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ABSTRACT BOOK

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2021 Rochester Academy of Science Abstracts

Oral Presentations
Alphabetical by title

ACCELERATED BIODEGRADATION OF AGRICULTURAL MULCH FILMS IN SOIL AND COMPOST ENVIRONMENTS. Harshal J Kansara and Jeffery Lodge, Rochester Institute of Technology.

Traditional mulch films used in agriculture are not biodegradable and are sent to landfills after the end of harvest each year. As direct alternatives replace these, mulch film manufacturers have been developing films with biodegradable polymers. These perform the same functions as the traditional mulches and can be tilled directly into the soil for in-situ biodegradation, unlike traditional films. But in the northern states of the US, as the temperatures in the winter are low, the microbial activity is reduced significantly. Hence, low metabolic rates lead to low rates of polymer biodegradation. This in turn leads to a buildup of plastics and microplastics in the soil over time and deterioration of the natural soil ecosystems. Thus, there is a need to accelerate the degradation of mulch films in soil or look at alternatives like composting to ensure their proper disposal. To accelerate biodegradation in soil, a microbial trigger is being developed. This microbial trigger mechanism would contain bacterial colonies isolated from degrading mulch films involving the culture refining method. Some early results based on growth curve data indicate that we have isolated specific film degrading micro-organisms, and isolated microbes are currently being identified using 16s rRNA sequencing. Further CO2 evolution and accelerated weight loss experiments need to be performed to demonstrate the authenticity these of methods and cultures. Composting of films was chosen as a viable alternative to the soil experiments. Specialized mesh bags were fabricated from a polyester screen for holding the test samples in compost and their ability for easy retrieval. Mesh bags holding the samples, though slightly hindering polymer biodegradability in compost, are necessary for accurate weight loss assessment which is the primary indicator of biodegradation being inspected. The first experimental trial is being conducted to assess the feasibility of fabricated mesh bags and compare forced air vs. naturally aspirated composting techniques.

Initial result data indicates that forced air compost seems to have a faster rate of biodegradation.

AN INVESTIGATION INTO THE CONTROL OF EUROPEAN DEWBERRY (*Rubus caesius*) IN THE FINGER LAKES REGION OF NEW YORK. A. Davis and K. Amatangelo, SUNY Brockport.

Invasive species are a significant component of anthropogenic global environmental change, as they disrupt plant communities and impact ecosystem processes. *Rubus caesius* (European Dewberry) is an invasive plant in western New York known to displace native vegetation, reduce streambank stabilization, and alter soil nutrients. There is no published literature on the best practices for the control of *R. caesius*. I evaluated the effectiveness of mechanical, chemical control, and combined treatments at the Ganondagan State Historic site in Victor, NY. With a randomized block design, I administered treatments to plots in five populations of *R. caesius*. I estimated the percent cover of each species in ten quadrats in each plot before and after treatment. Only the treatments using herbicide decreased the percent cover of *R. caesius. Rubus caesius* increased in percent cover where only mechanical treatments were applied. These results will provide landowners with an effective treatment option to prevent the spread of *R. caesius*.

CHARACTERIZATION OF SUSTAINABLE ALIPHATIC POLYESTERS INCLUDING MEASUREMENTS OF WETTABILITY BEFORE AND AFTER PLASMA SURFACE TREATMENT. Shao Demyttenaere and Matt Miri, Rochester Institute of Technology.

Sustainable polymers are a field of particular interest due to the rapidly depleting fossil fuel feedstocks used for conventional polymers. Furthermore, biodegradable polymers, such as polyesters, can help reduce plastic waste accumulation in the environment. Polybutylene succinate (PBS) is a promising bio-polyester which can be synthesized using renewable feedstock, but with comparable properties to commercial polymers using traditional feedstock. Several polyesters structurally similar to PBS were synthesized by our research group to investigate their thermal and surface properties. The polyesters were synthesized with melt polymerizations applying a titanium tetrabutoxide catalyst using even numbered dicarboxylic acids and diols. Thermal properties were determined by differential scanning calorimetry (DSC) and thermal gravimetric analysis (TGA). Surface wettability properties of the polyesters were investigated using contact angle (CA) goniometry, atomic force microscopy (AFM), and scanning electron microscopy (SEM). Surface modification by plasma treatment of these sustainable polyesters allows for broad and tunable applications, competitive or unique from traditional polymers.

GONADAL DEVELOPMENT AND FECUNDITY OF LAKE ONTARIO DEEPWATER SCULPIN. Jarrod Ludwig, Brian Weidel, Brian O'Malley, Mike Connerton, and Jacques Rinchard, SUNY Brockport.

Deepwater sculpin (*Myoxocephalus thompsonii*) is a benthic fish species listed as threatened in New York. Considered extirpated from Lake Ontario until the late 1990s, they have naturally repopulated the lake since then. As their reproduction is poorly described, we investigated their gonadal development and fecundity to better understand their resurgence. From 2018 to 2021, deepwater sculpin were collected from Lake Ontario in spring and fall using bottom trawling. To evaluate the duration of their spawning period and if females spawn several times during their spawning period, we examined their gonadosomatic index (GSI = gonad weight x 100/body weight), gonadal development, and fecundity. Our data showed that female GSI remained elevated in fall (7.4 ± 6.3%) and spring (4.3 ± 4.2%). Absolute fecundity, measured as the number of the largest oocytes present in the ovary, averaged 763 ± 246 and relative fecundity 19 ± 6 oocytes per gram of fish. The histological analysis revealed the presence of only one batch of developing oocytes in the ovary and the largest oocytes averaged 1.72 ± 0.19 mm in diameter. Therefore, we suggest that deepwater sculpin spawn once annually, but have a protracted spawning season. These data provide insight on their reproductive strategy and can be contrasted with the ones of the declining slimy sculpin (*Cottus cognatus*) and the abundant round goby (*Neogobius melanostomus*) populations for potential reasons of their resurgence in Lake Ontario.

MACHINE LEARNING ESTIMATE FOR DISTANCE MODULUS TO GALACTIC GLOBULAR CLUSTER MESSIER 3. Selim Kailici, SUNY Oswego.

RR Lyrae are short-period variable stars that lie in the intersection between the horizontal branch and instability strip on the Hertzsprung-Russell diagram. In this work, we used a precomputed grid of RR Lyrae stars from RSP. We employed a classic multi-layered perceptron machine learning model to estimate the function which maps the numerical representation of light curve features to the fundamental parameters of RR Lyrae, such as absolute magnitude or Luminosity. Once trained, this artificial neural network predicted the fundamental parameters of observed RR Lyrae in Messier 3. A distance modulus of μ = 15.06 $\pm$ 0.14 was determined with the predicted absolute magnitude, and observed apparent magnitude of these stars.

OPTICAL ROTATION OF FEW-ION CRYSTALS IN A LINEAR PAUL TRAP. Arpita Pal, Duc Le, A. Ozawa, T. Udem and M. Bhattacharya, Rochester Institute of Technology.

One-dimensional linear ion strings in linear Paul trap provide a mature architecture for the investigation of quantum simulation and quantum information processing protocols. Here we present a classical theoretical model to describe and characterize the radiation-pressure induced rotation of a two-ion crystal trapped in a linear Paul trap. The asymmetrically placed Gaussian cooling beam imparts a finite torque onto the ion chain and makes it rotate in a ring. Our theoretical analysis entails the estimation of the orbit diameter, rotation conditions, the shift of center-of-mass of the system, and rotational frequency with high accuracy. We also present simulated results, with which experimental data fits very well. Our investigation of optical ionic rotors can be useful in rotation sensing, observing Hawking radiation in acoustic analogs of black holes; and engineering micro-motors and related technologies.

OPTIMIZATION OF PHOTODYNAMIC COMPOUNDS FOR NON-INVASIVE TREATMENT OF BREAST CANCER. Connor McGrath, Rochester Institute of Technology.

Breast cancer is the leading cause of death for women globally, annually claiming the lives of 40,000 women in America alone. Photodynamic therapy (PTD) is a non-invasive cancer treatment that uses specific wavelengths of light to activate photoreactive probes that induce apoptosis (programmed cell death). PTD probes however are usually nonspecific and can impact both healthy and cancerous tissue. In this investigation we have collaborated with Dr. Hans Schmitthenner's research group in the RIT School of Chemistry and Material Sciences to test a photoreactive dye bound to a peptide that selectively targets breast cancer cells. Different iterations of this targeting agent were applied to breast cancer cells. Confocal microscopy was used to visualize staining. We found that these imaging agents do bind to cells as expected, and we are in the process of optimizing binding.

POST-GENDER PERFORMANCE IN BILLIE'S PROJECT BODY HAIR. Kelsey Dux, SUNY Geneseo.

This study analyzes new advertisements in women's beauty products and how they challenge and/or reinforce gender norms, specifically the shaving company Billie's Project Body Hair. Past research on advertisements relied on a binary system: man/woman as strict and biologically determined rather than fluid and performed. This traditionally gendered approach used masculinity to define femininity, constructing femininity as inherently non-agential. In response, the current study significantly revises the traditional gender advertising coding schemes to understand how gender performance in post-gender advertisements navigates the relationship between femininity and agency.

STELLAR PULSATION: INTERIOR LUMINOSITY CURVES OF CEPHEID VARIABLE STARS. Michele Manno, SUNY Oswego.

Cepheid pulsating stars display a regularly varying luminosity output or light curve. These stars pulsate due to internal physics and are a critical tool in establishing the size-scale of the Universe. We use a state-of-the-art 1D radiation hydrodynamics code to compute interior luminosity curves for a grid of classical Cepheid pulsating stars. We attempt to study where features in the surface light curve are determined in the star with a view to using these results for asteroseismology of these stars,

STELLAR PULSATION: LINEARIZED STELLAR PULSATION CALCULATIONS FOR 3 TYPES OF VARIABLE STARS. Hugh RIley Randall, SUNY Oswego.

By using the state-of-the-art 1D hydrodynamic radiation code, MESA/RSP, we model three classes of variable stars. A robust grid of models is run for each of the three classes (RR Lyraes, Classical Cepheids, and Type II Cepheids). Each grid of models is run with four theories of time-dependent convection, labeled A, B, C, and D. For these calculations, RSP linearizes the equations of momentum and energy, and produces results in the first ten modes of the normal mode spectrum. We plot every model that produces a positive growth rate on a Color Magnitude Diagram(CMD) and will compare the theoretical results to observational data.

VERTEBRAL FOSSILS OF THE SQUAMATES AND ANURANS OF CATHEDRAL CAVE, NEVADA. Jack Gembala, Maria Belen Salinas, and Jennifer C. Olori. Department of Biological Sciences, SUNY Oswego.

