Bailey[(a)], Michael Mehan[(b)], Surendra K. Gupta[(c)], Xinyun Li[(a)], and Gerald A. Takacs[(a)], [(a)] School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, New York 14623, [(b)] Xerox Analytical Services,

Xerox Corporation, Webster, New York 14580, USA, [(c)] Department of Mechanical Engineering, Rochester Institute of Technology, Rochester, New York 14623, USA.

Poly(ethylene 2,6-naphthalate) (PEN) was treated with ozone in the absence of radiation and the results were compared with UV photo-oxidation using 253.7 and 184.9 nm radiation. The surface modification was analyzed by X-ray Photoelectron Spectroscopy (XPS) of the top 2-5 nm surface for chemical changes. Higher saturation levels of oxidation were achieved using UV photo-oxidation than ozonation. Both treatment methods increased the amount of C-O-C, C=O, and O-C=O bondings while UV photo-oxidation also increased the concentration of the anhydride/carbonate moieties on the surface. Atomic Force Microscopy (AFM) detected smoother surfaces with increasing treatment time for both treatments. The changes in functional groups and surface roughness with both treatments contributed to an increase in hydrophilicity as determined by advancing water contact angle measurements. A greater increase in hydrophilicity was observed for the UV photo-oxidized PEN samples. Samples from both treatment methods were polymerized with acrylic acid to form a grafted super-hydrophilic polymer and analyzed by XPS.

EXPERIMENTALLY DETERMINING PRECISION AND ACCURACY OF 3D LASER SCANNING FOR COMPARISON TO TRADITIONAL ARCHITECTURAL CONSERVATION METHODS.

Evan Van de Wall, 3 Athens St., Waverly, NY 14892.

The National Historic Preservation Act was amended in 1980 to develop a uniform process and standards for documenting historic properties. The idea was to preserve the built environment of the United States to help retain its history. The standards called for the architect going the survey to create detailed field notes that had measurements of the structure, and other important information about the building. The measurements would be used to create a scaled drawing that would be saved, and the other information would be used to write a report on the structure. My work has been to see if the use of 3D Laser Scanner technology can replace the traditional method of hand measuring.

3D laser scanners use laser pulses to map an object to scale that can be uploaded to a 3D environment on a computer. There are three different types of laser scanners categorized on the distance that can be scan from and the resolution. The type that was used in my work is a time of flight scanner. The scanners hardware records how long it takes the laser pulse to leave and return, and by knowing the corresponding horizontal and vertical angle a coordinate can be given for the point.

Data was collected at three historic sites, Old Fort Johnson, Fort Johnson, NY, the President Lincoln's Cottage, D.C, and President Grant's Cottage, using both the traditional method and 3D laser scanning. The data will be used to analyze these hypotheses:

1. The scan data will be more versatile in post processing applications than the hand measurements can.
2. The average of the measurements taken of the doors from the scanner will match the average of the measurements taken by hand.
3. The standard deviation of the measurements of the doors taken from the scanner will be smaller than the standard deviation of the hand measurements.
4. The average of the measurements taken of the door molding from the scanner will match the average of the measurements taken by hand.

5. The standard deviation of the measurements of the door moldings taken from the scanner will be larger than the standard deviation of the hand measurements.
6. The laser scanner will be able to record warped features on structures better than hand measurements can.

TISSUES SPECIFIC ROLES FOR TWO GRP170 CHAPERONES LOCI IN PROTEIN FOLDING IN *CAENORHABDITIS ELEGANS*. Mengxin Wang and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Chaperones are essential proteins that help polypeptides fold into their functional three dimensional shapes. GRP170 is the largest chaperone of all chaperones and is found in the ER of cells. Grp170 has been recognized as a member of the Hsp70 superfamily for some time, yet its cellular function in animals remained elusive. The nematode *Caenorhabditis elegans* has two genes encoding the chaperone GRP170: T24H7.2 and T14G8.3. Homozygotes for deletion alleles of T24H7.2 induces the Unfolded Protein Response (UPR) suggesting that T24H7.2 is important for protein folding in adults. Alternatively, deletion alleles of T14G8.3 did not induce the UPR in adult nematodes. A UPR reporter transgene will be used to investigate which tissues are dependent on either GRP170 isoform for normal protein folding. The Phsp-4::gfp transgene links the promoter from the UPR responsive gene hsp4 with the reporter gene for the green fluorescent protein. Tissues which accumulate unfolded protein induce the UPR which can be detected with fluorescence microscopy. I have generated two *C. elegans* strains using simple genetic crosses to introduce the UPR reporter construct into genetic backgrounds deficient for either the T24H7.2 gene or the T14G8.3 gene. Preliminary data for the tissues specificity of UPR induction in these strains will be presented.

