

2012 Abstracts

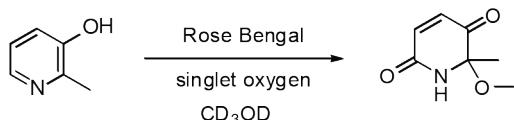
Alphabetical by the Last Name of the First Author

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

Aashish Abraham, David Samuel, David Hilmey

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Previous research has shown that Vitamin B₆ 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 B₆ 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 deuterated 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 0°C 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.

Kyle M. Alpha, Julie R. Hens

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Cadherin-11 (Cdh11) is a transmembrane, Ca²⁺-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 (PTHIP) 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 PTHIP and miRNA were isolated from the cells using RNAzol RT. miRNA expression was examined by qRT-PCR. Treatment with PTHIP 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 PTHIP 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 ($\gamma\text{-Fe}_2\text{O}_3$) 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.

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 $\alpha V\beta 3$ 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.

Mohammad Husain Bawany, Kathleen Savage.

St. John Fisher College, Department of Biology

Several transforming growth factor β (TGF β) related proteins have been shown to impact skeletal muscle. Many TGF β 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 of 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-Butyl> 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

Michael Boller

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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 -80°C. 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 $\approx 0.5\mu\text{m}$ to $4.5\mu\text{m}$ facilitates increased nutrient absorption after feeding. Changes in the muscular layers have not been reported. Patients with gastrointestinal motility disorders sometimes exhibit dystrophy, 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% paraformaldehyde. Hematoxylin 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 muscularis 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 Labacker, Kristin Nichols
Nazareth College

Recent work in our labs has shown SnX_2 ($X = \text{F}, \text{Cl}, \text{Br}$, 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 BETWEEN THRILLS AND INJURIES

Katharyn Christiana and Carolina C. Ilie

Physics Department, SUNY Oswego

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 do 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*)

Brittany Coppinger, Michael Noonan

Canisius College

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

Nico N. Covello and Laurie B. Cook

The College at Brockport, SUNY, Dept. of Biology

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 neuroblastoma 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 a slight increase in dots per ring present. We hypothesized that the organization of MCHR1 into 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.

Barb Dagata, Courtney Stein, Ashli Roberts and Professor James Hewlett

Finger Lakes Community College

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.

Ashley M. Dunham, Christopher Ried, Warren J. Hammond, Andrew Varble, Maureen C. Ferran

Gosnell School of Life Sciences, Rochester Institute of Technology

NF-κB is a major regulator of many cellular processes including induction of the interferon (IFN) antiviral response. In response, many viruses have evolved strategies to perturb the NF-κB pathway. In this study, we follow up on our previous findings that wild type Vesicular Stomatitis Virus (VSV) prevents activation of NF-κB, 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-κB. To determine if the R1 strain encodes other defective proteins that are responsible for early activation of NF-κB, we compared NF-κB 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-κB and the ELISA-based TransAM assay was used to examine DNA-binding activity of p65. NF-κB 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-κB, 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-κB; however r1026M failed to do so. Transfection studies indicate that the wt M protein alone can block viral-mediated activation of NF-κB, 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-κB 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-κB. In addition, we report that NF-κB is not regulated via the canonical pathway. The M protein regulates NF-κB through inhibition of host gene expression, or the M protein has been assigned the new function of regulating the NF-κB pathway.

CHARACTERIZING WETLAND VEGETATION USING AIRBORNE HYPERSPECTRAL IMAGERY.

Nicole Dutcher, A. Christy Tyler and Jan van Aardt

Rochester Institute of Technology School of Life Sciences, Chester F. Carlson Center for Imaging Science

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.

Joseph Engelbrecht, Bruce Thompson

Department of Physics, Ithaca College

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.

Chaz Feathers¹, Anna Bower² and Jeff Lodge¹

¹*Thomas Gosnell School of Life Science, ²College of Applied Science and Technology, Rochester Institute of Technology*

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.

Maureen Ferran, Ph.D, Erika De Bonte, Katherine Barbaccia, Nur Faseeha Suhaimi, Renée Thiemann
Gosnell School of Life Sciences, Rochester Institute of Technology

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

Canisius College

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 were obtained in moderate yields. The CILs derived from L-Ala-L-Val, L-Ala-Gly and L-Phe-L-Ala were liquid in room temperature while those derived from Gly-L-His and L-Phe-L-Phe were solids. The H1 and C13 NMR spectra of the CILs were in very good agreement with their chemical structures. Their melting point and glass transition temperatures ranged from 20.44 oC – 121.94 oC and -36.66 oC – 10.33 oC, respectively. The thermal decomposition temperatures of the CILs ranged from 250 oC to 356 oC. The CILs were found to absorb strongly in the UV region and some were highly fluorescent as determined using UV-Vis and Fluorescence Spectroscopy, respectively

SOCIAL DEVELOPMENT IN THE NEONATAL BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Elizabeth George, Michael Noonan

Canisius College

In order to explore social development in young beluga whales, the present study was designed to characterize the contacts made by three new calves with other group members. During the first month of life, the calves' social contacts were found to be almost exclusively centered on their mothers. Following that, and over the course of the next five months, the calves showed an increasing tendency to temporarily leave their mothers to approach other adults. Following these brief separations, the reunions of maternal-infant dyads were found to have been initiated by the calves as often as by the mothers. Social contact between calves initially consisted of brief parallel swims, almost always in the company of adults. Bouts of independent contact among calves were first observed between two and four months of age, and these gradually took on the form of recognizable play.