The Cathedral Cave system of Nevada has a diverse set of vertebrate fossils ranging from amphibians to mammals. The fossils collected from this area were dated to the Pleistocene, specifically about 150,000 years ago. These cave deposits provide important data about the environment at certain times throughout history that is free of biases that a non-cave site may be subject to, such as disruption of the sediment causing fossils to move from their original locations. While the mammals have been seen at other sites, showing evidence that these animals migrated sometime in the past, squamates and amphibians have been assumed to show no such migration events. The goal of our research was to use comparative morphology to see which species were fossilized in Cathedral Cave to assist with answering questions about past migrations. Preliminary results reveal a sacral vertebra of a squamate lizard with a relatively larger size and downward angled sacral ribs that resemble living *Uma* morphologically. Additional

vertebrae represent other phrynosomatid lizards and non-viperid snakes. Several frog vertebrae also were found and may represent several truck vertebrae tentatively assigned to *Anaxyus, Lithobates,* and *Ranidae*. There are also sacral vertebrae that have been identified as *Lithobates*. So far, the identified fossils suggest a mix of squamates and anurans similar to those living in the Great Basin area today, lessening the likelihood of migration.

X-RAY ABSORPTION STUDIES ON CATHODE MATERIALS FOR AQUEOUS ZN-ION BATTERIES. Christopher Patridge, D'Youville College.

Multivalent ion batteries represent a unique approach to increasing energy capacity for electrochemical storage. While Li-ion batteries (LIB) are the dominant technology that continues to advance with novel architectures and engineering, there still exists serious issues of thermal sensitivity and runaway. Aqueous systems would significantly reduce these thermal concerns and also drop the economic costs associated with the organic solvents that compose the electrolytes in LIBs. The Zn ion (+2) gives twice the capacity and the ionic radii (0.78 Å) matches closely to the Li ion. The increased electronic/structural disruption imposed by intercalating a +2 ion finds some relief by co-intercalation of H2O along with sandwich layered structures often associated with the multitude of vanadium oxide polymorphs. Synchrotron work* at NSLS-II BM-6 looked at the XANES and EXAFS dependence on voltage. Using crystal structure data for the material, theoretical XAFS scattering was compared to the experimental data to establish possible local site occupancy for the intercalated Zn ion. Further in-situ experiments on both Zn0.25V2O5 and Ca0.25V2O5 were performed using a novel electrochemical cell. Both materials exhibit a clear change in the local geometry and oxidation state of the vanadium in the active material with early cycle reversibility. Integrated XANES difference spectra are correlated with the approximate shift of vanadium from a nominal oxidation state of +4.75 → +4.00 if assuming an approximate fully discharged state stoichiometry of Zn1V2O5 or Ca0.25Zn0.75V2O5.

Poster Presentations
Alphabetical by title

A FLORISTIC QUALITY ASSESSMENT OF THE CRANBERRY POND RESTORATION, COMPARING PRE- AND POST-RESTORATION DATA. Patrick James Stetzel, SUNY College at Brockport.

The success of a Great Lakes Coastal Wetland restoration project was evaluated using an ecological assessment tool designed to measure wetland integrity through the collection of vegetative data. The restoration work was performed to reestablish habitat heterogeneity lost to the invasive cattail hybrid, *Typha x glauca,* through the construction of water channels and large open water areas called potholes. Transect surveys were conducted both pre- and post-restoration using Floristic Quality Assessment parameters to measure the change in the wetland plant community. Coefficients of Conservatism, or "C" values, are assigned to individual plant species on a scale from 0-10, with a 10 indicating a species with high fidelity to undisturbed habitats. A weighted mean C metric ($w\bar{C}$) was used for the analysis to account for species' abundance. Using a paired t-test to compare pre- and post-restoration data, we found a significant increase in $w\bar{C}$ values post-restoration. While there was no significant difference in $w\bar{C}$ between the post-restoration restored and control sites in 2021, there was a 36% decrease in relative abundance for the invasive cattail. This data suggests that there was a preliminary success for the restoration work. Low-water levels and insufficient time for higher fidelity species to establish may account for the lack of contrast between $w\bar{C}$ values in the restored versus unrestored areas. Future plantings to improve habitat heterogeneity and time may show an increase in floristic quality over time, which will be monitored again in 2022.

AN INVESTIGATION INTO THE EFFECTS OF LS1 AND TOP II POISONS ON HEART CELLS. Katelin Keenehan and Jonathan Millen, Ph.D, St. John Fisher College.

Type II topoisomerases are enzymes that are essential to cells. They correct any twists or winding in DNA and also create cleavage complexes when necessary. These enzymes are also necessary for processes like transcription, translation, and chromosome segregation. Common chemotherapeutic drugs target these top II enzymes and are known as topoisomerase II poisons. Top II poisons increase the amount of cleavage complexes, making the top II enzymes of the cell act toxic. These poisons induce the top II enzyme to generate more irreparable DNA breaks eventually resulting in death of the malignant cell[5]. Top II poisons include drugs like doxorubicin. Doxorubicin has a cardiotoxic impact on those going through treatment. Cancer patients that endure cycles of long, difficult treatment often end up suffering from lifelong cardiovascular complications due to the fact that doxorubicin targets all cells, healthy and unhealthy[4]. A known weaker top II poison is a compound called LS1. LS1 is selectively toxic to cells that have a lesser ability to repair double strand breaks. Previous experimentation shows that when LS1 is paired with strong top II poisons used to treat cancer, like doxorubicin, LS1 enhances the stronger drug's toxicity potentially by stabilizing top II covalent complexes. This creates a good target for the strong top II drug to poison and this is all done without increasing the toxic exposure in noncancerous cells. Since LS1 has been proven to

enhance the toxicity of doxorubicin while not increasing toxicity in noncancerous cells[3], combinations of LS1 and doxorubicin are hypothesized to decrease the cardiotoxic effect when compared to treating with only doxorubicin. Due to doxorubicin's known toxicity, there is a lifetime limit that is unique to each individual. This limit depends on other risks related to the heart, like the use of other heart-toxic drugs, age, and radiation exposure to the chest[1]. If LS1 is found to enhance the efficacy of doxorubicin killing cancer cells, while also providing protection to healthy heart cells, then this lifetime limit of doxorubicin could ultimately be increased for individuals seen as risky candidates. This could hopefully lead to more cancer patients having successful treatments and recovery, along with a smaller chance of immediate relapse if the cancer was treated more aggressively. To study the impact of LS1 paired with doxorubicin on cardiotoxicity, cultured rat cardiomyocyte cells were used to create a population of cells used to perform experiments[2]. The cells were treated with control conditions, doxorubicin, LS1, and a combination of dox/LS1. So far, the difference between the percentage of dead control cells and dead dox/LS1 cells was seen to be significant ($p=0.0205$). This suggests that the dox/LS1 treatment is effective in killing cells, however, much less deadly than the treatment of doxorubicin alone. On average, doxorubicin has been seen to kill 56% of cells where the dox/LS1 combined treatment has been seen to kill on average 11% of cells ($p=0.039$). These results suggest that LS1 provides a form of protection to heart cells and that there may be effective ways to treat cancer while minimizing harm to healthy cells throughout the treatment process, ultimately allowing courageous cancer survivors to live a healthier lifestyle after battling cancer.

ANALYSIS OF *E. coli* NUDIX HYDROLASE KNOCKOUT PHENOTYPES: ANTIMUTATOR PROPERTIES AND ANTIBIOTIC SUSCEPTIBILITY. Luiza Bianco, Sakinah Abdul-Khaliq, Nicolette Kulakowski, Thomas Hynes, and Suzanne F. O'Handley, School of Chemistry & Materials Science, Rochester Institute of Technology.

Enzymes of the Nudix Hydrolase superfamily are characterized by the ability to hydrolyze substrates containing nucleoside diphosphate linked to some moiety x, and their roles appear to be to modulate the levels of metabolites that would be detrimental at elevated levels. We have been systematically analyzing the *E. coli* Nudix hydrolase knockouts for phenotypes. MutT is an established antimutator, and we have determined that the other Nudix hydrolases from *E. coli* are not antimutators. Complementation studies with Nudix hydrolases from M. tuberculosis have been carried out to determine which, if any, are antimutators; thus far, none have been determined to be antimutators. We also have screened the *E. coli* Nudix hydrolase knockouts for antibiotic susceptibility with mixed results that we are in the process of understanding. A few *E. coli* Nudix knockouts appear to be more or less susceptible to some antibiotics depending on the knockout and the antibiotic.

ARGININE METHYLATION OF TBLPN IN TRYPANOSOMA BRUCEI AND ITS ROLES IN PHOSPHATIDIC ACID PHOSPHATASE ENZYMATIC ACTIVITY. Julia Hoyser and Michel Pelletier, Department of Biology, SUNY Brockport.

Phospholipids biosynthesis, particularly phosphatidyl-choline (PC) and phosphatidylethanolamine (PE) plays a major role in the survival of *Trypanosoma brucei*, the parasitic protozoan responsible for African Sleeping Sickness. Of great importance is the fact that, as opposed to other parasitic organisms, trypanosomes synthesize phospholipids de novo. Although the pathways for phospholipids biosynthesis have not been very well characterized, recent data have helped to better understand how trypanosomes are able to assemble phospholipids. Previous work in our lab has shown that a protein, termed TbLpn, is a phosphatidic acid phosphatase potentially involved in phospholipid biosynthesis in *T. brucei*. In addition, TbLpn contains methylated arginine residues and interacts with *T. brucei* Protein Arginine Methyltransferases 1 and 7 (TbPRMT1 and TbPRMT7). The major focus of my project is to identify the effect of TbLpn methylation on its enzymatic activity. The roles of arginine methylation on TbLpn enzymatic activity was determined by mutating two arginine residues predicted to undergo methylation, Arg-56 and Arg-325, to lysines. The mutant TbLpn protein was then expressed in *Escherichia coli*, purified, and its enzymatic activity assessed in vitro. The effect of these mutations on the enzymatic activity of TbLpn will be discussed.

CALLING BEHAVIORS OF FALL GROUND CRICKETS ON HARDSCAPES AND NATURAL LANDSCAPES. Mackenzie Bancroft and Dana Moukaled, Department of Biology, SUNY Geneseo.

We are addressing the question of whether the calling of Fall Ground Crickets (*Gryllus pennsylvanicus*) differs between hardscapes and natural landscapes. These crickets are found on the SUNY Geneseo Campus both around buildings and sidewalks and in more natural settings. We collected data in September and October of 2021 between the hours of 5-9 pm on clear days noting the temperature at the times data was collected. We made audio recordings of the calling crickets and measured the amplitude of their call, in order to compare the crickets calling on hardscapes vs natural landscape. We hypothesize that cricket calling frequency and amplitude is different in hardscapes and natural landscapes. We will report results on call rate and amplitude of fall ground crickets and suggest avenues for further analysis.