THE SIGNIFICANCE OF THE NUCLEAR GENE, *SGS1*, IN MITOCHONDRIAL GENOME STABILITY IN *SACCHAROMYCES CEREVISIAE*. Kathryn Wershing, Biology Department, SUNY Brockport.

Mitochondria are essential organelles in eukaryotes. Mitochondria synthesize ATP, supplying the cell with energy necessary for metabolic processes, hence its nickname as the cell's "powerhouse". Mitochondria have individual genomes, separate from the nuclear DNA, that encode proteins vital for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) lead to several neuromuscular and neurodegenerative disorders due to the compromised stability of the mtDNA. This particular study focuses on a nuclear gene, *SGS1*, and its significance in mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. *SGS1* is a member of the recQ family of helicases and therefore aids in the unwinding of chromatin at the duplex as it prepares for replication and helps resolve homologous recombination events.[1] Similar mutations in the human homolog of *SGS1* helicase lead to specifically, Bloom, Werner, and Rothmund-Thomson syndromes in humans.[1] Yeast lacking functional Sgs1p protein display hypersensitivity to DNA-damaging agents and hyper-recombination, as well as, exhibit signs of premature aging.[1]

The quantitative impacts of *SGS1* mutations in mtDNA stability of budding yeast are being studied via three genetic assays. The first measures spontaneous respiration loss, the second measures direct repeat mediated deletion (DRMD) events, and lastly, an induced direct-repeat mediated deletion assay currently being conducted, will help uncover if the observed mitochondrial DRMD events are a result of double stranded break repair or replication

dependent repair. Budding yeast *sgs1*Δ strains display an ~2.2 fold *increase* in respiration loss. From two independent isolates, *sgs1*Δ mutants have also shown an ~1.7 and ~1.5 *decrease* in mitochondrial DRMD events, but ~2.4 and ~2.8 *increase* in nuclear DRMD events compared to wild type strains. The nuclear data supports conclusions previously published. Our data shows that the presence of the Sgs1p protein plays a role in mitochondrial genome stability. Completion of the induced direct-repeat mediated deletion assay will provide insight into the specific repair mechanisms used during mitochondrial DRMD events.

CAPABILITIES OF TGA TO DETECT ENZYME ACTIVTITY ON EXTRACTED AND UNEXTRACTED LIGNOCELLULOSE. Courtney Whitney, and Dr. Robyn E. Goacher, Niagara University, NY 14109.

The need for renewable resources is growing in our modern world. Cellulosic ethanol is a second generation biofuel formed from the inedible components of plants (lignocellulose). Plant matter may be broken down by chemical means or through a potentially more environmentally friendly method of degradation: enzymatic degradation. In order to detect this enzymatic degradation, an efficient instrumental method must be discovered. Thermogravimetric Analysis (TGA) has proven to be useful in the analysis of lignocellulosic degradation. TGA is a solid-sampling instrument that can be used to detect the enzymatic degradation of wood. In this study, the small organic molecules (extractives) were removed from some wood samples, and left in others. Extractives inhibit enzyme degradation because they act as the plants natural barrier to environmental threats. The extractives were removed in order to monitor the change in the rate of degradation between extracted and unextracted wood. The first derivatives of the thermograms were analyzed using curve fitting. Our preliminary results showed that unextracted lignocellulose thermally degrades at a higher temperature. A more extensive comparison of the unextracted versus the extracted lignocellulose samples will also be discussed.

ELUCIDATION OF THE EFFECTS OF THE CELLULAR ENVIRONMENT ON THE UNCG HAIRPIN MOTIF. Michelle E. Whittum and Joshua M. Blose, SUNY Brockport, 350 New Campus Drive, Brockport NY, 14420.

The effects of osmolytes on nucleic acid chemistry are generally not as well understood as for their protein counterparts. Recent studies have shown that these effects are rather complex and show significant dependencies on the chemical and structural properties of both the nucleic acid and the cosolute. Osmolytes have the potential to affect the stability of secondary structure motifs and alter preferences for conserved stable nucleic acid sequences. The goal of this proposed research is to contribute to the understanding of the *in vivo* function of nucleic acids by studying the effects of different classes of osmolytes on the UNCG tetraloops secondary structure motif. UNCG tetraloops, are the most common and stable of the RNA tetraloops and are nucleation sites for RNA folding. Since this motif distorts the typical duplex conformations, studying these motifs in the presence of cosolutes may reveal unique preferences for osmolyte interactions and differences in the impact of excluded volume and changes in dielectric constant on structure formation.

