2012 Abstracts

Alphabetical by the Last Name of the First Author

INVESTIGATION OF THE STRUCTURAL REQUIREMENTS FOR REACTIVITY OF THE VITAMN B6 RING THROUGH PYRIDOXINE ANALOGS.

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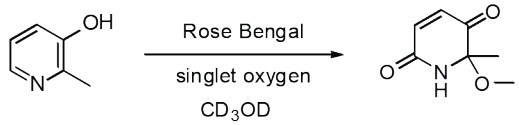
Previous research has shown that Vitamin B_6 is an antioxidant; however, the mechanism through which the vitamin reacts with singlet oxygen is not completely understood. It is thought to undergo a Diels-Alder like cyclization. We have proposed and begun synthesis of Vitamin B_6 analogs to characterize the effects of the substituents to the reaction by removing the 5'-hydroxymethyl, 4'-hydroxymethyl, 3'-hydroxyl, 2'-methyl, or a combination of these. The singlet oxygen addition is run in either a pH 7 dueterated buffer or methanol-d. The NMR analysis of the singlet oxygen addition to 3-hydroxyl-2-methylpyridine showed that several products were formed at room temperature. So, the reaction was run at 0ºC yielding a product that was characterized by 1D and 2D NMR analysis, which showed a product that had undergone an oxidation at the 2- and 6-positions of the original pyridine ring. We hypothesize that the 2'-methyl is crucial to the initiation of the reaction. Synthesis of further pyridoxine analogs has commenced and discussed below.



C3H10T½ CELLS TREATED WITH PTHLP SHOW ALTERED EXPRESSION OF microRNAS THAT MAY TARGET CDH11.

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Cadherin-11 (Cdh11) is a transmembrane, Ca^{2+}-dependent protein important in cell communication and adhesion. In order to better understand cdh11 regulation, this study examined the effect of parathyroid hormone-like protein (PTHlP) on the small regulatory RNAs known as microRNAs (miRNAs). miRNAs 21, 125-B1, 144, 200B, 214 and 218-12 were selected for study based on their involvement in breast cancer oncogenesis or on their predicted targeting of the cdh11 mRNA 3'-untranslated region (UTR). This targeting was predicted by computer algorithms in the PicTar, RNAHybrid and TargetScan programs based on sequence complementarity between the miRNAs and the cdh11 3'-UTR. Mesenchymal C3H10T½ cells were treated with 10^{-7} M PTHlP and miRNA were isolated from the cells using RNAzol RT. miRNA expression was examined by qRT-PCR. Treatment with PTHlP down-regulated miR-200B, 214 and 218-12 ($p=0.0302$, 0.0010, and 0.0083, respectively) and up-regulated miR-144 ($p=0.0033$). In order to verify their targeting of cdh11, the cdh11 3'-UTR will be cloned into the pmiR-GLO plasmid for a luciferase assay in which C3H10T½ cells are transfected with the recombinant plasmid and treated with miRNA mimics. If a specific miRNA does target the 3'-UTR, it should decrease luciferase activity, which will verify the involvement of that particular miRNA in cdh11 regulation. Future research will focus on examining the effects of these miRNA on Cdh11 protein expression and the mechanism by which PTHlP regulates cdh11 expression. This may lead to a better understanding of oncogenesis, since Cdh11 over-expression is correlated with the epithelial-mesenchymal transitions that occur in metastatic cancers.

SYNTHESIS AND CHARACTERIZATION OF IRON OXIDE NANOPARTICLES.

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The objective of this research project is to develop a novel, facile, procedure that yields monodisperse, crystalline iron oxide nanoparticles. These interesting particles possess unique physical properties that have many current industrial applications, such as catalysts for combustion in diesel compression ignition engines, medical contrast agents and medical therapeutic agents. Iron oxide nanoparticles were synthesized in a single reaction vessel through the thermal decomposition of a mixture of ferrous ions and a non-polar solvent. The molar ratio of oleic acid to iron ion is a parameter that is critical to the reactions success. A thermodynamically stable suspension of un-agglomerated monodisperse maghemite (γ-Fe_2O_3) nanoparticles that are highly crystalline and 3 to 3.5 nm in diameter was produced. A patent application for this novel method for preparing iron-containing nanoparticles has been submitted to the USPTO. Additional publication of these results in scientific journals is anticipated. Commercial engine testing is needed to study the efficacy of this product.

WATER QUALITY ANALYSIS OF TWENTY STREAM SITES IN THE OSWEGO/FINGER LAKES WATERSHED.

Grete Bader and William Hallahan
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Benthic macroinvertebrate communities are considered to be reliable indicators of stream health. In this study, macroinvertebrate samples were collected at twenty sites among twelve streams in the Syracuse area using the NYS Department of Environmental Conservation traveling-kick sampling method. Analyses were based on macroinvertebrate Biotic Index (BI), Ephemeroptera, Plecoptera, and Trichoptera species richness (EPT Index), and Percent Model Affinity (PMA). The twenty sampling sites can be divided into two major categories. For the first group, previous water quality assessments were available from the NYSDEC 30-Year Water Quality Trends Report (Bode, Novak, and Abele 2004), in addition to several more recent DEC publications. When the results from the present study were compared with previous data, significant changes in water quality were not evident for most sites. The second group of data encompasses streams that have not been assessed by the DEC. The average water quality for these streams was considered moderately impacted according to the EPT Index and PMA, and slightly impacted according to the Biotic Index.