CELL IMAGING IN MICROFLUIDIC DEVICES UNDER DYNAMIC CONDITIONS. Karnavaal Al-Rubayie[1], Jaqueline Chouinard[2] and Fernando Ontiveros[2]. 1. Cornell University, Department of Biomedical engineering. 2. St. John Fisher College, Biology.

The use of dynamic culture environments to better understand cellular processes as they take place in vivo is likely an improvement over the static-well setups more commonly used in cellular imaging. Current dynamic culture methods often make use of microfluidic devices. However, microfluidics technologies can require tools and expertise outside the reach of most investigators and may also present deficiencies regarding gas exchange and leeching. The work presented here aims to provide a solution to these challenges by using film-based microfluidic devices (PETLs). These devices integrate adhesive and porous materials that allow for gas and liquid exchange as well as culture in regular cell culture dishes. A semi-open channel configuration features a continuous liquid phase while preserving dimensional constraints for controlled flow. In preliminary studies we cultured mouse macrophages and measured cell viability as well as whole-cell phagocytosis using fluorescent probes. Our results show that cell culture PETL microfluidic devices are a viable option for the short- and long-term imaging of cells under dynamic conditions. This low-cost platform allows for rapid iteration of custom designs and may be applied to a wide variety of experimental conditions.

DETANGLING EVOLUTIONARY RELATIONSHIPS WITHIN THE PARSONSIINAE SUBTRIBE OF APOCYNACEAE USING CHLOROPLAST, MITCHONDRIAL, AND RDNA GENOMES. Deirdre O'Malley[1,3], Erika Sipos[1,3], Madison Cullinan[1], Tatyana Livshultz[2], and Shannon Straub[1] 1. Department of Biology, Hobart and William Smith Colleges; 2. Department of Biodiversity Earth and Environmental Sciences, Drexel University; 3. Equal contribution.

The Apocynaceae family, otherwise known as the milkweed and dogbane family, is one of the largest families of flowering plants with ca. 5,000 species organized into over 300 genera. Despite being one of the largest families with species found across the globe, Apocynaceae still holds evolutionary secrets amongst the tribes from which it is composed. Despite our taxonomic knowledge, the specific evolutionary relationships found between species and within genera of the subtribe Parsonsiinae are still not clearly understood. Our study aimed to infer the evolutionary relationships within the genus *Parsonsia* and in the subtribe Parsonsiinae using chloroplast and mitochondrial genomes, and ribosomal DNA (rDNA) cistron sequences obtained through genome skimming and to determine the congruence of the three phylogenetic trees inferred from the different genomes. Total genomic DNA was extracted from 28 individuals across 14 genera and sequenced on an Illumina NextSeq500. Genome sequences were then produced using reference-guided assembly, matrix alignment, and manual corrections and then used to infer three maximum likelihood phylogeny trees. The genus *Parsonsia* was found to be monophyletic in all three trees and Parsoniinae was consistently found to be polyphyletic. Two major clades were distinguished in *Parsonsia* across all three trees, consisting of species found only in Australia and those found in both South East Asia and Australia, suggestive of a recent diversification in Australia. The differences between species across the trees are representative of the three genomes evolving separately within each species. However, the overall congruence of the three genome phylogenies emphasizes subtle topological differences at the species level that may warrant further investigation.

DOES FLIGHT CALLING BEHAVIOR DIFFER IN RESPONSE TO CONSPECIFIC AND MULTISPECIES CALLING CUES? Alex Sidare and Will Vega, Canisius College

A conspicuous feature of avian migration is the use of flight calls during nocturnal migratory flights. Flight calls are short, species-specific vocalizations with a function that is unknown, although previous work has shown that they elicit calls from other individuals. Because the timing of many warbler species' migration overlaps, flight calls may be used for interspecific communication. The goal of this experiment was to compare flight calling behavior in response to conspecific calls compared to a selection of mixed species calls in two species of warblers: *Setophaga ruticilla* (American Redstart, AMRE) and *Setophaga magnolia* (Magnolia Warbler, MAWA). Our initial hypothesis was that birds would be more likely to respond, respond more quickly, and respond with more calls in response to conspecific calls than to mixed species calls. In conjunction with the Appledore Island Migration Station (Appledore Island, ME) we used captive warblers to investigate responses to flight call recordings in an acoustically isolated chamber. Individuals were assigned to either hear conspecific or mixed species recordings. For each individual, we determined whether it responded, and if so, the latency (time between cue and first call) and the rate of calling (calls/min). During our experiment, we tested 928 Magnolia Warblers and 772 American Redstarts. Our results showed both American Redstarts and Magnolia Warblers were significantly more likely to respond to conspecific calls (AMRE: $\chi 2=25.4$, df=1. P

EFFECT OF ANTHROPOGENIC NOISE ON ANURAN VOCALIZATIONS. Robert Colbath and Micah Hosley, Department of Biology, SUNY Geneseo.

The impacts of anthropogenic activity, including noise pollution, have been linked to a global decrease in

amphibian species. It is critical to understand which wetland landscapes, especially those used as breeding sites, are being impacted by noise pollution. Male anurans produce species-specific vocalizations in the spring and summer seasons at breeding sites to attract mates. Previous studies suggest noise pollution, namely traffic noise, has an impact on these vocalizations. This study examines acoustic recordings from three known anuran breeding sites within the Genesee Valley in New York. The acoustic recordings collected during June 2019 were analyzed using the Raven Pro software to determine species richness, and patterns of calling behavior for each species at these sites. We aim to understand species use of available habitats in noisy and quieter areas, and vocalization patterns of three local anuran species: Northern Gray Treefrog (*Dryophytes versicolor*), Bullfrog (*Lithobates catesbeianus*), and Green Frog (*Hylarana erythraea*). The data collected will expand upon knowledge regarding anuran breeding patterns in roadside and other habitats in New York State.

EFFECT OF ARGININE METHYLATION ON THE ENZYMATIC ACTIVITY OF TBLPN AND ITS ROLE IN PHOSPHOLIPID BIOSYNTHESIS IN *Trypanosoma brucei*. Mackenzie Drum and Michel Pelletier, Department of Biology, SUNY Brockport.

African sleeping sickness is a vector-borne devastating disease caused by the parasitic protozoan *Trypanosoma brucei*. This parasite is transmitted between mammalian hosts by the tsetse flies of the genus *Glossina*. Sleeping sickness threatens over 60 million people in 36 countries of sub-Saharan Africa. Over 70,000 deaths every year are a result of sleeping sickness and the disease is always fatal unless treated. Phospholipids biosynthesis, particularly phosphatidylcholine (PC) and phosphatidylethanolamine (PE) plays a major role in the survival of *T. brucei*. Of great importance is the fact that, as opposed to other parasitic organisms, trypanosomes synthesize phospholipids de novo. Although the pathways for phospholipids biosynthesis have not been very well characterized, recent data have helped to better understand how trypanosomes are able to assemble phospholipids. We have identified TbLpn, a protein homologous to yeast and human lipin and demonstrated that, as its yeast and mammal homologs, it catalyzes dephosphorylation of phosphatidic acid (PA) to form diacylglycerol (DAG). In addition, TbLpn contains methylated arginine residues in vivo, and interacts with TbPRMTs, a class of trypanosome Protein Arginine Methyltransferases. To determine the roles of arginine methylation on TbLpn enzymatic activity, two arginine residues predicted to undergo methylation, Arg-32 and Arg-123, were mutated to lysines. The mutant TbLpn protein was then expressed in Escherichia coli, purified, and its enzymatic activity assessed in vitro. Our results indicate that methylation of wild-type TbLpn by TbPRMT1/3 as well as methylation by TbPRMT7 increases TbLpn enzymatic activity. In addition, our results suggest that methylation of Arg-32 by TbPRMT1 inhibits TbLpn activity, while methylation of the same residue by TbPRMT7 increases TbLpn enzymatic activity. Results obtained with the R123K mutants will also be discussed.

EFFECT OF PHOSPHORYLATION ON THE ENZYMATIC ACTIVITY OF TBLPN, A *Trypanosoma brucei* PHOSPHATIDIC ACID PHOSPHATASE. Zachary Case, Abigail VanGelder, and Michel Pelletier. Department of Biology, SUNY Brockport.

Trypanosoma brucei is a protozoan parasite, which causes Human African trypanosomiasis (HAT). *T. brucei* carried by the tsetse fly of Sub-Saharan Africa. If left untreated, Human African trypanosomiasis is usually fatal and represents a very serious health risk. Another version of the disease known as Animal African trypanosomiasis (AAT) also exist and threatens the livestock of farmers. There are two stages of the disease, the first blood steam phase and the second central nervous system phase. In the second phase, *T.brucei* is able to penetrate the blood brain barrier and cause very pronounced disturbances. This phase is where the disease gets its less formal name, "African Sleeping Sickness" due to the sleep disturbances and neurological symptoms prevalent in the second phase. Treatment options and outlooks are better in the first phase and get significantly worse in the second phase. Many of the treatments available are incredibly toxic, have very pronounced side effects, and often involve painful injections. As a result, a more effective means of treating HAT is necessary. Our research seeks to determine the role of protein phosphorylation in TbLpn enzymatic activity. TbLpn is a lipin protein homologous to human and yeast lipins. TbLpn is likely involved in membrane biosynthesis, and is predicted to be regulated post transcriptionally phosphorylation and arginine methylation. We performed site directed mutagenesis of specific amino acids predicted to be phosphorylated to alanine residues. The mutant TbLpn proteins were expressed in *Escherichia coli*, purified, and their enzymatic activity assessed *in vitro*. Our results indicate that the S272A and S623A/S624A mutants were 3-fold and 2-fold more active respectively than the wild-type protein, suggesting that phosphorylation of these amino acids has an inhibitory role on TbLpn enzymatic activity. On the other hand, the T247A mutant was 5-fold less active than the wild-type TbLpn, indicating that phosphorylation of T-247 is essential for optimal enzymatic activity.

EFFECT OF THIEVES OIL AND TEA TREE OIL ON *Staphylcoccus epidermidis* BIOFILM GROWTH. Kira Dewey, Catherine Pryzybyla, and Johanna Schwingel, PhD, Department of Biology, St. Bonaventure University and Archbishop Walsh Academy, Olean, NY.