ALKALI HALIDE SALTS DISSOLVED IN NON-IONIC SURFACTANTS STUDIED BY ^{23}NA, ^{81}BR, AND ^{87}RB NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY. Morgan E. Wilson, Leeza M. Kerr, and Markus M. Hoffmann*

Polyethylene glycol (PEG) has been recognized as a green solvent medium for chemical synthesis and processing. In contrast to traditional organic solvents, mineral salts can be dissolved in PEG. However not much is established about how the salts that are dissolved interact with PEG. The spin-lattice relaxation time (T1) and thus the linewidth of quadrupolar nuclei are sensitive to the presence of electric field gradients, which are expected to increase when ion pairs are formed. NMR spectral data will be presented for 0.075 molal salt solutions with varying compositions of PEG and water expressed in % volume. The spectral linewidth of the 23Na signal first gradually increased from 0.1 ppm in aqueous solution to 0.5 ppm at 50 % volume PEG, and then dramatically increased well above 10ppm in neat PEG. The linewidth of 81Br became too large to acquire with solution NMR spectroscopy if the PEG concentration was greater than 30 % volume. Additional results will be presented for 87Rb NMR as well as other nonionic surfactants related to PEG for comparison.

GRAPHENE QUANTUM DOTS BIND TO COBALTIC ION WITH POTENTIAL APPLICATIONS FOR CONTROLLING CANCER: ELECTROCHEMICAL AND SPECTROSCOPIC STUDIES.

Kris Wong[1] , K.S.V. Santhanam[1*] and S. Kandlikar[2], [1]School of Chemistry and Materials Science and [2]Department of Mechanical Engineering and Microsystems, Rochester Institute of Technology, Rochester, NY 14623.

- Corresponding author

There are innumerable attempts to bind cobaltic ion by complexing agents as cobalt and cobalt compounds have been classified as potentially cancerous beyond a limit by International Agency for Research on Cancer (IARC) to humans [IARC 1991] (1). While in general metal ions and graphene quantum dots have collisional interaction that increases the mass transport to the electrode, cobaltic ion shows contrasting behavior in binding to it (2). This behavior of cobaltic ion binding has been studied by cyclic voltammetry, chronoamperometry and differential pulse voltammetry. The electrochemical reduction of cobalt chloride in sodium sulfate has been examined at glassy carbon electrode by cobaltic ion shows a well-defined cathodic peak at E_{pc}=- 0.95 V vs. saturated calomel electrode (SCE) and a complementary anodic peak at E_{pa} = -0.38 V. The peak currents increase with increasing sweep rate. The differential pulse voltammetry shows a distinct cathodic peak at E_{pc} =-0.92V. In the graphene quantum dot bath, the cyclic voltammetric peak is shifted to a more negative potential with reduced cathodic peak current and an increased anodic peak current. Due to the large surface area of graphene, cobaltic ion in the bound form is transported to the electrode. By examining the cathodic potential shift with graphene quantum dot, it is estimated to bind six graphene quantum dots for one cobaltic ion. The UV-Visible absorption spectroscopy, Fourier transform infrared spectroscopy and fluorescence spectroscopy are used to understand the mechanism and usefulness of cobalt interaction with graphene quantum dots. The morphology of cobalt deposit is examined by scanning electron microscopy.

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MULTI-YEAR ANALYSIS OF MICROBIAL POPULATIONS IN THE ROCHESTER- LAKE ONTARIO EMBAYMENT.

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The composition of freshwater bacterial populations is affected by a wide variety of factors. Temperature, acidity, organic matter, and environmental pollutants like industrial chemicals and antibiotics are a few examples. The impact that bodies of freshwater have on human activity and the wider ecosystem warrants the systematic identification of microbial flora, and in particular of species known to be pathogenic in plants and animals. In order to achieve the long-term goal of using satellite imagery to predict the occurrence of specific bacterial species, our team is in the process of creating a multi-location, multi-year microbial flora database for the Rochester Lake Ontario embayment and nearby bodies of water. Our collaborators at the Rochester Institute of Technology have provided us with water samples collected at these locations during the summers of 2013 and 2014. In this work we present and analyze data from said samples. Using 16S ribosomal DNA data we characterize bacterial populations, determine their geographical distribution, establish genera prevalence and discuss the presence of and investigate antibiotic resistance in several pathogenic species. The scope of our long-term project and the summer of 2015- sample collection are also considered.