TIN II HALIDES AS CATALYSTS FOR THE METHYLATION OF OLEIC ACID.

Matthew Gilligan, Elana Tontarski, Eliot Sachsenmeier, and Richard Hartmann
Nazareth College

Although biodiesel is known to be an effective and environmentally sound replacement for petroleum diesel, it has remained a marginal fuel because of high production costs. The majority of this cost could be eliminated if high free fatty acid (FFA) waste oil were used as the starting material rather than virgin oils. Because these kinds of oils require acid catalyzed pretreatment, we have been investigating a variety of mild Lewis acids as replacements for the highly caustic and sulfur containing H_2SO_4 which is the standard catalyst employed. Using oleic acid as a model FFA we have found SnX_2 ($X = F, Cl, Br$, and I) to be an effective catalyst for this reaction and have also observed an interesting trend in reaction rates ($I > Br > Cl > F$). This poster will present our findings along with a discussion of their significance and the unique use of 1H NMR to determine the rates of these reactions.

NOTABLE TREE AGES IN NATURAL PLANT COMMUNITIES OF UPSTATE NEW YORK.

Bruce A. Gilman,
Department of Environmental Conservation and Horticulture, Finger Lakes Community College

Individual tree ages exceeding 150 years were found in seven natural plant communities of upstate New York including functioning old growth forests, sites with difficult accessibility and locations selectively protected by governmental agencies and private landowners. The oldest tree discovered in this field research was an eastern hemlock with a tree-ring count of 440 years. Hale's Woods, the Irondequoit Bay Bluffs, the Lake Ontario Shoreline and the Zoar Valley Wildlife Management Area all had individual trees of at least 200 years in age.

DESENSITIZATION OF MELANIN-CONCENTRATING HORMONE -MEDIATED ERK SIGNALING DESPITE POOR MCHR1 INTERNALIZATION.

Andrew Goodspeed, Jay I. Moden, Stacy Wicks and Laurie B. Cook.
The College at Brockport, SUNY, Dept. of Biology

Melanin-concentrating hormone (MCH) receptor 1 knockout mice have limited incidence of diet-induced obesity. This makes the MCH signaling pathway a potential pharmacological target to fight human obesity. MCHR1 is a G-protein coupled receptor (GPCR) that activates multiple signaling pathways, including ERK phosphorylation. Overstimulation of GPCR signaling is a hallmark of many diseases. Likewise, inadequate desensitization of MCH signaling could potentiate the obese phenotype. GPCR desensitization typically involves agonist-induced internalization of activated receptors, and subsequent degradation or receptor recycling. Our initial aim was to determine whether MCH signaling desensitizes. In order to measure this we maximally stimulated MCHR1-transfected BHK-570 cells with 100 nM MCH for 10 min, then following three washes in serum-free media and a 30 min recovery period, cells were stimulated again. Western blots of lysates for phosphorylated-ERK and total ERK were performed. ImageJ was used to normalize activation levels. MCH was unable to signal a second round of ERK signaling unless we waited 70 minutes, indicating that the MCH signaling pathway is desensitized during this period. We hypothesized that MCHR1 internalization was responsible, however when MCH was added to cells, no visible redistribution of MCHR1 was detectable using fluorescence microscopy. We tried a more sensitive assay, a cell-based ELISA, and only measured a 15% loss of surface MCHR1 after 30 min of MCH treatment. Live-cell experiments conducted with rhodamine-MCH and MCHR1-eYFP transfected cells support these conclusions. We tested the hypothesis that β -arrestins and/or GRKs were limiting factors in preventing agonist-mediated endocytosis of MCHR1. Only overexpression

of β-arrestins-1 and -2 showed significant gains. We conclude that MCHR1 can undergo receptor-mediated endocytosis, but the fraction of available receptors on the plasma membrane does not account for the extensive loss of ERK signaling observed. This suggests that MCHR1 mediated ERK signaling desensitizes while MCHR1 is at the plasma membrane, rather than via removal of the receptor from the cell surface. Future experiments are aimed at determining whether this ERK pathway desensitization is homologous or heterologous.

SCLERACTINIAN CORAL EXTINCTIONS IN PAST REEF CRISES IN THE PALEONTOLOGICAL RECORD.