Biofilms are ubiquitous in our environment causing infections in sites of dental work, catheterization, and orthopedic implantation. Biofilm infections are particularly harmful to immunocompromised individuals. Experimental conditions were piloted to study the effect of tea tree and Thieves essential oils on *Staphylococcus epidermidis* biofilm growth on stainless steel and glass. Liquid cultures were grown overnight in varying concentrations of tea tree and Thieves oil in glass tubes with or without stainless steel washers. Biofilm development on both the washers and tubes was then separately quantified by crystal violent staining. Tea tree and Thieves oil both caused a statistically significant reduction of *S. epidermidis* biofilm development on glass compared to no essential oil (ANOVA p=0.00004). There were no statistically significant differences in biofilm development on the stainless-steel washers. The full impact of essential oils on *S. epidermidis* biofilm development may be further supported by experiments testing different essential oils, growth surfaces, and different bacterial strains. The *S. epidermidis* strain (ATCC 12228) used in this study was less effective at forming biofilms than others in literature as it lacks the ica operon (icaADBC) coding for the production of biofilm exopolysaccharide. The use of essential oils could prove to be an effective and natural method of preventing biofilm development both in the home and medical settings.

ELUCIDATING THE EFFECT OF SITE-DIRECTED MUTATIONS ON THE ELECTROSTATIC INTERACTIONS BETWEEN BOVINE γB-CRYSTALLINS. Lucas Cirrincione[1], Natalie Labbe[1], Zachary Williams[1], Jimmy Hasselbeck[1], George Thurston[2], Jeff Mills[1], and Lea Vacca Michel[1]. 1. School of Chemistry and Materials Science, Rochester Institute of Technology 2. School of Physics and Astronomy, Rochester Institute of Technology.

Crystallin proteins comprise the water-soluble interior portion of the optic eye lens. There are three categories of crystallins: alpha (α), beta (β), and gamma (γ), all of which contribute to maintaining the transparency of the lens. Research has shown that the β and γ crystallins can aggregate with time, leading to the formation of cataracts. Here, we describe our research on bovine γB crystallin, the structural and functional homologue to human γD crystallin. Our current study focuses on both wild-type γB crystallin and two clinically relevant site-directed mutants of γB crystallin (D107A and P23T), with the goal of understanding how both versions of the protein aggregate in response to changes in their environment. We also describe optimization of methods to express the proteins in bacteria and to purify them via a size exclusion and ion exchange chromatography. Preliminary results from our NMR spectroscopy and dynamic light scattering experiments suggest that temperature and protein concentrations affect inter-protein interactions among the γB crystallins.

ENZYME FUNCTION PREDICTION, DISCOVERY, AND CHARACTERIZATION IN UNDERGRADUATE BIOCHEMISTRY TEACHING AND RESEARCH LABS. Elizabeth Lucas, Andrew Seyler, Nana Aikins, Kevin DiMagno, Katherine Wilson, Minh Le, Kevin O'Donovan, Spencer Richman, Paul Craig, Jeffrey Mills, and Suzanne O'Handley, Rochester Institute of Technology, School of Chemistry and Materials Science.

The Structural Genomics Initiative was an effort by consortiums to solve as many unique protein structures as possible; the Protein Data Bank contains a number of enzymes whose structures have been solved, but for which no enzymatic activity has been determined. The Enzyme Function Initiative is an effort to determine as many unique enzyme functions as possible. There are a number of putative NUDIX Hydrolase superfamily members whose structures have been solved, but for which no enzymatic activity has been determined. We have catalogued the structurally-determined enzymes within the NUDIX Hydrolase superfamily using BLAST, Dali, SCOP, and PDB. We then began to characterize these enzymes in the biochemistry teaching laboratory and are finishing their characterization in the research lab. In the biochemistry lab course, the students have expressed his-tagged Nudix Hydrolases (PDB entries 2AZW, 2PQV, 3QSJ, and 3R03) from plasmids obtained from DNASU, purified the enzymes using nickel affinity chromatography, and then did enzyme assays to determine the substrates. From the assays, the students discovered Nudix Hydrolase activities for these enzymes, which we have finished characterizing in the research lab. This project is supported by NSF IUSE 1503811.

ESTABLISHING IMAGING CONDITIONS FOR EVALUATING THE ROLE OF KRSB IN RAP1-MEDIATED ADHESION OF *Dictyostelium discoideum*. Kelsey Roberts and Dr. Yulia Artemenko, SUNY Oswego.

Cell adhesion to substrate is key for proper migration. *Dictyostelium discoideum* is a beneficial organism to study in regard to cell adhesion and migration because its movement is similar to that of other amoeboid cells, such as neutrophils and metastatic cancer cells. Rap1 is a small GTPase that has been previously observed to increase cell spreading and adhesion. Kinase responsive to stress B (KrsB) is a negative regulator of cell adhesion but the exact mechanism of how it decreases adhesion remains unknown. We hypothesized that KrsB may reduce cell adhesion by inhibiting Rap1. To test this hypothesis, cells lacking KrsB were transformed with inducible GFP-tagged KrsB and either constitutively active RFP-Rap1 or an empty vector as a control. The goal was to image the cells with or without KrsB and/or Rap1 to measure spreading

and cell velocity during random migration. Although past studies in the lab that demonstrated increased adhesion of cells lacking KrsB or expressing constitutively active Rap1 were performed in growth media, for this study individual cells have to be imaged with epifluorescence microscopy in a buffer instead of growth media, which is autofluorescent, to ensure that only cells expressing the relevant GFP and RFP-tagged proteins are used for the analysis. Thus, we tested whether the buffer had an influence on spreading and migration of cells. Wild-type cells were plated in either buffer or growth media and then imaged using brightfield microscopy. The area and perimeter of cells in each condition were measured and compared; however, no significant differences between cells imaged under the two conditions were found. This indicates that future experiments imaging cell migration and spreading can be conducted in buffer instead of growth media.

EXAMINING PHYSICOCHEMICAL PROPERTIES OF POLYETHYLENE GLYCOL USING MOLECULAR DYNAMICS SIMULATIONS. Nathaniel A. Paddock and Markus M. Hoffmann, SUNY Brockport.

Polyethylene glycol (PEG) is a polymer mixture of ethylene glycol compounds of various chain lengths. Over the past 20 years PEGs have been researched as a green solvent in chemical synthesis. PEG is considered a green solvent because it is nontoxic, nonhazardous, and biodegradable. Optimal use of PEG as a green solvent requires a molecular level understanding that is presently lacking because PEG has largely been studied as an ingredient for products related to the health care and beauty industries. Molecular dynamics (MD) simulations were use in this study because they provide such molecular level insights. MD simulations track the movement of molecules over time that can be viewed like a movie. The molecular movements are a result of the present intermolecular interactions that are modeled by specified parameters called the force field. Physical properties such as density and viscosity obtained from MD simulations were compared to available measurement values to test and improve the force field parameters. The MD simulations were also used to investigate molecular level properties that are not easily obtained by experimental laboratory methods such as average structural configurations. We will provide MD simulation results on PEG200, which has an average molar weight of 200 g/mol. These results are new because MD simulations on PEG have to date only been reported in the literature for aqueous solutions. Details on the methodologies we developed for the MD simulation runs and their analysis will be included.

EXPLORING THE INTERACTIONS BETWEEN CRESYL VIOLET AND NUCLEIC ACID MOLECULES. Abby Manning, Nazareth College of Rochester.

This research project examines the interactions that take place between cresyl violet (CV), an organic compound used for staining tissue and neurons, and nucleic acids. CV is a planar molecule that forms a complex with DNA and RNA and generates different colors. Running different sequences of DNA and RNA oligos, 15 bases in length, through gel electrophoresis and using CV as the stain produces the color differences. RNA tends to be stained more of a purple color while DNA stains as a bluer tone. To more precisely quantify these colors UV-Vis spectroscopy is used. In gel, a fiber optic UV-Vis is used to analyze the band on the gels, and a Cary 60 is used for the solution studies. The wavelength scans of the different oligos are unique with multiple peaks/forms present and therefore indicate that these nucleic acid-CV interactions may be base dependent. To further explore the CV local environment, we have experimented with different pHs around the pKas of the molecule. CV has been found to have distinctive spectra for each pH, similar to what is observed in the CV stained nucleic acids, providing insight into the local environments within the DNA and RNA oligos. PeakFit (Systat Software Inc.) continues to be used to identify and quantitate the peaks which represent the monomer, dimer and other unique forms.

FIRST REPORT ON THE PRESENCE OF *Wolbachia sp.* FROM FRESHWATER CRAYFISH SPECIES IN THE KEUKA LAKE WATERSHED Dr. Luciana Cursino-Parent and Austin Glazier, Jephson Science Center, Division of Natural Sciences and Mathematics, Keuka College.

Wolbachia sp. is a common bacterial endosymbiont found in arthropods and isopod crustaceans. Although crayfish are related to Isopods, there has never been an identified positive case of *Wolbachia sp.* in species of crayfish. The goal of this experimental research was to examine species of crayfish in the Keuka Lake Watershed and to identify the presence of *Wolbachia sp.* within their muscle or gonad tissue. By using a sample of tail muscle and gonad tissue from each of 46 crayfish specimens, DNA extraction was performed. Then, endpoint PCR analysis was conducted using the WSP_F1 and WSP_R1 primers to locate and confirm the presence of a conserved *Wolbachia*-specific- wsp gene. The products of the PCR were analyzed by gel electrophoresis and then prepared for DNA sequencing. Simultaneously, each specimen was barcoded using the COI primers (LCO1490 / HCO2198). The subset of the positive samples was formally submitted for Sanger DNA sequencing of wsp and COI genes. The results of this sequencing were used to create a wsp phylogenetic tree. Our results are indicative of a high level of *Wolbachia sp.* infection in our samples (75%)

from the various species of Crayfish identified by barcoding in the Keuka Lake Watershed. This is the first report of the *Wolbachia sp.* infection in freshwater crayfish.

GENETIC DIVERSITY IN A NON-NATIVE ANT-MIMICKING SPIDER IN ITS INVADED RANGE. Cassidy Mills and Jennifer L. Apple, SUNY Geneseo.

The ant-mimicking spider *Myrmarachne formicaria* (Salticidae) is a species native to Eurasia and was first identified in North America in 2001. It has since been found in many locations in the Northeast including western New York, western Pennsylvania, northeastern Ohio, and southern Ontario. Little is known about its introduction to North America and how it has dispersed since. By characterizing the mitochondrial genetic diversity of this species, we can learn about its introduction history and dispersal patterns in North America. Sequencing of a 600-bp mitochondrial DNA gene region spanning the 16s rRNA, leucine tRNA, and part of the ND1 gene from 26 specimens collected from 14 localities in New York, Pennsylvania and Ohio yielded no genetic polymorphisms. Comparisons with sequence data available with GenBank for other salticid species (*Myrmarachne erythrocephala* and *Habronattus ustulatus*) have shown that within-species divergence in this mitochondrial DNA region is found in other spiders, so *M. formicaria's* lack of variation is likely unusual. Our current data are consistent with a single invasion of *Myrmarachne formicaria* from one source locality, but data from additional loci and samples would help to confirm this conclusion. Nuclear genes are currently being explored that may have more variation.