Fertilization effects on soil respiration, root respiration, and microbial respiration in northern hardwoods of New Hampshire

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Soil respiration has received a great deal of attention recently because it is a major pathway of flux in the terrestrial ecosystem carbon cycle. The soil respiration can be affected by soil resource availability owing to changes in forest productivity. In our previous study which quantified pre-fertilized conditions in three sites of the northern hardwood forests, NH, soil respiration was low in a high N availability site even though fine root biomass and litter production was not different. To understand which components of soil respiration are affected by soil nutrient availability, we measured soil respiration, root respiration with trenching, and microbial respiration with incubation in N, P, and N and P fertilized plots of differing ages at each site. After fertilization in 2011 and 2012, soil respiration was unchanged in most stands and root respiration was unchanged. However, microbial respiration increased in some

stands in N, P, and NP plots. The general lack of evidence of fertilization effects on soil respiration and root respiration supports that carbon flux in soils does not change within a couple of years after nutrient additions. Continuous measurements are needed over a long period.

OBSERVABLE TRENDS IN THE GEOGRAPHICAL DISTRIBUTION OF NATIVE AND NON-NATIVE FRESHWATER MOLLUSKS IN WESTERN NEW YORK STATE.

Kate Bailey

With over 110,000 species of mollusks in the world, freshwater gastropods account for roughly 75% of this figure, while bivalves account for the remaining 25% (Voshell 2002). In Western New York, native freshwater mollusks play vital roles as ecosystem engineers, with freshwater mussels serving as sediment-burrowers and water column filters, while snails graze on algae and periphyton; both classes of mollusks keep aquatic food webs in balance. However, the introduction of non-native species of mussels into the Hudson River and St. Lawrence seaway by transoceanic vessels has inadvertently altered the population dynamics and distribution of native mollusks, particularly mussels of the Unionid family. Over the course of research during the Summer of 2012, which included sampling sections of Lake Ontario, the Finger Lakes, and other aquatic habitats, an overwhelming majority of species found and collected were invasive *Dreissenid* mussel species such as the zebra mussel. The goal of this research was to find and identify native and non-native mollusks in Western New York and to determine whether the presence of invasive species is correlated with low population densities of native mussel and gastropod species.

Reference: Voshell, J. 2002. A Guide to Common Freshwater Invertebrates of North America. Ohio: McDonald & Woodward Publishing Co.

PEPTIDE SCAFFOLDS FOR TARGETED MULTI-MODAL IMAGING AGENTS.

Taylor M. Barrett, Zane R. Barnstien, Hans Schmitthenner

The purpose of this research will be to design the methodology used to synthesize new targeted multi-modal molecular imaging agents (TMIA) that are useful in diagnosing cancer and heart disease. This approach is based on peptide scaffolds from which multi-binding or multi-modal agents may be formed. The initial target will have a contrasting agent for use in magnetic resonance imaging (MRI) and a near infrared fluorescence (NIRF) dye, along with a small bio-active peptide to target diseased tissues. The first step in this process will be to create a tri-peptide with differentially protected, or masked, amine side chains. The next step is to unmask the scaffold to create a functional TMIA. The first multi-modal agent will have two groups on it that can image diseased tissues: a fluorescent dye and a Gadolinium chelating group (for use in MRI). Finally, a targeted multi-modal imaging agent will be synthesized to selectively image diseased tissue. The cyclic peptide c(RGDyK) will be used for targeting. This peptide has been shown to target tumors through the αVβ3 integrin receptor pathway in angiogenesis. The products will be analyzed by HPLC, mass spectrometry, and evaluated for medical imaging properties by fluorescence, NMR spectroscopy, and confocal microscopy on targeted cancer cells.

ARCTIGENIN IMPROVES GLUCOSE TOLERANCE IN A STRAIN OF MIGHTY MICE.

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Several transforming growth factor β (TGFβ) related proteins have been shown to impact skeletal muscle. Many TGFβ family members signal through the activin receptor IIB. Mice expressing a muscle specific dominant negative activin receptor IIB (dnActRIIB) have muscle hypertrophy, increased lean

mass, decreased fat mass, improved glucose metabolism on standard and high-fat diets, and resistance to diet-induced obesity. In recent years, scientists discovered what they termed "exercise in a bottle," by activating adenosine monophosphate kinase (AMPK), a key mediator of endurance training adaptations. The current study was undertaken to examine the ability of an AMPK activator to change glucose metabolism in dnActRIIB mice. Wildtype and Dn ActRIIB mice were treated with arctigenin, an herbal extract that activates AMPK, or saline 5 days per week for 6 weeks. Mice were fasted overnight and a standard intraperitoneal glucose tolerance test was performed. Treatment with arctigenin did not alter glucose disposal in wildtype mice. However, arctigenin treatment resulted in better glucose disposal for DNActRIIB mice than those treated with vehicle alone. Arctigenin treatment did not alter body weight and is therefore thought to have not altered body composition. The results suggest that activation of AMPK in combination with additional muscle mass might lead to future therapy for muscle conditions such as age related muscle mass loss and diabetes.

INVESTIGATING THE EFFECT OF STERIC BULK ON THE CATALYTIC ACTIVITY OF SUBSTITUTED TIN(II) CHLORIDES IN THE METHYLATION OF OLEIC ACID.

Emily Benton, Richard W. Hartmann
Nazareth College, Department and Chemistry and Biochemistry

Recent work in our group has shown the tin(II) halides to be effective Lewis acid catalysts for the methylation of oleic acid with an unusual pattern of reaction rates (I> Br> Cl >F). In an effort to determine if this effect is of steric origin, substituted tin(II) chlorides of the form SnCl2X2 (X= Me, Et, t-Butyl) were employed as catalysts under the same reaction conditions as the original halides. Reaction rates for the substituted halides follow a similar trend (t-Buytl> Et > Me). We present here the methods used to obtain and analyze our data, our interpretation of the data in terms of potential mechanisms, and our planned future work.

MCH RECEPTOR LOCALIZATION: CONNECTING THE DOTS.