Michael R. Grenier

Department of Geology, University at Buffalo

Although scientists have been aware for decades of the ever-increasing amounts of anthropogenic CO₂ released into the atmosphere and the likely effect of increasing global temperatures, it has only been found in the past few years that massive quantities of the CO₂ have been dissolved into the oceans, increasing their acidity. There are concerns that the marine biota may face severe effects from Ocean Acidification—including the possibility of destroying coral reefs and causing mass extinction of reef dwellers. High CO₂ and global warming is implicated in two mass extinctions and in four of the five greatest past reef crises. To understand what had occurred at these times, an analysis of extinction rate of scleractinian corals was performed using the entire complement of 808 genera in the Paleobiology Database. For each genera, the last recorded appearance is presumed to be approximately equivalent to extinction, with analysis in fifty 5-million year time-slices, beginning with their prominence in the mid-Triassic. Significant coral extinction events are demonstrated at the end-Triassic, earliest Jurassic, late Cretaceous, end Cretaceous, and during the Paleocene–Eocene Thermal Maximum. The first, second, and fifth of these are associated with strong evidence for high CO₂ levels and Ocean Acidification, supporting current concerns for the health of coral reefs.

CROCODYLIAN DENTAL MORPHOMETRICS: AN ANALYSIS OF SIZE AND SHAPE HETERODONTY WITHIN AND BETWEEN EXTANT SPECIES, AND ECOLOGICAL AND PHYLOGENETIC IMPLICATIONS.

Megan Harmon, Domenic D'Amore

Daemen College

Crocodylians are incredible predators that have roamed the earth for more than 200 million years. They have been studied extensively on many aspects including biomechanics of feeding, snout morphology, and tooth marks on bones after feeding. However, few studies have quantified tooth morphology, specifically size and shape heterodonty within an individual's tooth row or between species. Two important questions evaluated in this study are; 1) how does the morphology of crocodilian teeth compare between several extant crocodilian species, and 2) is the morphology of crocodilian tooth influenced by ecological and/or phylogenetic pressures? In this study, 14 species of extant crocodilian skulls were collected and each intact tooth was photographed. The photographed teeth were then quantified using semilandmark based geometric morphometrics to separately evaluate size and shape at each tooth position. The results were analyzed using linear regression analysis with a post-hoc homogeneity of slope test, coefficient of variation, and Akaike's information criterion (AIC), to size and shape variability between both species, and the tooth positions in a single individual. The results show that tooth shape changes in a significant linear fashion along the tooth row for all species. Certain species showed a significant difference in slope from certain others. Size heterodonty is non-linear, but variation differs in degree between species. AIC indicates that size and shape heterodonty are decoupled. The results suggest that phylogeny influences differences in tooth shape, with alligators and crocodiles grouping separately and *Gavialis* showing a significant difference from all others in both

slope and intercept. In ecology, long snouted crocodiles and *Gavialis* have been known to eat primarily fish due to their slender pointy teeth. Although this may be true, more research is necessary to formulate significant correlations between ecology and tooth morphology. This study reinforces that idea that *Tomistoma* is more closely related to crocodiles rather than to the *Gavialis* based on tooth morphology.

AGGREGATION DYNAMICS OF THE IONIC LIQUID [C₆mim][NTf₂] IN THE LOW-DIELECTRIC SOLVENT CHLOROFORM

Markus M. Hoffmann, Nathan T. Scharf

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The interest in ionic liquids (ILs), salts that are liquid below 100°C, has exponentially increased over the past decade. Unlike inorganic salts many ILs dissolve appreciably in organic solvents, an aspect that needs to be considered for applications where ILs are in contact with other solvents. We explored the structural and dynamic behavior of [C₆mim][NTf₂] in chloroform by experimental measurements of ¹H and ¹⁹F self-diffusion coefficients, viscosity, and excess molar volume in the concentration range of 0.001 to 1.0 mol·kg⁻¹ and temperatures ranging from 15 to 45°C. Combined the data indicates a progression from ion pairing to aggregate formation as concentration increases where at concentrations near 0.1 mol·kg⁻¹ aggregate formation becomes dominant. We also observe an apparent breakdown of the validity of the Stokes-Einstein equation at higher concentrations, which we explain by translational motion to become dominated by individual ion pairs moving rapidly between IL aggregates.

CHARACTERISTICS OF OBJECT PLAY IN A BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Ashley Holmes, Michael Noonan

Canisius College

Play is hypothesized to be an important way in which young animals develop essential skills. This study investigated an occurrence of object play in a single, captive beluga whale. Details of the ways in which the way the animal manipulated and contacted an enrichment, object are presented. The findings are interpreted with respect to the likely benefit derived by the animal in terms of psycho-motor development.

MOLECULAR DYNAMICS SIMULATION: EXPLORING ANTIMICROBIAL LIPOPEPTIDES AT THE ATOMIC LEVEL

Joshua Horn, Jesse Sengillo, Alan Grossfield

The advent of multiple drug resistant bacterial strains and the lack of novel antibiotic therapeutics to respond remains one of the pressing medical concerns of our time. Recent work has highlighted a class of synthetic compounds, known as antimicrobial lipopeptides, which show great promise as a scaffold for future drug design. One such compound, Palmitoyl-Lys-Gly-Gly-Dlys (C16-KGGK), has micromolar minimum inhibitory concentrations against a variety of bacterial and fungal species. Here we have used coarse-grained and all-atom molecular dynamics simulations in tandem to probe the biophysical mechanism of action behind this lipopeptide with varying detail and time-scales. Our results are validated and compared to experimental results and suggest a possible mechanism by which lipid bilayers are disrupted.