GREENHOUSE GAS SENSING FABRIC FOR CLIMATIC MITIGATION USING A COMPOSITE OF GRAPHENE QUANTUM DOTS. Reeba Thomas and K.S.V. Santhanam, School of Chemistry and Materials Science, Rochester Institute of Technology.

Recently, greenhouse gas has been an important topic in science and technology as it is considered to result in global warming. There have been innumerable efforts made to reduce the greenhouse gases by reducing the usage of fossil fuels. Another possible approach is climatic mitigation through absorption of greenhouse gases. We wish to report here the preparation of a greenhouse gas absorbing fabric using a composite of graphene quantum dots and emeraldine green. The infrared spectrum of the fabric containing the composite shows well defined features at 2348 cm-1, 1560 cm-1, 1482 cm-1, 1301 cm-1 11246 cm-1, 1102 cm-1,1008 cm-1, 881cm-1 and 800 cm-1 and Raman spectrum with characteristic D and G bands that could be identified with emeradine green and graphene. The sheet resistance of the fabric changes upon exposure to carbon dioxide gas and stays steady for several hours. The sensor sensitivity factor of the composite fabric is determined to be 14.6.

HETEROLOGOUS EXPRESSION OF ZEBRAFISH ANO1 TO VALIDATE ANTI-HUMAN-ANO1 ANTIBODY. Taylor Hatchett, Kierra Mcinnis, Aubrey Morgan-Powell, Naroly Veras, and Adam Rich, SUNY Brockport.

Background: Anoctamin 1 (ANO1) codes for a voltage-gated calcium-activated anion channel with many cellular functions. We are attempting to study Ano1 in zebrafish, but only anti-human ANO1 and anti-mouse ANO1 antibodies available currently. It is unknown if any of these antibodies identify zebrafish Ano1. The gold standard for determining antibody specificity is to express the protein in a cell culture system and to determine whether the antibody binds to that protein. Aim: The overall goal of this experiment is to validate that anti-human-ANO1 Antibody for identification of zebrafish ano1a and/or ano1b expression. Experimental Approach: We will express zebrafish ano1a and ano1b in CHO cells and perform immunocytochemistry, or western blot on isolated protein, to test antibodies for specificity. Expected Outcome: If the antibody recognizes zebrafish ano1 or ano1b expression should be detected in the cell membrane of transfected CHO cells, and a band between 100 and 130 KD in western blot.

IDENTIFICATION OF CANDIDATE GENES RESPONSIBLE FOR GERM-LINE DEVELOPMENT IN OPHIUROIDEA. Quaid Guarino, Liza Ward, and Hyla Sweet; Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology.

Echinodermata is a diverse phylum in which germ-line specification is not well studied except in select species. This study aims to identify the mechanism and candidate genes that play a role in specification of the germ-line in the ophiuroid *Ophioplocus esmarki* through literary searches and transcriptomic analysis. In the sea urchin *Strongylocentrotus purpuratus*, unequal cell divisions at the 16-cell and 32-cell stage result in the formation of the small micromeres. Primordial germ cells (PGCs) form out of the small micromere lineage, and the germ-line is specified through an inherited mechanism in sea urchins. Other echinoderm groups use an inductive mechanism, which involves intercellular signaling to propagate the PGC fate, in contrast to inherited mechanisms which alter the epigenome as the PGC precursors (small micromeres) first form during embryonic cleavage. Literary searches of germ-line development in *Strongylocentrotus purpuratus* and Asteroidea were performed to identify candidate mRNAs that either localize to the posterior enterocoel (site of PGC origin) or may function in the inductive mechanism. Fourteen candidate genes were identified: BMP2/4, Blimp1, Boule, Cnot6, Gustavus, Lin28, Nanos2, Ovo, Prdm14, Pumilio, Seawi, SoxE, Vasa, Wnt8.

Transcriptomes from *Ophioplocus esmarki* were analyzed to determine the presence of the candidate mRNAs in the juvenile and vitellaria larva. Future work will examine the expression patterns of these candidate genes to demonstrate the development of the germ-line in brittle stars.

IDENTIFICATION OF HUMAN ANO1 EXPRESSION IN ZEBRAFISH VIA HUMAN ANTI-ANO1 ANTIBODY. Margalit Kaufman, Nicole Mckeeby, Eric Wise, and Adam Rich, Department of Biology, The College at Brockport.

Background: Anoctamin 1 (ANO1) is involved in a variety of physiological functions in humans, such as heat sensing, Cl- efflux across membranes, insulin secretion, mucin secretion, and gastrointestinal contraction. Studying zebrafish ano1 function offers additional perspective to understand its function. Zebrafish-specific Ano1 antibodies are unavailable and therefore validation of antibodies designed to identify human ANO1 are necessary. Aim: The objective is to determine specificity and selectivity of an anti-human ANO1 antibody for zebrafish Ano1. Methods: We will use the Western Blot technique to determine the size and specificity of protein(s) isolated from the zebrafish that are detected by anti-human ANO1 antibodies. Anticipated results: If our antibody detects zebrafish Ano1 we expect to see a band near 130 KD in western blot. If our antibody is specific, we expect a single band. Specificity for Ano1 will be determined by probing zebrafish protein isolated after morpholino oligonucleotide knock down of Ano1 expression which we predict will not show immunoreactivity.

INCREASING ALGAL LIPID DENISTY BY MANIPULATING NITROGEN AND GLYCEROL LEVELS IN SOLUTION. Samantha Ross, Lauren Saggese, Aiden Williams, and Alex Lazaro. Advised by Barnabas Gikonyo, SUNY Geneseo.

To many, algae are the pesky product of eutrophication in local lakes and ponds. To our research, algae is a promising competitor for renewable resources of biodiesel. Algae is versatile in the way that it ingests a notable amount of carbon emissions from the atmosphere. These emissions are then converted into energy-dense lipids, which can be harvested and transformed into biofuel. However, before the fuel industry can accept algae farming as a worthy alternative to fossil fuels, the process of harvesting must be maximized further. Although algae have its advantage in flourishing within small spaces, the amount of lipid yield is not significant enough to be considered a worthwhile option. Our purpose aims to make algal lipid extraction more efficient by determining the ideal growing conditions of the algae species *Chlorella vulgaris*. Previously, our plan was to observe the effect of differing algal solutions to produce the amount of yield desired. Our objectives were: a) to test how nitrogen starvation corresponds with the lipid yield, and b) to test the effects of glycerol. According to our data, density growth began to decline as we increased or decreased the solution volume. According to our data, there seems to be an optimal period for growth near the 70-80% bracket. Unfortunately, our data further imply that nitrogen, by itself, did not have a significant role in lipid density growth. However, adding glycerol to our solution proved to be an area that should be explored further. So rather than the nitrogen starvation having a great effect on the algae as we had anticipated, we also gathered that the media we used that held the glycerol was where the impact came from, although it was within a certain margin. During this upcoming semester, glycerol will be our focus as we test its effects in a more holistic approach to determine if it is worthwhile to use in various other developed medias.

INITIAL STUDIES IN REMOVING CHEMICALS FROM THE WATER SUPPLY. Alexandra Davidson and Elana M.S. Stennett, Department of Chemistry, Hobart and William Smith Colleges.

Due to the growth of modern medicine in today's society, many drugs and chemicals are being deposited in the water supply. Wastewater treatment plants cannot effectively remove all of these chemicals like perfluoroalkyl substances (PFAS) or drugs like hydrochlorothiazide (HCT), which is particularly troublesome as they can bioaccumulate. This project seeks to begin studies to uncover a cheap and efficient way to remove these chemicals from wastewater. Fouling experiments were conducted of these chemicals, both with and without the presence of model proteins to explore if interactions between the model proteins and chemicals would lead to easier extraction. By utilizing a membrane similar to those employed in wastewater treatment plants, experiments were conducted to begin studying the interactions between the chemicals and model proteins. The fouling results were used to uncover a way to eliminate the chemicals from the water supply.

INVESTIGATING THE PROMISE OF LIGNOCELLULOSIC BIOFUELS: RICE HUSKS AS A NON-HUMAN FEEDSTOCK. Dineen Vogler, Claire Martin, and Barnabas Gikonyo, SUNY Geneseo.

The Earth has endured years of damage caused by an overuse of fossil fuels. Many are combating the damage with alternative energy. Biofuels represent an economical and often overlooked alternative to fossil fuels. Efforts have been geared toward the use of human food sources such as sugarcane (first generation biofuel). Although first generation biofuels aid in curbing greenhouse gas emissions, they lead to increasing food prices which negatively impacts developing countries. This research

focuses on the production of second generation biofuels which relies on non-human food biomass, which are much more appealing than first generation biofuels. This project specifically focuses on the use of one of the most abundant and readily available biomass, rice husks as a biofuel feedstock. Second generation biofuels are also relatively inexpensive. The outermost layer that is separated from the rice grains during the milling process is usually thrown away as a waste product. Rice husks are ideal as a biofuel feedstock, because they're cheap if not free, and they have the power to curb greenhouse gas emissions. One of the greatest challenges in conversion of feedstock into biofuel is how to break the biomass down; a process termed pretreatment. For this project, a unique class of solvents, ionic liquids are employed in the pretreatment process. An ionic liquid (1-Butyl-3-methylimidazolium chloride) was used for the pretreatment of the rice husks to yield glucose. The amount of glucose obtained is then quantified using refractometry, and DNS analyses. From this, it is then possible to determine how efficient rice husks are as second generation biofuel. The results are presented and discussed herewith.

INVESTIGATION OF THE ADHESION-MODULATING PROPERTIES OF BOVINE SERUM ALBUMIN (BSA) IN *Dictyostelium discoideum*. Palina Saljanin, Yulia Artemenko, SUNY Oswego.

Dictyostelium discoideum is a social amoeba commonly used as a model organism in cellular migration studies. *Dictyostelium* adhesion is mediated by non-specific interactions, such as Van der Waals forces, as well as specific protein-mediated interactions between the cell and the substrate. Since adhesive properties of this organism affect its motility, finding ways to manipulate its nonspecific or specific interactions can be useful for future migration experiments. We tested the effects of Bovine Serum Albumin (BSA), which is known to affect non-specific binding via its interference with electrostatic interactions, on *Dictyostelium* adhesion. Bacterially-grown wild-type cells had increased adhesion when plated on 3% BSA, while axenically-grown cells exhibited a decrease in adhesion on BSA. To explore why BSA has differential effects on adhesion of *Dictyostelium* grown under different conditions we tested adhesion of cells lacking one of the specific mediators of attachment, Talin A (TalA). Our preliminary results suggest that unlike wild-type cells, both axenically and bacterially-grown TalA-null cells have decreased adhesion on BSA. These data suggest that BSA effects on adhesion may be dependent on TalA in bacterially-grown cells. Moving forward, similar adhesion assays will be conducted in cells lacking a second talin isoform, Talin B, or both Talin A and B, as well as in cells overexpressing either or both of the talin isoforms.