Derek T. Bernacki, and Laurie B. Cook

Genetic obesity is largely thought to be caused by defects in hormonal appetite regulation. Melanin concentration hormone (MCH) is a key hormone in this pathway; MCH acts through the G protein-coupled receptors MCHR1 and MCHR2. In order to develop an effective treatment for obesity, we need to develop a better understanding of how MCH signaling is regulated. Preliminary observations in our laboratory occasionally revealed unusual MCHR1 localization patterns in different cell types. We have observed MCHR1 enrichment on primary cilia of differentiating adipocytes, MCHR1 distributed in dot and ring formations in SH-SY5Y cells and enrichment of MCHR1 at two distinct dots at or near the centrosomes in transiently-transfected BHK-570 cells and CHO-K1 cells. We hypothesized that these three observations were stages of MCHR1 delivery to ciliary structures. To test this hypothesis, we first needed to conduct proper immunostaining control experiments to determine whether our observations were scientifically sound. In this study we focused on the latter observation in CHO-K1 cells. Aim 1 was to repeat the experiment that revealed centrosome-like patterning of MCHR1 and determine if serum starvation (which promotes cilia formation) promoted MCHR1 delivery to this region. Others have reported delivery of beta-arrestin, a well-known GPCR downregulating protein, to the centrosome. Aim 2 was to determine if MCH also promotes delivery of GFP-beta arrestin 1 and 2 to these regions. Confocal microscopy was used to capture images of MCH-treated and untreated cells. Our experimental results indicated that the localization of MCHR1 to centrosome-like structures is specific and reliable and seems to be promoted in the absence of serum. Under no circumstance were we able to detect beta-

arrestin localization to this region, however we hypothesize that this may be because we were using an overexpression system. Future experiments are aimed at confirming that MCHR1 is co-localizing with a centrosomal marker such as gamma-tubulin and endogenously expressing cell models harboring both MCHR1 and/or beta arrestins.

ECOSYSTEM SCALE IMPACTS OF SIMULATED EMERALD ASH BORER IN WESTERN NEW YORK FORESTS
Rebecca Bernacki, Mark Norris

The emerald ash borer (EAB) is an invasive pest from Asia that has recently become established in localized areas of Western New York (WNY). This pest, first discovered in Michigan in 2002, may kill more than 85% of ash (*Fraxinus*) trees in a stand within 3-5 years of establishment. Therefore, the potential for dramatic community and ecosystem change exists following the establishment of this pest. Despite the damage inflicted by EAB, few ecological studies of the impact of this pest exist beyond *Fraxinus* population dynamics. However, it is likely that this pest will drastically change ecosystem functioning in infested stands. We are comparing stands with simulated EAB mortality to adjacent uninfested control stands with the goal of filling this information gap on the broader impacts of EAB. This is especially important in WNY where ash are a major forest contributor. We hypothesize that ash-dominated sites, which are currently atmospheric carbon sinks, will become carbon sources due to declines in production and increased decomposition associated with the loss of ash and shifts in microclimate. We also hypothesize that this pest will set back the successional clock of infested sites, shifting the community toward an early successional community with an increased presence of nonnative plants.

A CHARACTERIZATION OF BLACK SPOT STREAMS IN THE SENECA LAKE WATERSHED.
Shannon M. Beston, Susan F. Cushman

Uvulifer ambloplitis, a trematode that commonly infects fish with a disease called black spot, was found in *Rhinichthys atratulus* blacknose dace and *Semotilus atromaculatus* creek chub in multiple streams in the Seneca Lake watershed. Because a degraded stream habitat can be associated with poor stream health, and compromised fish condition is related to a degraded habitat, it was hypothesized that the occurrence and abundance of black spot in a fish community could be an indicator of an unhealthy stream. Fifteen streams in the Seneca Lake watershed were sampled for fish with a Smith-Root electrofisher in a 75-meter sampling reach. The fish were identified to species and observations of various characteristics were noted for each fish. Blacknose dace and creek chub were also measured for total length. Habitat surveys were performed at each site and water quality was recorded, as well. The presence of black spot on fish was used to categorize streams and parameters such as percentage of black nose dace and creek chub, percentage of black spot incidence, species richness, and habitat descriptions were used to help characterize linkages with black spot disease because of their potential to indicate stream health. Black nose dace with black spot were found to be significantly smaller than black nose dace without black spot. In some of the black spot infected streams a decrease in dissolved oxygen and increase in temperature were observed in comparison to data collected in 2011. The data collected supports the hypothesis of black spot disease as a part of a positive feedback cycle leading to decreased stream health.

THE COMPOSITION OF DISSOLVED ORGANIC MATTER IN STREAMS SURROUNDING CONESUS LAKE, NY.

Morgan R. Bida, Todd Pagano, A. Christina Tyler, Thomas H. Gosnell
School of Life Sciences Graduate Program in Environmental Sciences Rochester Institute of Technology

In recent decades, the water quality of Conesus Lake in the Finger Lakes Region of New York State has declined, suggesting that the ability of Conesus Lake to sustain its multiple uses may be threatened, particularly its use as a primary drinking water source. Previous water quality and watershed-health studies at Conesus Lake have focused on the delivery of inorganic nutrients to the lake. We know much less, however, about the effects of watershed land use on the quantity and composition of dissolved organic matter (DOM) supplied to this system. With 70% of the flow to Conesus Lake supplied by more than 18 unique streams and several smaller tributaries, the lake has a topography that makes it an ideal study site for an analysis of the effects of land use on DOM quality. It was hypothesized that DOM from agriculturally dominated stream subwatersheds would reflect a more labile, autochthonous signature. We assessed the influence of land use on the quality of DOM entering Conesus Lake with a suite of optical indices using UV-visible spectroscopy and fluorescence excitation-emission matrices (EEMs) with parallel factor analysis (PARAFAC), a chemometric technique for the decomposition of characteristic fluorescence peaks. We will present a 4-component PARAFAC model showing two (C1 & C2) allochthonous, humic-like components and two autochthonous, protein-like components (C3 & C4). Principle components analyses (PCA) suggest that agriculturally dominated streams are associated with increased nitrate, a greater proportion of protein-like PARAFAC components (C3 & C4), and that the DOM tends to be less humified. These results confirm our hypothesis and imply that anthropogenic land uses can act to stimulate autochthonous production in a stream, thus altering the quality of DOM exported to the lake.