PHENOTYPIC CHARACTERIZATION OF *CHLAMYDOMONAS REINHARDTII* MOTILITY MUTANTS.

Sarah Hryzak, Mariana Reyes, and Noveera Ahmed

Biology Department, St. John Fisher College

Flagella and cilia are highly conserved structures that can either serve as a source of motility or play a role in the sensory system of an organism. Defects in the assembly of these organelles have been linked to human ciliopathies such as hydrocephalus and situs inversus. To better understand these ciliopathies, this study used the model organism *Chlamydomonas*, a biflagellate protist, to identify novel genes required for proper flagellar formation. Mutant strains showing defects in flagellar movement were made and the disrupted genes are being identified. In particular, a PCR-based screen was conducted to identify mutants with disruptions in FAP198 or FBB9. These genes encode for hypothetical flagellar proteins that share 50-60% identity with mammalian proteins. Seven mutant strains have been phenotypically analyzed for swimming speed, phototaxis and photoshock response. Western blot analysis and observation of axonemes by TEM are currently underway.

SOIL MICROBIAL COMMUNITY STRUCTURE AND FUNCTION VARIES ALONG AN OLD FIELD SUCCESSION GRADIENT.

Torri Ivancic, Daniel Potts

Buffalo State College

Widespread and accelerating anthropogenic climate change and shifting patterns of land-use demand an improved understanding of terrestrial carbon cycling. As a major contributor to ecosystem CO₂ exchange, the potentially dynamic factors that control soil microbial respiration warrant close scrutiny. I examined how plants, via root exudates, mediate the soil microbial community structure and function along an old field succession gradient. I quantified soil microbial respiration (SMR) responses to the addition of simulated root exudates in soils collected from adjacent grass, shrub and forest patches using a series of laboratory incubation experiments. Additionally, I used substrate-induced selective inhibition to compare the contribution of bacteria and fungi to SMR. The positive effect of root exudates on SMR was least in grass soils and greatest in forest soils. Whereas the bacterial contribution to SMR was consistent across patches, the fungal contribution to SMR increased along the old field succession gradient. These results suggest that plant communities mediate soil microbial structure and function by influencing the quantity and quality of soil carbon inputs. By improving understanding of the linkages between plant communities and soil microbial activity, these results inform the carbon cycling consequences of changing land-use patterns associated with agricultural abandonment.

MILLIMETER-SCALE ELEMENTAL VARIABILITY IN TUFA FROM THE MONO BASIN, CALIFORNIA.

Victoria Jaskula, Paul Tomascak, Sidney Hemming

Department of Earth Sciences, SUNY Oswego

Lamont-Doherty Earth Observatory of Columbia University

Micro-scale sampling of a laminated tufa mass from the Mono Basin, eastern California, was carried out in order to better understand changes in lake composition in the past, specifically over short time scales. Calcium carbonate tufa deposits were formed extensively during the last glacial cycle, mostly during deglaciation (Benson et al., 1990, PPP). Concentrations of the lanthanide rare earth elements (REE) correlate with alkalinity in modern saline lakes (e.g., Johannesson et al., 1994, GRL, 21, 773-776); the same is evident for U/Th (Anderson et al., 1982, Science, 216, 514-516). Previous results from our group on bulk tufa samples showed promise for the application of this approach to evaluating paleo-alkalinity. Measurements were made on samples extracted from individual millimeter-scale laminae,

characterized by texture, color, and appearance in phosphor imaging. Sample solutions were analyzed with the SUNY Oswego Bruker 820MS quadrupole ICP-MS, with an estimated uncertainty of $\pm 5\%$.

The tufa sub-samples are separated into two broad textural groups. The spongy tufa sub-samples have total lanthanide REE concentrations ranging from 3.6 to 49 ppm; this sum ranges from 98.7 to 290 ppm in dense tufa sub-samples. All of the sub-samples have moderately LREE-depleted shale-normalized REE patterns with negative Eu anomalies. The spongy sub-samples have small positive Ce anomalies whereas sub-samples from the dense tufa laminae have small negative Ce anomalies. Concentrations of U and Th range from 5.2 to 18.7 ppm and from 0.4 to 5.9 ppm, respectively, in the spongy tufa ($U/Th = 0.9$ to 32.3) and from 1.8 to 7.1 ppm and from 7.5 to 40.8 ppm, respectively, in the dense tufa ($U/Th = 0.1$ to 0.6).

Tufa sub-samples with lower total REE have higher U/Th , consistent with control of trace element incorporation into original carbonate minerals from water with secularly variable alkalinity. The total variability in U/Th over a distance of < 10 cm in this sample was striking. The range is equivalent to the variability seen in bulk tufa samples from mounds that differ in elevation by > 100 m (Wilcox et al., 2009) and which clearly formed over a period of more than 30,000 yr. The homogeneity of concentrations and ratios in the dense tufa suggests this material crystallized under steady lake conditions (level, chemistry). The variability in the spongy-textured tufa could represent changing water chemistry over time but also could reflect early post-formation recrystallization and remobilization of these elements.