INVESTIGATION OF THE AFFINITY OF THE SARS COV-2 SPIKE PROTEIN TO THE GOLD-NANOPARTICLE. Kazushige Yokoyama, Zi Chao Lin, Alex Serum, Veronica Szygalowicz, and Betina Popnikolova, The State University of New York Geneseo College.

Our group studied the adsorption of the SARS-CoV-2 spike protein (s-protein) to the gold nanoparticle surface and characterized the behavior as a function of core nano-particle size (i.e., diameter; d). We observed the color change of the gold colloid as they formed the aggregates. Compared to the case of bare gold colloids, the gold colloid with $d \geq 60$ nm exhibited a drastic redshift at relatively higher pH conditions. By hypothesizing that a red-shift was due to the formation of the gold colloid aggregates through the interaction between s-protein, we concluded that the aggregation of the gold nanoparticles and spike protein depends upon the size of the gold nanoparticles and can be affected by many different factors working together.

LASER FREQUENCY STABILIZATION TECHNIQUE BASED ON DIRECT ABSORPTION SIGNAL OF A TEMPERATURE STABILIZED RUBIDIUM VAPOR CELL. Fiona Wee, SUNY Oswego

External-cavity diode lasers are widely used in spectroscopy applications due to their ease of use, compact size, wide range of frequency tunability, and high-frequency resolution. The stability of these lasers is typically short-termed (~1MHz in a millisecond time scale). However, certain high-precision spectroscopy experiments such as two-step, two-color spectroscopy techniques demand long-term stability at a 1 MHz level. This requires the implementation of additional feedback-based stabilization techniques. Here we present a laser frequency stabilization technique based on a direct-absorption signal of a temperature-stabilized rubidium vapor cell. According to the current conditions, our lock shows less than 5 MHz long-term stability.

METHOD DEVELOPMENT: ZOOPLANKTON GUT CONTENT ANALYSIS USING DNA EXTRACTION AND AMPLIFICATION OF THE 16S rRNA GENE. Sarah Wojtas, Arden Hepler, Coleen Edwards, Cassandra Marnocha, and William Edwards, Niagara University.

Daphnia are zooplankton found in freshwater lakes across the world and in Fayetteville Green Lake near Syracuse, New York. *D. pulex* have been found to spend time in different layers of the lake in association with different microbial species, however their specific feeding activities at these locations are unknown. Determining the gut contents of zooplankton in Green Lake could lead to a better understanding of how their feeding behavior impacts carbon and nutrient cycling in the lake. This study focused on devising a method to extract DNA from whole organisms to determine the gut contents of zooplankton.

In the laboratory setting, *Daphnia magna* were divided into three groups and fed either *Chlorella, Synechococcus*, or a *Chlorella* and *Synechococcus* mixture. 16S rRNA was amplified from extracted DNA in a polymerase chain reaction (PCR). The results of the PCR indicate that *D. magna* filled their guts with the food provided in all three treatments and that we were able to amplify the extracted 16S sequences. This suggests that whole organism gut content analysis can be successful. Through continued development of this technique, gut contents of wild caught zooplankton, including *D. pulex* from Green Lake, could be analyzed leading to predictions regarding their role in nutrient cycling.

NON-TOPOGRAPHIC CONTRIBUTIONS TO THE LUNAR GRAVITY ANOMALY. Nicole Zhe, Daisuke Kobayashi (SUNY Brockport), and Kenneth Sprenke (University of Idaho).

There is a strong association between surface gravity and elevation on the Moon, suggesting the gravitational variation is dominated by anomalies associated with surface shape, such as the near side/far side dichotomy, craters, basins, and ejecta piles. Gravity anomalies not connected in any way with surface shape might better reveal, compared to regular Bouguer gravity maps, details of uncompensated subsurface structure not previously resolved. This study is the first to present a lunar gravity map showing only disturbances in the free air gravity field that have no correlation, positive or negative, with topographic relief. We use data collected by the Gravity Recovery and Interior Laboratory (GRAIL). The non-topographic anomalies are located by applying a concept in structural geology. At each point on the Moon, we calculate the horizontal gradient in the free air gravity that is normal to the elevation gradient. We then construct the anomaly map by integrating these horizontal gradients across the entire lunar surface.

PATTERNS OF BAT FORAGING BEHAVIOR ACROSS HABITATS ON THE SUNY GENESEO CAMPUS. Peyton Mackey and Brooke Licata, SUNY Geneseo.

Bats are nocturnal, flying mammals that locate food by emitting high frequency calls from their nose and mouth. This frequency is too high for humans to hear, and together with their nocturnality, studying them is difficult. A previous study done in 2018 discovered the presence of foraging bats on SUNY Geneseo Campus during the summer using bioacoustic techniques. The current study was conducted to follow up and examine how different environmental factors influence bat species' use of foraging habitats on the SUNY Geneseo campus. These habitats differ in location, substrate, vegetation, temperature, and light exposure. By studying bat foraging calls and the factors associated with their presence we will gain insight into how to better support bat populations in our area. Although several months of data collection were collected in 2021, this poster will focus on comparing bat activity in August 2018 and 2021.

PHYLOGENETIC RELATIONSHIPS AND SPECIES BOUNDARIES OF THE TEMPERATE NORTH AMERICAN CLADE OF MILKWEEDS (*Asclepias*; APOCYNACEAE). Claudia Kalina[1], Mark Fishbein[2], Shannon Straub[1]. 1. Hobart and William Smith Colleges, Department of Biology; 2. Oklahoma State University, Department of Plant Biology, Ecology, and Evolution.

Recent research has led to the construction of a phylogenetic tree for the species of the North American milkweeds (*Asclepias*). These phylogenetic relationships were supported with high bootstrap values, but only one individual from each species was analyzed. This research aims to expand upon these relationships and examine the boundaries of species within the Temperate North American Clade by determining whether these species are reciprocally monophyletic. A total of 45 individuals were sampled (3 *A. asperula ssp. asperula*, 3 *A. asperula ssp. capricornu*, 10 *A. viridis*, 2 *A. asperula x viridis,* 4 *A. labriformis*, 6 *A. macrosperma*, 6. *A involucrata*, 1 *A. macrosperma x involucrata*, 2 *A. welshii*, and 8 outgroups) by sequencing and assembling chloroplast genomes. The inferred phylogenetic tree showed that the relationships among all species were supported with high bootstrap values. *Asclepias viridis, A. asperula ssp. asperula,* and *A. asperula ssp. capricornu* were recovered as reciprocally monophyletic and supported as sister species. However, the phylogenetic pattern recovered for the plastomes of *A. macrosperma, A. longifolia, A. welshii,* and *A. involucrata* were more complex due to incomplete lineage sorting, a history of introgressive hybridization among these closely-related species.

REGULATION OF RAS-ASSOCIATED PROTEIN-1 BY KINASE RESPONSIVE TO STRESS B IN *Dictyostelium discoideum*. Tiffany Flores and Dr. Yulia Artemenko, SUNY Oswego.

Dictyostelium discoideum is a social amoeba that is commonly used as a model organism for studying chemotaxis, which is directed migration along a chemical gradient, due to its similarities to human neutrophils and metastatic cancer cells. There are multiple pathways involved in regulating migration. In particular, kinase responsive to stress B (KrsB), a homolog of mammalian tumor suppressor MST1/2 and *Drosophila* Hippo, is a negative regulator of cell adhesion and migration in *D. discoideum*. However, little is known about the molecular mechanism of KrsB action. Another regulator of adhesion is a small GTPase Ras-associated protein 1 (Rap1), which acts by affecting talin and myosin II. In mammalian cells, Rap1 can be phosphorylated, which leads to its inhibition. We hypothesized that KrsB might negatively regulate Rap1 by phosphorylation, thereby disrupting the

activation of Rap1 on the membrane. To determine if KrsB phosphorylates Rap1 we performed immunoblotting for Rap1 in cells with or without KrsB and looked for a shift in the electrophoretic mobility as an indicator of phosphorylation. Although we detected RFP-tagged constitutively active Rap1G12V on an immunoblot using an antibody against mCherry, we did not observe an electrophoretic mobility shift for Rap1G12V in wild-type compared to KrsB-null cells under basal unstimulated conditions. Future studies will examine electrophoretic mobility of Rap1 in cells with and without KrsB following stimulation with a chemoattractant. To be able to track Rap1 localization, we successfully generated an RFP-Rap1 expression construct. Studies examining RFP-Rap1 localization in cells with or without KrsB are ongoing.

REPRODUCTION OF THE ROUND GOBY IN SANDY CREEK, A TRIBUTARY TO LAKE ONTARIO. Mathew Suflita and Dr. Jacques Rinchard, SUNY Brockport.

The round goby, an invasive species from the Ponto-Caspian region of Eastern Europe, has become well established in the Great Lakes region; now being found in all five Great Lakes as well as some of their tributaries. The objectives of this study were to use morphological and histological analyses to determine their gonad development and to establish if this species is a single or multiple spawner fish. In addition, we evaluated their fecundity. Round goby were collected from Sandy Creek every two weeks from May-August of 2021 using backpack electrofishing gear. Gonadosomatic index (GSI) was significantly higher in females than in males. In females, GSI significantly increased with their gonadal development. Absolute fecundity averaged 287 ± 120 oocytes and was positively correlated to fish length. A protracted spawning season is evident by the presence of females ready to spawn throughout the study (May to August). The histological analysis revealed only one batch of oocytes being developed during this spawning season. This suggests that round gobies spawn only a single batch of eggs during their spawning season.

ROLE OF SIBA PROTEIN IN CELLULAR ADHESION AND MECHANOSENSATION OF *Dictyostelium discoideum*. Alexia Perez & Yulia Artemenko, SUNY Oswego.