THE CONTROL OF INVASIVE *TYPHA* SPP. AT A RESTORED FRESHWATER WETLAND.

Kathryn Boa, A. Christy Tyler
Rochester Institute of Technology: Thomas H. Gosnell School of Life Sciences, Program in Environmental Science

Wetlands are important ecosystems that provide many services such as stormwater detention, nutrient absorption, groundwater recharge, and wildlife habitat. Wetland creation is a form of mitigation used to replace natural wetlands lost to agriculture and urban development. It is critical to the preservation of wetland ecosystem functions and services that wetland loss be combatted by the restoration and creation of functionally sound wetlands. High Acres Nature Area (HANA) in Perinton, NY is a 250 ha site owned and managed by Waste Management Corp., and includes four mitigation wetlands constructed in 2009 along with a mosaic of natural wooded and emergent wetlands. Invasive species are one of the most serious ongoing causes of biodiversity loss and habitat degradation worldwide. An aggressive invader of wetlands such as *Typha*, commonly known as cattail, alters community dynamics and is a management concern, especially for mitigation wetlands. Efficient use of nutrients, clonal growth forms resulting in monoculture, positive feedback loops and allelopathy are all potential invasion mechanisms for this species. Adding carbon to invaded systems has been shown to negatively affect invaders such as *Typha* and benefit native species, possibly by altering allelopathic interactions or altering nutrient availability. Through my research I will seek to determine the major factors involved in the *Typha* invasion at HANA and evaluate potential control methods. My major objectives are to determine the current extent and spread of *Typha* at HANA, identify the limiting nutrient in the wetlands, determine the effects of different carbon sources on plant community growth and nutrient pools, determine the mechanism through which *Typha* litter affects native species, and determine if *Typha* litter decomposes more slowly in the created wetlands. Data from these ongoing

experiments will assist in making recommendations for *Typha* control efforts at HANA.

INVESTIGATION OF THE LOW N METHOD TO DETERMINE NEUTRINO FLUX AT LOW ENERGIES.

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We investigate the low ν method (developed by the CCFR/NuTeV collaborations) to determine the neutrino flux in a wide band neutrino beam at very low energies, a region of interest to neutrino oscillations experiments. Events with low hadronic final state energy below 1, 2 and 5 GeV were used by the MINOS collaboration to determine the neutrino flux in their measurements of muon neutrino and antineutrino total cross sections. The lowest neutrino energy for which the method was applied is 3.5 GeV and the lowest antineutrino energy was 6 GeV. At these energies, the cross sections are dominated by inelastic processes. We investigate the application of the method to determine the neutrino flux for neutrino and antineutrino energies as low as 0.75 GeV, where the cross sections are dominated by quasielastic scattering and P(1232) resonance production. We find that the method can be extended to low energies by using hadronic energy cuts of 0.5 and 0.25 GeV, which are feasible in fully active neutrino detectors such as MINERvA.

PLANT DNA BARCODING AS AN EXPERIENTIAL COLLEGE LABORATORY

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To facilitate experiential learning in the biology curriculum, a DNA barcoding module has been implemented in Plant Biology Laboratory at St. John Fisher College. DNA barcoding aims to utilize short, standard DNA sequences to identify all species of life. The rbcL and matK plastid loci have been proposed to provide the necessary levels of reliability and species discrimination for plants. The protocols, modified from those of the iPlant Collaborative (http://www.iplantcollaborative.org/), has students sample plant tissues, extract DNA, PCR amplify one of the barcode loci, obtain a sequence, and process and analyze the sequence results and phylogenetic relationships using the DNA Subway (http://dnaubway.iplantcollaborative.org/). To provide greater meaning to the results, students have sampled the collection of the Lamberton Conservatory of Highland Park, Rochester, NY. Additionally, the Rochester Academy of Sciences Herbarium has been investigated a source of subjects. The ultimate goal of the project is for students to contribute barcode data from an institutional collection to the Barcode of Life Database (http://www.boldsystems.org/). The protocols have proven very successful with students that have limited bench experience and the bioinformatics methods introduce students to a challenging subject in an approachable but robust manner. Overall, the module addresses a broad array of learning goals and allows students to contribute unique data to science rather than just demonstrate their ability to follow a protocol.

BACTERIAL ISOLATION FROM THE GENESEE RIVER AND CHARACTERIZATION OF ANTIBIOTIC RESISTANCE

Sarah Bowen, Maryann A.B Herman
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The Genesee River currently serves as downtown Rochester's hydroelectric power source and its water is used for recreation, drinking water, irrigation, and supporting wildlife. Knowing what organisms and chemicals are present in the river is of great value. With the human population's high use of antibiotics and inability to fully metabolize them, more antibiotics find their way into bodies of water, including local sources such as the Genesee River. This poses a potential threat to organisms inhabiting the river, as well as a health concern for individuals who interact with this water source. Water samples were collected from five designated locations along the Genesee River to test for the presence of antibiotic-resistant bacteria. Water samples were filtered through a 0.2 Millipore membrane and placed on R2A Agar to foster bacterial growth. The mixed cultures of bacteria were sub-cultured until pure cultures were obtained and frozen at -80ºC. Bacterial morphology and sequencing will be used to identify isolates. The Kirby Bauer Disc Diffusion Assay will be used to determine the reactivity of the bacteria samples to commonly prescribed antibiotics.

PHYLOGENETIC ANALYSIS OF HUMAN MITOCHONDRIAL DNA.