DETERMINING THE ROLE OF TUBULIN IN OPTIMIZING CILIA MORPHOLOGY & CHEMOSENSORY BEHAVIOR

Nazish Jeffery, Daryl D. Hurd

Biology Department, St. John Fisher College

Microtubules are involved in many different roles in cells including cytoplasmic organization, chromosome separation during mitosis, and support for cytoplasmic extension such as cilia/flagella. The model organism *C. elegans* has nine alpha-tubulins and six beta-tubulins which have been studied in numerous contexts.

One particular alpha-tubulin, *tba-5*, has been shown to be expressed in ciliated sensory neurons. A deletion mutant does not cause gross abnormalities, but knowing that this tubulin is expressed in cilia gives way to the question of how exactly tubulins are utilized in creating proper morphology of cilia.

In *C. elegans*, correct morphology of cilia is required in order for proper chemosensory behavior of the organism. Cilia are supported by a microtubule-based axoneme which are comprised of alpha and beta tubulin heterodimers. Genetic deletion of other ciliary tubulins can cause morphological or functional changes in cilia.

Nephronophthisis (NPHP) is a common renal condition caused by the loss or alteration of nephrocystins, proteins which function to build and maintain cilia. *C. elegans* provides a model to study the structure and function of sensory cilia as the worm genome contains homologues of most proteins that are used to build and maintain cilia. This lets us ask how nephrocystins and tubulins interact with one another in an organism.

DO FORAGING DESMognathus ochrophaeus EXHIBIT THREAT-SPECIFIC BEHAVIORAL RESPONSES TO CHEMICAL STIMULI ASSOCIATED WITH PREDATION?

Elyse C. Johnson, Aaron M. Sullivan

Department of Biology, Houghton College

Prey species must balance the benefits of antipredator behavior with the reduction of other behaviors associated with fitness (e.g., foraging). Prey may accomplish this by adjusting the intensity of their

responses to the level of threat associated with different stimuli related to predation. In this study, we conducted two experiments to evaluate threat-sensitive responses by the Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) mediated through chemical stimuli. Plethodontid salamanders are well suited to studies of chemically-mediated interactions because they utilize a number of chemosensory structures and behaviors (e.g., nasolabial grooves, nose-tapping) to detect stimuli associated with reproduction, foraging, and predation. In Experiment 1, we evaluated the varying intensity of behavioral responses of *D. ochrophaeus* to chemical stimuli from distressed and damaged conspecifics as well as predatory *Gyrinophilus porphyriticus*. In Experiment 2, we attempted to characterize the nature of the tradeoffs related to antipredator decision-making by exposing salamanders to these chemical stimuli while foraging on *Drosophila melanogaster*. We assessed the behavior of test salamanders by recording nose-taps (chemosensory behavior), movement (forward steps with forelimbs), and edge behavior (amount of time in contact with the wall of the experimental dish). In Experiment 1, salamanders significantly increased their nose-taps, movement, and edge behavior when exposed to cues from damaged conspecifics, but significantly reduced movement when exposed to the cues from predatory *G. porphyriticus*. In Experiment 2, salamanders exhibited a similar pattern of response and significantly increased nose-taps when exposed to the damaged conspecifics and significantly decreased movement when exposed to the predator stimulus. In addition, foraging efficiency (estimated by the number of prey captured per strike) tended to decrease in the damaged conspecific and predator treatments. Our data suggest that *D. ochrophaeus* 1) detect and differentially respond to chemical stimuli from conspecifics and predators, 2) balance the costs and benefits of antipredator decision-making by engaging in threat-specific responses, and 3) may incur a cost with regards to foraging when responding to chemical stimuli associated with predation.

ARRHENIUS CALCULATIONS FOR THERMAL DESORPTION OF WATER FROM POLY(METHYL METHACRYLATE) FILM.

Thorin Kane¹, Ross Netusil², Anastasia Yorke¹, Carolina C. Ilie¹

1. Physics Department, SUNY Oswego

2. Chemistry Department, SUNY Oswego

We present herein the water desorption from the dipole oriented poly (methyl methacrylate) PMMA. Water desorption from PMMA presents the “ice species” at 150 K and a bulk peak at about 280 K. We note that the desorption peak temperature does not vary greatly with increasing coverage. The energy of desorption is obtained by employing the Arrhenius and Polany-Wigner equations.