Dictyostelium discoideum is a social amoeba commonly used as a model organism for the study of various cellular processes, including directed cell migration. Mechanical cues, such as shear flow, have the ability to induce directed migration. However, little is known about the role of cell-substrate adhesion in mechanosensation of *D. discoideum*. We hypothesized that adhesion is important for the ability of cells to respond to mechanical cues, and cells with reduced adhesion may have aberrant directional migration in response to shear flow. To test this hypothesis, we examined whether mechanosensation depends on SibA, a transmembrane protein involved in adhesion of *D. discoideum*. Before testing cell response to shear flow, we examined adhesion of SibA-null cells grown under our experimental conditions. SibA-null cells were derived from the axenic wild-type strain DH1-10, which was used as a control for the experiment. Adhesion of SibA-null cells in growth media was significantly reduced compared to DH1-10, consistent with previously published findings. Importantly, the percentage of adherent cells was also significantly decreased in SibA-null cells compared to DH1-10 cells grown on a bacterial lawn, which is the growth method used for assessment of mechanosensitivity to shear flow. We are currently testing how SibA-null cells respond to acute mechanical stimulation by examining Ras activation, which is used as a read-out of activation of the signal transduction network involved in directed migration. Ras activation is tracked using a fluorescently-tagged biosensor, Ras-binding domain (RBD), which is expressed in DH1-10 and SibA- cells. Future studies will also examine directed migration of DH1-10 and SibA-null cells in response to shear flow.

ROLE OF THE DIMERIZATION DOMAIN OF FILAMIN IN *Dictyostelium discoideum* RESPONSE TO SHEAR FLOW. Sarah Buckler and Yulia Artemenko, SUNY Oswego.

Molecular mechanisms by which cells sense and directionally migrate in response to mechanical perturbation, which is critical in homeostasis and many diseases, are not well understood. *Dictyostelium discoideum* cells exposed to a brief burst of shear flow show rapid and transient activation of multiple components of the signal transduction network that participates in directed migration of these cells. Previous data from our laboratory demonstrated that actin crosslinking protein filamin is involved in the ability of cells to respond to shear flow. We also found that the actin-binding domain is required for filamin's function in this context, although the role of its dimerization domain (DD) is still unclear. To determine if DD is required for filamin's role in sensing/transmitting mechanical stimuli we generated a truncation construct of filamin lacking DD (FLNΔDD) and expressed it in wild-type or filamin-null cells. We found that FLNΔDD was able to relocalize to the cortex of both wild-type and filamin-null cells following 2-sec stimulation with shear flow, suggesting that dimerization between filamin molecules is not required for their recruitment to the cortex. To detect activation of the signal transduction network in the presence or absence of FLNΔDD, we used fluorescently-tagged Ras binding domain biosensor that detects active Ras and was previously shown to relocalize to the cortex following mechanical stimulation. When testing the ability of FLNΔDD to rescue the reduced response of filamin-null cells to shear flow stimulation, FLNΔDD was able to

improve the response, suggesting that filamin without DD can mediate mechanosensation in this system. This study suggests that dimerization of filamin is not needed for its ability to sense or transmit mechanical cues, although the mechanism of this process remains to be elucidated.

SKELETOGENESIS AND COELOMIC STACKING DURING BRITTLE STAR DEVELOPMENT. Lexi Anderson, Skye Bixler, Terence Cotsonas, Ava deFerrante, Jade Mullen, Cassidy Owens-Kashorek, and Hyla Sweet. Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology.

One of the significant features of echinoderms is their five-fold symmetry. This unique pattern develops during metamorphosis from a larva that has bilateral symmetry. The mechanisms controlling this include a process known as coelomic stacking, which is poorly understood. The brittle star *Ophiopluteus esmarki* has rapid metamorphosis, which is useful for studying this important transformation. The purpose of this study is to document the development of the juvenile skeletal plates relative to the coelomic cavities and to track their movements during metamorphosis. Brittle star larvae were imaged using polarized light to demonstrate the skeleton, and confocal microscopy to demonstrate the internal body tissues. We found that the first skeletal granules formed at the pre-vitellaria stage in five clusters of mesenchyme cells next to the left and right somatocoels. This confirms the presence of a five-fold pre-pattern in the coelomic cavities, which precedes coelomic stacking. Additional skeletal granules form later in association with other tissues. During coelomic stacking, the skeleton moves with the left and right somatocoels as they grow to form structures with five-fold symmetry. Future directions include (1) using markers for the skeletogenic mesenchyme to determine earlier aspects of the coelomic pre-pattern, and (2) examining morphogenesis of the ectoderm, which may also be involved in coelomic stacking and skeletal growth.

STUDYING THE BUFFER INFLUENCE ON MEMBRANE FOULING OF HEMOGLOBIN. Kara Gilleland and Elana M.S. Stennett, Hobart and William Smith Colleges.

Safe drinking water is essential to human life and the lack of safe drinking water is an issue that affects millions of people around the world. In order to increase the amount of safe drinking water, water purification methods are necessary. One type of purification method is membrane based. However, this method is limited due to fouling. Fouling is when there is a buildup of matter on the membrane that results in a blockage of the membrane pores. There are many different factors that can lead to fouling, so these factors are often studied using model systems to improve purification methods. This project studies the role buffers play in the fouling of a model system. The fouling of hemoglobin with a hydrophobic PVDF membrane was studied at pH=4 (citrate and acetic acid buffers), pH=6 (citrate and phosphate buffers), and pH=8 (phosphate and TRIS buffers). Beyond the differences based on pH, the fouling decay also varied depending on the type of buffer. The fouling curves were fit to an exponential decay to extract initial and steady state relative flux as well as the rate of fouling to quantify the differences. Gaussian calculations of the buffer molecules were used to supplement and illustrate the importance of the interactions of hemoglobin with the buffer molecules.

THE BIOGEOCHEMISTRY AND MEROMIXIS OF DEVIL'S BATHTUB, A FERRUGINOUS MEROMICTIC LAKE IN HONEOYE FALLS, NY. Jacob Stablewski, Emily O'Brien, Anna Meichenbaum, Isabel Deschamps, William Edwards, Cassandra Marnocha, Niagara University.

Devil's Bathtub (DBT; Mendon Ponds Park, Rochester, NY) is an iron-rich meromictic lake. Meromictic lakes are bodies of water that are permanently stratified, meaning that there are distinct thermal and chemical layers. DBT is surrounded by steep sides covered in mature forest, which limits the effects of weather on the lake and helps maintain its thermal stratification. These rare lakes, such as DBT, are analogs of the Earth's oceans before the Great Oxidation Event and have proven to be instrumental in understanding how the oxygenation of the ocean takes place. We characterized the vertical structure of DBT through measurement of temperature and conductivity using a CTD, which we combined with dissolved oxygen, turbidity and chlorophyll fluorescence using a YSI sonde. We then took vertically detailed water samples and analyzed for water chemistry, including iron, phosphorus and nitrogen and filtered for DNA/RNA. Preliminary data shows a deep meromictic layer from 10-15 m, where conductivity is higher and concentrations of iron and phosphorus are very high. The microbial community is strongly layered, with microbial density peak below the oxic layer at 3m. Understanding how the biogeochemical cycling of elements such as Fe, S, and C through the stratified water column will allow us to draw inferences on the microbial community structure in early-Earth waters, as well comparing this location to other lakes similar to it.

THE INFECTION RATE OF *Ophryocystis elektroscirrha* UPON *Danaus plexippus* IN OSWEGO COUNTY AND THE WESTERN ADIRONDACK PARK IN NEW YORK STATE. Lucas Deland and Gabrielle Waters, SUNY Oswego.

Eastern monarch butterflies (*Danaus plexippus*) are a charismatic insect species famous for their long migration route from central Mexico to southern Canada. In recent years, their numbers have significantly dwindled to the point that they are under consideration by the United

States Fish and Wildlife Service for listing as an endangered species under the Endangered Species Act. Though several factors may be contributing to their decline, the role of the protozoan parasite *Ophryocystis elektroscirrha* is poorly understood. In New York, the impact of *O. elektroscirrha* is unknown as there has been little data collection in this region. This ongoing study culminates six years of surveying monarchs during the fall migration in Oswego, New York, for *O. elektroscirrha* infestation. In 2020, we began also to collect larvae and rear them to adulthood throughout the season. In 2021, an additional location was surveyed in the western Adirondacks, building a wider data set for New York. Throughout the six years of this project, we have found an average infection rate of fall migrants to be 18% as well as infections within local larvae. This indicates some prevalence of the parasite in the local breeding population. Preliminary results from the Adirondack samples indicate a lower infection rate, around 6%. Overall, there has been a low spore count across most infected individuals at levels suggesting little impact on health and ability to migrate.

THE MARCH 31, 2020, M 6.5 STANLEY, IDAHO EARTHQUAKE: BOOKSHELF FAULTING? Jennifer A Setaro and Daisuke Kobayashi, SUNY College at Brockport.

On March 31, 2020, a magnitude 6.5 earthquake occurred about 19 miles northwest of Stanley, Idaho. The epicenter of this earthquake lies on a potential northern extension of the Sawtooth fault. The fault plane solution as well as the moment tensor solution suggests that it was a strike-slip faulting. The spatial distribution of the aftershocks indicates it was a sinistral slip along the N-S fault plane. The epicentral area is located in the western part of the Centennial Tectonic Belt, which is an area of southwest-northeast extension north of the Snake River Plain. This part of the Centennial Tectonic Belt is characterized by well-developed active normal faults. If the epicentral area is undergoing shear, it should be in a dextral sense because of a difference in the rate of rotation as in the case of the Centennial Shear Zone. We suggest that the sinistral slip of the Stanley event was a result of bookshelf faulting caused by the dextral shear in the epicentral area. To test this hypothesis, we employ kinematic block modeling. In these models, GPS surface velocities and earthquake slip vector data are inverted to solve for the best fit rotational poles of modeled tectonic blocks in the study area. If a tectonic block adjacent to the hypocenter has the best fit pole within or near the block (i.e., a small-radius rotation), it suggests that the Stanley earthquake resulted from bookshelf faulting.

THE ORIGIN OF POP-UP RIDGES NEAR CHAUMONT JEFFERSON COUNTY NY: GLACIAL OR TECTONIC? Nathan Henry and Dr. Daisuke Kobayashi, SUNY Brockport.

Around Chaumont, NY are several rocky ridge formations protruding ~4 ft in height and ~10 ft in width. These structures along with the bedrock of the area is entirely composed of the Chaumont Limestone Formation. My study is to determine the origin of these ridges, whether it was caused by glacial motion or tectonic horizontal compression.

THE RELATION OF HOTSPOTS, SEISMIC PARABOLAS, AND PRECAMBRIAN TRANSFORM FAULTS IN THE NORTHERN ROCKY MOUNTAINS: THE BOZEMAN ANOMALY. Daisuke Kobayashi, Kenneth Sprenke, and Basil Tikoff, SUNY Brockport.