Larry Buckley, Alexandra Cooper

A phylogenetic analysis of the human mitochondrial genome was constructed by using the GenBank accession numbers from an updated comprehensive phylogenetic analysis (Kayser et al. 2009). The mtDNA haplotypes were aligned with ClustalW and trees were produced with MEGA 5 (Molecular Evolutionary Genetic Analysis). Parsimony network analyses of the haplotypes were constructed based on DNA substitutions among 26 different haplotypes using TCS 1.2.1. Both types of analyses recover similar relationships among extant human haplotypes supporting the theory that the deepest human genetic variation exists among current African haplotypes while the closest haplotype relationships exist among a recently separated subset of African and all non-African haplotypes.

FISH ASSEMBLAGES IN LAKE ONTARIO TRIBUTARIES FROM OVER ONE CENTURY AGO: WAS WRIGHT RIGHT?

Ben Carson, Paul Shipman
Rochester Institute of Technology, Thomas H. Gosnell School of Life Sciences

Albert Hazen Wright (1879-1970) conducted a comprehensive survey of fishes and their habitats from 1902 -1903 in ten Lake Ontario tributaries west of Rochester, NY. These tributaries are located in a region greatly impacted by human activity over the past century, from the construction of the Erie Canal, to the urban sprawl of the city of Rochester. For study, we digitized data from Wright's manuscript, which was re-discovered and posthumously published in Guelph Ichthyology Reviews in 2006, and subjected it to modern statistical analysis. We performed canonical correspondence analysis to identify any errors that Wright might have made in his innovative, but informal, graphical analysis that related fish species with particular habitat types. We plan to conduct a new survey to see how fish communities have changed in these same tributaries over the last 100 plus years. Of particular interest are the effects of numerous incursions of non-native species of plants and animals, many of which have most likely been spread via the Erie Canal System, on native fishes and their habitats. These Streams, when combined with the other small tributaries, excluding, the Niagara River, the Genesee River, the Oswego River, and the Black River, comprise 17% of the New York State watershed for Lake Ontario.

Tributaries such as these are critical components for the life cycles of many fishes found in and along Lake Ontario, and have a big impact on an economically important sport fishery.

MEIOSIS CONCEPTS IN UNDERGRADUATE EDUCATION.

Christina M. Catavero, L. Kate Wright, Dina L. Newman
Rochester Institute of Technology

This survey is intended to determine which concepts related to meiosis faculty feel are important for students to know at various levels of their biological sciences education. The undergraduate science community should benefit from the results of this survey, as the information gathered will be used to assess the usefulness and merit of biological science textbooks that address meiosis. The survey will take about 10 minutes to complete. Paper copies will be distributed, and the survey is also available online at https://clipboard.rit.edu/take.cfm?sid=7780847E

REMODELING OF THE PYTHON GASTROINTESTINAL TRACT AFTER FEEDING

Tori Cenzi, Adam Rich
The College at Brockport

Introduction: Organs and tissues have the capacity to remodel in response to environmental stimuli. The Burmese python snake feeds intermittently and after eating the mass of the gastrointestinal tract doubles Secor, 2008). The morphology of the gastrointestinal tract also changes and an increase in microvilli length from ≈ 0.5µm to 4.5µm facilitates increased nutrient absorption after feeding. Changes in the muscular layers have not been reported. Patients with gastrointestinal motility disorders sometimes exhibit dystrophia, or a reduced smooth muscle function as well as reduced interstitial cell of Cajal density. The total number of smooth muscle cells and of ICC is influenced by the rate of formation of new ICC, as well as ICC lifespan. A better understanding of remodeling of the gastrointestinal tract after feeding in the Burmese python will contribute our understanding of these processes in humans.
Objective: The objective of this project is to characterize the anatomy of the tunica muscularis of the Burmese python GI tract in both fed and fasted states. We will test the hypothesis that feeding triggers an increase in thickness of smooth muscle layers as well as an increase in ICC and enteric neuron density which is necessary to regulate smooth muscle contraction.
Methods: Frozen gastrointestinal tissues of fed and fasted Burmese pythons were obtained from Stephen Secor. Tissues were cryosectioned and fixed in 4% paraformaldahyde. Heamtoxylin and eosin staining was used to examine cell morphology and specific antibodies were used to examine smooth muscle, enteric neurons, and ICC. Mouse small intestine was used as a positive control. Digital imaging was used to capture images of the stained tissues and the thickness of the muscle layers was measured in fed and fasted states
Results: Changes in epithelial cell morphology were observed between fed and fasted samples. Connective tissue layers between the submucosa and the circular muscle cells was expanded in the fed sample. Smooth muscle thickness and the size of individual smooth muscle cells did not appear to change.
Summary: Feeding did not result in morphologic changes in the muscularus externus of the Burmese python. Experiments are underway using paraffin embedding because cryopreservation may alter tissue morphology. Suitable antibodies to identify smooth muscle, enteric neurons, and ICC will be selected to further examine cellular morphology.

SYNTHESIS OF TIN (II) HALIDE-PHOSPHINE COMPLEXES AND CHARACTERIZATION VIA ^{119}SN AND ^{31}P NMR SPECTROSCOPY.

James Chambers, Briana Laubacker, Kristin Nichols
Nazareth College

Recent work in our labs has shown SnX_2 (X = F, Cl, Br, and I) to be effective Lewis acid catalysts for the methylation of oleic acid. The results show a clear trend, but we are unable to determine if the result is due to changes in electron density at the metal center, or the steric bulk introduced by the halide ligands. In an effort to systematically modulate the electron density on the tin center we have undertaken the synthesis of several phosphine derivatives of each tin II halide using the following phosphines: triphenyl phosphine, 1,2-Bis(diphenylphosphino)ethane, and trioctylphosphine. ^{119}Sn and ^{31}P NMR studies verify the formation of several novel compounds and this poster will discuss the interpretation of these spectra and the possible identity of the compounds that were formed.