TERMINATION SEQUENCE IS MORE SUSCEPTIBLE TO CROWDING AGENTS IN THE AMP REGION VERSUS MID GENE, INITIATION SEQUENCE AND ORI-P

Lauren Kapus, Robert Greene

Crowding effects on DNA can duplicate the *in vivo* intracellular environment to a greater degree than dilute *in vitro* methods. In this study supercoiled pUC19 plasmid DNA is exposed to different macromolecular crowding *in vitro* environments and then cut with a restriction enzyme specific to functional structural regions in the origin of replication, the AMP gene and non-coding DNA regions. Samples of the restrictions were taken at different time intervals to determine the kinetics of restriction and the effects on the functional plasmid regions when in contact with crowding agents. The samples of DNA fragments and crowding agents were heat inactivated and analyzed using agarose gel electrophoresis to determine the concentrations of the super coil, linear and open circular components of the DNA. The average density of the bands that appeared on the agarose gel were analyzed by

densitometry to determine if the crowding agents had any effect on inhibiting or promoting the DNA restriction into the three components. Three location and specific restriction site on the Amp region of the plasmid were focused on to determined if a change in restriction kinetics occurred in the presence or absence of crowding agents. Results indicate multiple effects on restriction kinetics in the different regions of the plasmid DNA that may be reflective of their functional nature.

PRION CONTAINING YEAST CELLS CAN BE VISUALIZED INVADING AGAR USING THREE INVASION ASSAYS

Haeja A. Kessler, Yin Peng Lee, Prashanti Patil, Dylan S. Weil, Zachary Nizolek, Sean Aronow, Thomas Di Benedetto, and Irene M. Evans

Yeast prions are cells that contain infectious protein particles that are capable of self-propagating. These proteins are also epigenetic elements of inheritance. Due to these properties of prions, it is believed that prions may allow for increased diversity in a yeast population, and that these prions may sometimes be beneficial to the host. These prions may allow the host cell to survive in an unstable or stressful environment. When the yeast cells are grown under stressful conditions, they may switch from budding into pseudohyphal filamentous growth which allows them to migrate to find new food sources. To visualize this pseudohyphal filamentous growth and the invasion of yeast cells into agar, we have developed three methods that allow us to determine whether yeast cells are invading the agar or not. Two of the assays are novel invasion assays. The first assay is the agar wash off assay, and the two novel assays are the test tube invasion assay and the confocal microscope invasion assay. The confocal microscope invasion assay and the agar wash off assay are qualitative while the test tube invasion assay is a quantitative assay. Using the test tube invasion assay, the distance migrated can be determined. Many haploid yeast strains cannot carry out agar invasion because they contain a mutation in one of the flocculation or “agar invasion” genes. It is believed this mutation was selected for when the original yeast strains were developed to avoid cells that flocculated and dropped out of solution. Using these three invasion assays, we have seen [PSI⁺], a Sup35 prion containing cell, invade the agar. The invasion occurred after the cells were grown in a nitrogen limiting medium. The [PSI⁺] prion-containing strains are able to read through stop codons and this ability of [PSI⁺] may explain our results. The ability of [PSI⁺] to invade agar may allow it to survive in stressful conditions and is evidence that prion formation may sometimes result in the acquisition of traits that can be advantageous to the organism.

DISRUPTION OF CAVEOLAE LIPID RAFTS AND THE EFFECTS ON MELANIN-CONCENTRATING HORMONE RECEPTOR-1 LOCALIZATION: A PHARMACOLOGICAL STUDY.

Colin King, Laurie B. Cook

Melanin-concentrating hormone (MCH) is integral to the regulation of human appetite. MCH targets G protein-coupled receptors in the brain and peripheral tissues. When MCH receptor 1 binds MCH on the surface of cells, it activates multiple signaling pathways, then desensitizes. Internalization of MCH-bound MCHR1 is only thought to be partially responsible for the loss of MCH signaling capacity of cells. We have previously shown that MCH receptors are enriched in caveolae and specifically complex with caveolin-1. Caveolin-1 is a key structural component of caveolae, which are cholesterol-based lipid rafts that are known for concentrating signaling molecules and clathrin-independent endocytosis. We are interested in investigating the role of MCH localization to caveolae on MCH signaling. We hypothesize that MCH signaling would be disrupted if MCH receptors weren't enriched in these regions and our first approach is pharmacological; we are disrupting caveolae with nystatin, a cholesterol inhibitor. We have previously utilized a sodium-carbonate based extraction procedure followed by flotation on sucrose

density centrifugation to isolate caveolae from other cell contents. To confirm whether nystatin does indeed deplete caveolae in BHK-570 cells we performed our caveolae isolation procedure on cells pre-treated with or without nystatin. Caveolin-1 can usually be detected by Western Blot in Fractions 4 and 5 of our gradients. We observed a gradient shift of caveolin-1 to Fractions 7-10 in nystatin-treated cells confirming that we at least partially disrupted caveolae. Future experiments will test whether other pharmacological inhibitors such as filipin and methyl- β -cyclodextrin as well as caveolin-1 RNAi are better able to deplete caveolae from cells as well as their impact on MCH signaling.

A NEEDS ASSESSMENT OF NEW YORK STATE FOOD AND AGRICULTURAL EMPLOYERS

Robert N. King

Monroe Community College

This quantitative study explores and identifies the baseline knowledge and skills required of incumbent, underemployed, and displaced workers seeking a career pathway within the New York State food and agricultural sector. Forty seven (20.8%) businesses within the Finger Lakes region responded to a voluntary online survey with a large majority of respondents indicating experience in operations management and/or human resources. Results suggest existing and new curriculum and the need for a 24 credit certificate program when providing a career pathway with local employers. Regardless of the number of employees or nature of business, employers were similar when indicating and suggesting employee and organizational needs. A large majority of respondents indicated the need for a blend of hard and soft skills including technical knowledge of food and agriculture, food safety and sanitation, quality assurance, writing, management, problem solving skills, and applied computer skills. A large majority of employers indicated using online/internet and one-on-one methods, but lacked sufficient funds for education and training.