The Yellowstone hotspot track exhibits an ENE-younging of volcanism, a parabola of seismic activity, and an aseismic low-velocity anomaly. We argue for the existent of a second EW-trending hotspot-like track that trends from Orofino, Idaho, to Bozeman, Montana. We refer to this structure as the Bozeman anomaly, based on a seismic parabola that can be delineated with its vertex around Bozeman, MT. An S-wave tomography model and heat flow data suggest an along-axis zone of relatively low velocity and high heat flow in the Bozeman anomaly parabola. A geoid height map, after removing the strong anomaly caused by Yellowstone hotspot, shows that the geoid height along the axis of the Bozeman anomaly parabola is ~1 m lower than the surrounding areas, indicating a mantle-origin density deficit. An average tomographic model constructed from four S-wave models reveals the along-axis low-velocity body along the Bozeman anomaly branching out from the main body below Yellowstone/eastern Snake River Plain at ~200 km depths. The Bozeman anomaly also connects the Centennial Tectonic Belt to the northernmost part of Intermountain Seismic Belt. If the Bozeman anomaly is a hotspot, albeit minor compared to the Yellowstone hotspot, why do these two features have different orientations? The geometric and structural similarity between the two seismic parabolas points to a common mechanism: a propagating rift and intrusion of buoyant mantle along a reactivated Precambrian transform faults. The Yellowstone hotspot follows the ~060 trending Snake River transform, as previously recognized. However, the Bozeman anomaly follows an EW-oriented transform fault (Orofino transform), which was rotated from its original ~060 orientation during 30° clockwise tectonic rotation of west-central Idaho. The unique geometry of two differently oriented transform faults within the same region, provides the ability to evaluate the relative role of pre-existing features on mantle upwelling.

THE SCOTT TEST FROM AN INORGANIC PERSPECTIVE. Matthew Seyse, Fiona Wee, and Thomas M. Brown, Department of Chemistry, SUNY Oswego.

Law enforcement officers often rely on colorimetric tests to determine the presence of illicit substances. Colorimetric tests allow officers to quickly analyze samples in the field and provide initial information regarding the composition of the substance. The Scott Test has been used extensively over the last four decades as a method for detecting cocaine. In the presence of cocaine, the Scott Test changes from pink to blue. This color change can also be induced by a number of legal substances which calls into question the specificity of the test. In fact, the origin of this color change has been debated upon and a consensus in the field has still yet to be reached. Two opposing hypotheses for the color change include the formation of a coordination compound where the cocaine directly coordinates to the cobalt center and the other being the formation of a complex ion where the cocaine is not directly coordinated to the metal center but serves as a counter ion. Investigating the Scott Test from an inorganic perspective, it appears that the latter hypothesis is more reasonable. The Scott Test was carried out using a number of substances, in particular lidocaine, that give false positives to further investigate the origin of the color change. The coordination environment of the cobalt metal center was found to be free of lidocaine suggesting the formation of a complex ion. A crystal structure of the lidocaine-cobalt salt suggests that the color change is the result of a change in coordination geometry about the cobalt center. The origin of the color change may be aptly described using ligand field theory.

THERMOPHYSICAL PROPERTIES OF THE GREEN SOLVENT POLYETHYLENE GLYCOL. Joseph D. Kealy and Dr. Markus M. Hoffmann, SUNY Brockport, SUNY Brockport Department of Chemistry and Biochemistry.

Polyethylene glycol (PEG) is a polydisperse mixture of ethylene glycol oligomers consisting of ethylene oxide repeat units. The recognition of PEG as a green solvent is steadily increasing due to its nontoxic and environmentally friendly properties. It is also widely and inexpensively available because of the widespread industrial production of PEG for the health and personal care industry. Current research on PEG as a solvent lacks data concerning the differences in thermophysical properties between vendors, as well as the influence of water, the most common impurity of PEG. To address this lack of knowledge, experimental data was collected on density, viscosity, and self-diffusion coefficients from 298.15 K to 358.15 K. Densities and viscosities were obtained in parallel using a vibrating tube density meter and a rolling ball viscometer in tandem. Self-diffusion coefficients were measured by a pulsed field gradient nuclear magnetic resonance (NMR) spectroscopy method based on the stimulated echo pulse sequence. Samples included PEG200 (having average molar weight of 200 g/mol) from varying vendors, PEG400, and binary mixtures of tri- and hexaethylene glycol, where each sample was measured with varying amounts of water impurity. The obtained sets of experimental data showed very small variations in both the vendor as well as level of water impurity present. Thus, PEG can be purchased as a chemical solvent from varying vendors without compromising experimental integrity. Extrapolation to zero water content provided the property values of the neat PEG samples at varying temperatures. Temperature dependence was found to be linear for density. For viscosity and self-diffusion, the temperature dependence was found to follow the Arrhenius Law. The binary mixtures were found to behave ideally, which means that the properties of mixtures can be predicted from evaluating the mole fraction weighted averages of the neat ethylene glycol oligomers.

THIAMINE DEFICIENCY AND FATTY ACID CONCENTRATIONS IN LAKE ONTARIO STEELHEAD TROUT. Desmond Barber Jr., Matthew Futia, Thomas Kielbasinski, and Jacques Rinchard, SUNY Brockport, Dept of Environmental Science & Ecology.

Thiamine deficiency complex (TDC) has posed a constant threat to wild salmonine species from the Great Lakes since the 1960's. Strong correlations have been made between TDC and a diet rich in alewife. The objectives of this study were to measure thiamine concentrations, lipid contents, and fatty acid signatures in steelhead trout eggs collected at the Salmon River State Fish Hatchery from 2015 to 2021. Egg total thiamine concentrations varied significantly among years (Kruskal-Wallis, $p<0.05$), with the highest concentrations reported in 2016 (4.97 ± 1.50 nmol/g) and the lowest in 2020 (2.07 ± 0.75 nmol/g). A significant number of fish produced eggs below the lethal concentration inducing 50% offspring mortality (LC50 = 6.54 nmol/g) across all years (95.1 ± 8.4%). Yearly total egg lipid content was positively correlated to yearly egg total thiamine concentrations (r^2 = 0.64, $P<0.05$). Fatty acid signatures in eggs significantly differed among years (ANOSIM, Global R = 0.415, $P < 0.05$) and the major fatty acids responsible for the differences were 22:6n-3, 18:1n-9, 20:5n-3, and 16:0. Although these results suggest a potential shift in steelhead trout diet, it did not affect egg thiamine concentrations.

USING FLOATING TREATMENT WETLANDS TO REMOVE NUTRIENTS AND RESTORE MEADOW MARSH HABITATS IN WETLAND SYSTEMS IN THE NORTHEASTERN UNITED STATES. Kevin Killigrew, Dr. Rachel Schultz, Dr. Michael Chislock, and Dr. Kathryn Amatangelo, SUNY Brockport.

A significant threat that watersheds face is nutrient pollution, particularly excess phosphorus in freshwater systems. Floating treatment wetlands (FTWs) can remove excess phosphorus by plant and microbial uptake directly in the water column, and we explored both a mesocosm and pond experiment to test plant and substrate treatments. We examined phosphorus removal rates in a mesocosm setting using different combinations of four wetland plant species native to northeastern North America; *Carex stricta* (tussock sedge), *Iris versicolor (*northern blue flag), *Juncus effusus* (common rush), and *Eleocharis palustris* (common spikerush), as well as a control. Each plant plug was planted with a coconut coir substrate while the control had coconut coir substrate with no plants. The plant combinations of the FTWs included tussock species (*Carex stricta* and *Iris versicolor*), reed species (*Juncus effusus* and *Eleocharis palustris*), and a mixture. We measured the total phosphorus (TP) and orthophosphate removal rates along with changes over time in chlorophyll-a, dissolved oxygen, specific conductivity, and pH. Preliminary results of this 6-week experiment showed that TP concentrations increased in each of the mesocosm treatments between the first and last week; however, there was a significantly lower increase in TP concentrations in the reed treatment compared to the control ($p = 0.002$) and tussock treatments ($p = 0.04$). The second part of this study examined total phosphorus and orthophosphate removal of FTWs in retention ponds, comparing treatment FTWs with a mixture of reed and tussock species and control mats. After the conclusion of this retention pond application, the plants were transplanted into soil to see how effective these plants can overwinter to be reused in FTWs or planted in meadow marsh habitats.

UTILIZING PET-EVA FILM FOR MICROFLUIDICS. Audrey Collins, Karnavaal Al-Rubayie, and Dr. Fernando Ontiveros. St. John Fisher College.

Microfluidic devices, which consist of micro-channels and chambers that are molded, cut or 3D-printed, are used to manipulate small volumes of fluids. This enables the development of lab-on-a-chip systems, which can simplify a wide variety of chemical and biological processes by using small amounts of sample and reagents. These devices have previously been made from materials such as glass or silicone. In this work, we utilize PET, or polyethylene terephthalate, a low-cost, laminated polymer as an alternative material for producing microfluidic devices. The technique used to construct the devices utilizes inexpensive and user-friendly materials including a craft cutter, thermal laminator, and vinyl bumpers. The process involves minimal expertise, and it takes only a few minutes to fabricate, test and revise each device. A distinctive feature of this technique is the facilitated integration of secondary and tertiary materials. Paper sinks, filtering systems, various metallic foils, and viral-detection components, for instance, can all be readily integrated into the chip. This increases the potential commercialization of microfluidic chips in areas like diagnostics, sample processing and sensing. We were able to manufacture and test a range of microfluidic design patterns combining paper with PET material using this approach, and produce prototypes of devices that may be useful in rapid, PCR based diagnostic applications.

VALIDATION OF ANOCTAMIN 1A AND ANOCTAMIN 1B AT THE MOLECULAR LEVEL USING MORPHOLINO OLIGONUCLEOTIDES. Sarah Cook, Maddie Flack, Lindsey Wait, Meaghan Sabella, and Adam Rich, SUNY Brockport.

Background: Anoctamin 1 (ANO1) is a calcium-activated chloride channel that plays a role in multiple physiological functions important for life such as heat sensing, efflux across membranes, insulin secretion, mucin secretion, and gastrointestinal contraction. The role of ano1 in zebrafish is unknown. Studying zebrafish ano1 offers a different perspective to better understand ANO1 function in humans. However, zebrafish might express two ano1 genes, ano1a and ano1b. It is necessary to determine if ano1a and ano1b are expressed. Morpholino oligonucleotides (MO) can be injected into zebrafish embryos to knock down expression of targeted genes. Aims: The overall goal is to determine if ano1a and/or ano1b are expressed in zebrafish. Experimental approach: ano1a expression will be knocked down using MO and an anti-human ANO1 antibody will be used to probe expression. These results will be compared to control zebrafish. ano1b expression will be similarly examined. Protein will be isolated from zebrafish after MO knockdown for ano1a and ano1b for western blot experiments. Expected Outcomes: It is expected that loss of Ano1 immunoreactivity will occur after MO knockdown of either ano1a, ano1b, or both. However, one remaining challenge is that antibody specificity is unknown. For example, our antibody may recognize ano1a, ano1b, or both. Similarly, using protein isolated from embryos after MO knockdown it is expected that one band will disappear.