A PARTNERSHIP BETWEEN COLLEGE AND HIGH SCHOOL STUDENTS TO MONITOR LEVELS OF NUTRIENTS IN BUCKLAND CREEK

Kimberly Chichester, Kristina Lantzky, Lynn Donahue, Alyse Palumbo, Jason Brownell, and Irene Kimaru
Chemistry Department, St. John Fisher College

Service learning has been incorporated into the Analytical Chemistry Laboratory to give students a real world sampling experience involving collection of water from a local creek. Analysis of the water includes metals, suspended solids, phosphorus and nitrogen containing compounds requiring knowledge of several different instruments, test kits and wet chemical techniques. Most educational experiences do not afford students the chance to see the real world applications of their classroom knowledge, but with the service learning aspects this deficiency has been resolved. In the quantitative analysis course, analysis of waterways is conducted with assistance from East Rochester Central School. One aspect of this project involves students providing baseline analysis of nutrients and metals found in Buckland Creek and the Genesee River for the Department of Environmental Services, Division of Pure Waters, who are studying the effects of industrial expansion and human activity on water quality in Rochester. The second phase of the project involves St. John Fisher College students mentoring students from the East Rochester School district on sampling and analysis of water samples. In addition to feeling like active contributors to the community, the students from both schools also researched the acceptable levels for each analyte studied and the consequences of exceeding or underachieving the desired level.

NEPHROCYSTINS AND TUBULINS INTERACT IN CILIATED SENSORY NEURONS OF *CAENORHABDITIS ELEGANS*

Linda Childs and Daryl Hurd
Department of Biology, St. John Fisher College

Ciliopathies are the cause of many human diseases and disorders, including nephronophthisis, a cystic kidney disorder causing renal failure in children. Caenorhabditis elegans contains homologs of the proteins that when missing in humans, can lead to these diseases. These proteins are found in ciliated sensory neurons of worms. Better understanding of the effects of mutations in the nphp genes can lead to a greater understanding of human ciliopathies. The ability of certain C. elegans sensory neurons to take up lipophilic dyes depends upon the integrity of their cilia, making them an ideal model cell type to study cilia formation. Do deletions in C. elegans nphp-1, tbb-4, or tba-9 genes, alone or in combination, cause morphological changes in these sensory neurons and the ability to take up lipophilic dye? Using a modified dye-filling procedure and fluorescent microscopy, we were able to ascertain whether or not

deletions of those genes and combinations thereof have an effect on the sensory neurons. Previous evidence showed that mutation of either nphp-1 or tbb-4 alone did not abolish dye-filling, but caused variable clumpiness in the dendrites of the sensory neurons. However, mutation of nphp-1 and tbb-4 shows that these proteins are needed together for proper uptake of dye in the sensory neurons. These results suggest that tbb-4 may be required for nphp-1 to work properly in amphid morphology and functionality.

ROLLER COASTER SAFETY: MINDING THE LINE BETWEEEN THRILLS AND INJURIES

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Every year there are millions of riders on board the world's roller coasters. These impressive machines give riders the sensation of being in incredible danger, while maintaining a level of safety that limits the number of on board injuries to a handful of riders, and put the annual death toll of deaths caused by roller coasters lower than that of deaths caused by vending machines. But how so the designers of these rides maintain the balance between making riders feel like they're on the brink of death while keeping them completely safe? The answer can be found in basic physics and mechanical engineering.

EURYPTERIDS OF THE DEVONIAN OLNEY LIMESTONE (MANLIUS GROUP) OF CENTRAL NEW YORK.

Samuel J. Ciurca, Jr.

In central New York, the Olney Limestone constitutes part of the Manlius Fm./Group. Of the several litho- and biofacies evident, two are particularly interesting as the repository of eurypterids (sea scorpions) presumably of Early Devonian age.

The typical or characteristic species, *Erieopterus microphthalmus*, is widespread, occurring at various horizons from Thacher Park near Albany, westward into Ontario, Canada. It occurs, usually, in shallow-water deposits with abundant *Howellella*, ostracods, a clam, microbialites and not much else.

In contrast, a pterygotid/stromatoporoid biofacies was discovered in upper Olney beds (Ciurca, 1978) consisting of the eurypterid Acutiramus sp. in direct association with stromatoporoids (fossil sponges) and a slightly more diverse (marine) biota consisting of gastropods, an orbiculoid, spirifers and prolific marine plants. This peculiar facies is interpreted to be a back-reef, lagoonal deposit – the reef being more developed eastward and southward from the Syracuse region. Its limited extent favors this interpretation – a lagoon with the shallow portion (landward) bearing the Erieopterus biota, the deeper the Acutiramus biota.

Added Note: The Olney Limestone itself has yielded hundreds of specimens of E*. microphthalmus* with only one specimen of *Acutiramus* sp. present.

In contrast, the *Acutiramus*/stromatoporoid biofacies has thus far produced only the pterygotid to the exclusion of E. *microphthalmus*.

Reference: 1978, Ciurca, S. J., Jr., Eurypterid Horizons and the Stratigraphy of the Upper Silurian and Lower Devonian Rocks of Central-Eastern New York State in the New York State Geological Association (NYSGA) 50th Annual Meeting Guidebook (Syracuse University).

CHARACTERISTICS OF PLAY IN JUVENILE KILLER WHALES (*ORCINUS ORCA*)

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The killer whale is a long-lived, highly social species, characterized by a lengthy period of adolescence. The goal of the present investigation was to describe the patterns of play behavior that

occurred in two juvenile orcas held in captivity at Marineland of Canada. Among the interactions that were exclusively calf-calf, the social behaviors included chasing, mutual rolling, mouthing, and water flow/object manipulation. The findings suggest that orcas are highly playful in nature, and support the notion that play very likely has a major role in social development in this species.