CHARACTERIZATION OF DOMAIN-SWAPPING PROTEINS FOR DESIGN OF SELF ASSEMBLING-HYDROGELS

Molly Kingsley, Josh Karchin, Nancy Walker-Kopp and Stewart N. Loh

Increased interest in hydrogels has resulted from their many biomedical applications, such as tissue engineering (1). In the past, agarose and PEG were used to make hydrogels; however, interest in using proteins instead has recently grown. We have successfully engineered a unique domain swapping modules (DSM) from ribose binding protein (RBP) and ubiquitin (Ub). A DSM will form large oligomers by our forced unfolding mechanism (2). DSMs with high oligomerization can be engineered into a cassette with an N-and C-terminal DSMs, which has four binding sites. At high concentrations, the cassette can form cross-linked polymers, which can form a hydrogel. In the tested DSMs, both RBP and Ub were used as the lever and assembler domain. The lever unfolds the assembler and the assembler domain swaps with a neighboring assembler. Previous DSMs have suffered from low solubility. Here we characterize five new DSMs with greatly increased solubility.

EFFECT OF HERBIVORY ON THE GROWTH AND COMPETITIVE ABILITY OF AN INVASIVE GRASS.

Lisa Kratzer, A. Christy Tyler

Rochester Institute of Technology: Thomas H. Gosnell School of Life Sciences, Program in Environmental Science

Phalaris arundinacea, reed canary grass, is a prevalent wetland invader whose presence alters native plant diversity. *P. arundinacea* spreads through rhizomes and seed dispersal into monotypic stands which can clog waterways and alter hydrologic regimes. Field observations and previous work suggest

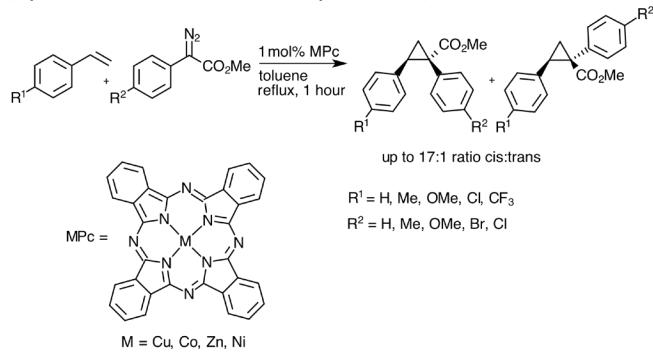
that muskrats, geese and wetland snails consume *P. arundinacea*. However, we have little understanding of the ecological impact of grazers on the growth of competitive ability of this species. Understanding the impact of herbivory on *P. arundinacea* by common herbivores will lead to a better understanding of wetland resistance to *P. arundinacea* invasion. To address the question of the effect of grazing by herbivores on *P. arundinacea*, enclosure/exclosure cages were constructed in June 2012 in the mitigation and natural wetlands at High Acres Nature Area in Fairport, NY and on the Rochester Institute of Technology campus. Half of the plots contain only *P. arundinacea* and half were placed at the boundary between *P. arundinacea* and *Typha latifolia*, another invasive plant. In caged treatments, that exclude larger grazers such as geese and muskrats, snails were either included or removed. Control plots without cages assessed the effect of larger grazers. We predict that herbivory will negatively impact the growth of *P. arundinacea*, and in mixed plots will allow *T. latifolia* to spread into the *P. arundinacea* zone. We also predict that herbivory by snails and other small grazers will have less of an impact on *P. arundinacea* growth compared to large grazers such as geese and muskrats. Preliminary results will be presented.

METALLOPHTHALOCYANINE CATALYZED CYCLOPROPANATION.

Robert W. Kubiak II, Dominic L. Ventura*

Math and Natural Sciences Department, D'Youville College

Metallophthalocyanine catalyzed cyclopropanation reactions have had little attention to date. The yields and diastereoselectivity of these reactions are influenced by the nature of the styrene as well as the aryldiazoacetate and catalyst. The products have been synthesized in good yields (up to 74%) with high diastereoselectivity (up to 17:1 ratio cis: trans products).

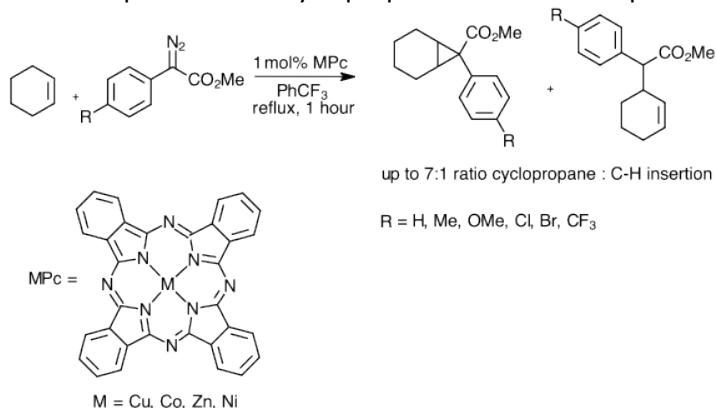


METALLOPHTHALOCYANINE CATALYZED REACTIONS: C-H INSERTION VERSUS CYCLOPROPANATION.