MCHR1 LOCALIZATION TO PRIMARY CILIA IN SHSY-5Y CELLS

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Melanin-concentrating hormone (MCH)is a cyclic peptide that is activated in response to stress as well as environmental stimuli. In mammals MCH was identified in the hypothalamus and is a 19- amino acid peptide and has been shown to act as a regulator in energy homeostasis, which has effects on both feeding behavior and energy expenditure. In both ob/ob and normal mice the addition of MCH has been shown to increase feeding, while during fasting an increase of gene expression occurs. Melanin-concentrating hormone receptor 1 (MCHR1) is a G protein-coupled receptor which allows MCH to signal across the cell membrane. MCHR1 knockout mice are shown to be lean, even with normal feeding and MCH levels. In SH-SY5Y cells a neurblastoma cell line MCHR1 is endogenously expressed. Preliminary results from our lab indicate that MCHR1 localizes to distinct punctate regions within the cell rather than the expected surface organization. My hypothesis was that MCH caused increased localization of MCHR1 to these regions. This was tested by first fixing SHSY-5Y treated with and without MCH for 0, 5, 10 and 30 minutes. Then immunostaining with an antibody to MCHR1 and fluorescent secondary antibody. The cells were visualized using an inverted fluorescent microscope and cells were scored for MCHR1 localization based on 3 categories dots, rings, and rings/dot. Quantitation was used to determine whether MCH facilitates MCHR1 presence in the dots or rings. We determined that with an increase in MCH treatment time there was an slight increase in dots per ring present. We hypothesized that the organization of MCHR1 in to dots/rings precedes the formation of primary cilium. Future experiments will test this hypothesis.

IMPACT OF SOUFRIERE HILLS VOLCANO ON THE CORAL REEF ECOSYSTEM OF MONTSERRAT, W.I.

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The Soufriere Hills Volcano in the southern part of the island began erupting on July 18, 1995 following a 3 year period of seismic activity. Volcanic eruptions have completely engulfed the old capital city of Plymouth along with the old airport. The FLCC team explored the coral reef ecosystem of Montserrat using monitoring techniques developed by Reef Check. The team investigated the effects of the Soufriere Hills Volcano on the reef system in an ongoing research project that studies fish, corals and invertebrates that live there. By correlating the site condition with its proximity to the volcano, it can be inferred that there is a negative relationship between reef conditions and silt coverage.

THE VESICULAR STOMATITIS VIRUS MATRIX PROTEIN REGULATES NF-κB ACTIVATION IN L929 CELLS.

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NF-kB is a major regulator of many cellular processes including induction of the interferon (IFN) antivial response. In response, many viruses have evolved strategies to perturb the NF-kB pathway. In this study, we follow up on our previous findings that wild type Vesicular Stomatitis Virus (VSV) prevents

activation of NF-kB, which may allow the virus to evade the IFN-gamma response and successfully infect the cell. In contrast, this transcription factor is activated at early times postinfection with the IFN-inducing T1026R1 (R1) mutant strain of VSV. The R1 virus contains a M51R mutation at position 51 of the matrix (M) protein, suggesting a role for this protein in regulation of NF-kB. To determine if the R1 strain encodes other defective proteins that are responsible for early activation of NF-kB, we compared NF-kB activation in cells infected with a virus that encodes a functional M protein (wt and rHR) to activity in cells infected with R1 or r1026M, a recombinant virus that contains only the single M51R mutation in the M protein. Immunofluorescence was used to determine nuclear translocation of the p65 subunit of NF-kB and the ELISA-based TransAM assay was used to examine DNA-binding activity of p65. NF-kB was activated in cells infected with the M-defective viruses, while this transcription factor was not activated in cells infected with strains that encode a functional M protein. To determine if the M-defective viruses failed to activate NF-kB, or if they encode a protein that suppresses this transcription factor after it was activated, a coinfection assay was utilized. The wt and rHR viruses suppressed R1-mediated activation of NF-kB; however r1026M failed to do so. Transfection studies indicate that the wt M protein alone can block viral-mediated activation of NF-kB, while the R1 M protein alone is not able to block this activation. Expression of the VSV G, L, N or P protein did not alter NF-kB activation. Taken together, these results indicate that the VSV M protein in the context of viral infection, and when expressed alone, is able to block viral-mediated activation of NF-kB. In addition, we report that NF-kB is not regulated via the canonical pathway. The M protein regulates NF-kB through inhibition of host gene expression, or the M protein has been assigned the new function of regulating the NF-kB pathway.

CHARACTERIZING WETLAND VEGETATION USING AIRBORNE HYPERSPECTRAL IMAGERY.

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There has been a >50% decline in wetlands in the U.S. over the last 200 years. Creation of compensatory wetlands subsequently has been required in the U.S. since the late 1980's in an attempt to offset these losses. In this context the U.S. Army Corps of Engineers requires vegetation monitoring of mitigation wetlands for five years following creation. However, wetland assessment is a time-consuming process that may also disturb nascent plant communities. There is a need for approaches that minimize disturbance of these fragile ecosystems but still enable the collection of data over large portions of the landscape. A potential method to quickly collect ecosystem information with minimal impact to the environment is by combining remote sensing, typically hyperspectral imagery, and field data collection. In July 2010, vegetation community composition, spectral signatures of individual plant species, canopy level spectral measurements, and an aerial hyperspectral imagery dataset were obtained from two natural and two mitigation wetlands on the Rochester Institute of Technology campus, Rochester, NY. We are using spectral analysis techniques and training-validation based on field data, to (i) develop a spectral library of common western NY wetland vegetation and plant communities and (ii) assess differences in vegetation communities between natural wetlands and in-kind mitigation wetlands. These efforts were supplemented with the collection of field spectra data during the summer of 2012 from similar types of wetlands at High Acres Nature Area, Penfield, NY. The latter collection will serve to validate the model as a regionally appropriate assessment tool. Initial results from this research project will be presented.

CORONA WIND VISUALIZATION AND OPTIMIZATION

Ryan Ellis, Danielle Citro, Josh Apenowic, Justin Patus, and Adrian Ieta

Corona wind occurs when a high voltage above corona onset is applied to an electrode system. As ions migrate, a momentum is imparted to other nearby neutral molecules generating corona winds. Visualization of corona wind is often overlooked due to the high voltages needed for its inception and rather complex setups and instrumentation required for flow visualization. By using liquid nitrogen and a laser sheet, visualization of corona wind flow can be done in a simple yet effective manner. The low temperature of the liquid nitrogen initiates the naturally occurring water vapors to condense. Using an image analysis program along with the high speed camera recording of the flow visualization allows for the estimation of the wind speed at different voltages. Different electrode configurations using both positive and negative polarities were applied and the resulting flows were compared. The method allows for a convenient way of corona wind optimization in terms of electrode geometry and voltage applied. In addition to the asymmetrical plane wire-plate configuration, a third in-plane negative wire controlled electrode was attached. Optimization of the corona wind was performed using the additional control electrode. A comparison to experimental studies and simulations found in the literature is also performed.

MEASUREMENTS OF Rb MOT CLOUD CHARACTERISTICS.

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After stabilizing the temperature and frequency of the trapping laser in our magneto-optical trap (MOT), we now have a stable Rubidium atom cloud that is amenable to measurement. In this poster we show several recent measurements of cloud characteristics including 1) the number of atoms in the cloud as a function of the laser detuning, 2) the number of atoms as a function of the trapping magnetic gradient strength, 3) the number density of the atoms in the cloud, and 4) the lifetime of an atom in the cloud for several Rubidium pressures.

DEGRADATION OF BIODEGRADABLE PACKAGING MATERIALS IN SOIL ECOSYSTEMS.

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Every year enormous amounts of non-degradable plastic packaging are made and used for products which are only required for short-term use. This can be seen by the number of single use plastic bags consumed in the United States alone, at over 100 billion bags per year with an estimated 96% being thrown away. As a result of this many alternative polymers are being developed or are already commercialized, offering safe biodegradation of the material back into the soil by microbial metabolism. In this investigation the percent degradation was determined for biodegradable materials in various soil ecosystems as well as characterization of fungal diversity for each. During 30-day degradation periods, samples reached up to 93% degradation for PHA-type plastics and only 1% degradation for the PLA plastic blend. Fungal swabs and isolations made directly from the samples surface during degradation have shown strong correlation to the fungal diversity of the soil samples assessed post-degradation. The degrading capability of the fungi, characterized as degraders of specific polymers, has lead the investigation to continue assessment by percent degradation for more biodegradable materials and identification of fungi species by Fungal-DNA Barcoding.

DEVELOPMENT OF A SAFE UNDERGRADUATE VIROLOGY LABORATORY COURSE USING AN ALGAL VIRUS.

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Development of an undergraduate laboratory course that teaches hands-on methods used to the study eukaryotic viruses is a significant challenge. Courses of this nature often require expensive, specialized equipment and reagents to grow and maintain animal cells in culture, such as CO2 incubators, laminar flow hoods and growth serum. In addition to budgetary and infrastructure constraints, a virology laboratory course can pose a significant health and safety risk. Human viruses obviously pose a risk to students, and their use has always been limited in traditional laboratory courses. More recently, especially post 9/11/2001, use of historically "safe" non-human animal viruses in a laboratory course is questionable. Accidental or intentional release of viruses into the environment could pose health and/or environmental risks and result in significant economic loss. Citing these concerns, many institutions have cancelled their virology lab courses, however, lack of experience with eukaryotic viruses leaves a significant gap in student learning. To address this, a student-centered virology laboratory course using chlorovirus, an algal virus that infects a microalgae called Chlorella, can be developed. Students will collect water samples from different environments, culture and maintain the host, isolate virus, perform a one-step virus growth curve, titer the virus, isolate viral DNA, and characterize the virus in a semester-long project. Additional experiments could include analyzing DNA, amplifying regions of the DNA, and conducting bioinformatic analysis. Participating in this real-life research project will challenge students to think like scientists rather than simply follow a protocol.

GENDER SEGREGATION AND SEXUAL BEHAVIOR IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Alexandra Ferrente, Michael Noonan
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The beluga whale is a highly social species adapted to inhabit high arctic regions. Except during mating season, the adults of this species ordinarily segregate themselves into sex-specific groups (i.e., male-only groups and female-only groups). The present study investigated the behavior of three adult male belugas housed together with adult females at Marineland of Canada. During the period under study, the males predominantly associated with each other. Furthermore, more instances of male-on-male pelvic thrusting were observed than male-on-female. These findings are discussed with respect to the possible role that such non-reproductive, sexual behavior might play in this species.

SYNTHESIS AND CHARACTERIZATION OF A SERIES OF NEW PEPTIDE-BASED CHIRAL IONIC LIQUIDS.

Faiza Filfil, Irene Kimaru

We report the synthesis and characterization of new di-peptide based chiral ionic liquids (CILs). The CILs were synthesized via an ion-exchange reaction between a lithium bis(perfluoroethyl)sulfonyl imide anion and various di-peptide cations including; glycine-L-histidine hydrochloride hydrate (Gly-L-His-HCl), L-alanyl-l-valine methyl ester (L-Ala-L-Val-OMe-HCl) hydrochloride, L-phenylalanyl-L-phenylalanine methyl ester hydrochloride (L-Phe-L-Phe-OMe-HCl), L-alanyl-glycine methyl ester hydrochloride (L-Ala-Gly-OMe-HCl), and L-phenylalanine alanyl methyl ester hydrochloride (L-Phe-L-Ala-OMe-HCl). The CILs