Robert W. Kubiak II, Brandon M. Belz, Dominic L. Ventura*

Math and Natural Sciences Department, D'Youville College

Metallophthalocyanines have recently been found to catalyze cyclopropanation reactions from donor-acceptor carbenoids. Here we investigate substrates which contain the possibility for cyclopropane as well as C-H insertion products. We began to study the effects of a variety of substrates as well as catalyst and the diazo compound. Initial results (example shown below) have shown that both products are formed, but much in favor of the cyclopropane compound. The products herein have been synthesized in good yields and up to 7:1 ratio cyclopropane : C-H insertion products.



HYDROPONIC REMOVAL OF BISPHENOL A BY PHYTOREMEDIATION WITH *PHASEOLUS VULGARIS* AND *TRIFOLIUM PRATENSE*.

Ariel Kubissa

Endocrine disruptors are substances that interfere with the metabolic processes of plants and animals, such as reproduction by acting as a hormone. Bisphenol A (BPA) is a toxin involved in the production of epoxy resins, polycarbonates, and plastics. Manufactured goods, such as disks, packaging, baby bottles, and electronics often contain BPA. Disposal of these products and others are a cause for BPA contamination in natural aquatic areas and waste landfill sites. Phytoremediation is an innovative technology that removes pollutants by taking advantage of natural plant processes. Chemicals found in water and soil can be stored in the plant or metabolized into less harmful chemicals by the plant. The purpose of this study was to use two local plants and assess their effectiveness in removing BPA from a hydroponic solution through High Performance Liquid Chromatography (HPLC) analysis. Plants in the study included *Phaseolus vulgaris* (common bean) and *Trifolium pratense* (red clover). Data are forthcoming.

LONG-TERM TRENDS AND TROPHIC STATUS OF CONESUS LAKE 2012.

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¹Department of Environmental Science and Biology, The College at Brockport - State University of New York

Conesus Lake water chemistry has been monitored since 1985 due to its status as a eutrophic lake. In 2000, the New York Department of Environmental Conservation (DEC) identified the lake as impaired for boating and bathing purposes, stressed relative to fishing and aesthetics, and threatened as a water supply. The Livingston County Planning Department reported the following problems as being critical to the degraded health of Conesus Lake: 1) weed growth and invasive species, 2) increased algae from

phosphorus loading, 3) pathogens from animal waste, 4) pesticides from residential and agricultural sources, 5) increasing salts from deicing chemicals on impervious surfaces, and 6) erosion from various land-use practices and developments. Since then, monitoring and management plans for land use have been recommended and/or updated. Water sampling and physical measurements were taken at approximately the deepest point in the southern basin of Conesus Lake from 22 May to 14 August 2012. Samples were analyzed for TP, TN, SRP, NO₃, sodium, Chl-a, and dissolved oxygen. Several of these parameters suggest that Conesus Lake water quality and trophic status may be improving. Total phosphorus is now below the 20 µg P/L guideline of the NYSDEC, Chl a levels have decreased to a less productive state, and the trophic status index has changed from eutrophic to mesotrophic. An increase in sodium can be attributed to the accumulation of deicing salt in the lake. The effects of this increase are not well understood.

FUNCTIONALITY IN TOOL USE IN WESTERN LOWLAND GORILLAS

Matthew LeFauve

Canisius College, Department of Animal Behavior, Ecology, and Conservation

Nonhuman primates are known to use objects as tools. Gorillas however seem to be the least proficient tool users. We have previously observed the western lowland gorillas (*Gorilla gorilla gorilla*) at the Buffalo Zoo using buckets, given for enrichment, to collect water (Margulis et. al., 2011). To further explore the cognitive ability of these gorillas, we designed a study that tested whether the gorillas could distinguish between a functional and a non-functional tool. The gorillas (1 adult male and 2 adult females) were given four buckets, two of which had holes drilled in the bottom (the “non-functional” tool). We collected 85 hours of videotaped data to test the null hypothesis that the gorillas could not distinguish between the functional and the non-functional buckets. We documented that there were individual differences in bucket usage depending on the functionality of the bucket, with one gorilla using the functional buckets significantly more often than the non-functional buckets. This study sheds light on the cognitive ability of gorillas and reveals opportunities for further investigation.

WHY MILKY WAY SPIRALS?

Ingo H Leubner, PhD

Rochester Institute for Fundamental Research

Observations:

Observation of galaxies with spirals, like the Milky-Way and NGC4321, reveal the following:

1. Cores of galaxies are an association of stars circulating the gravitational center of the core in the form of Ellipses
2. The roots of the spirals originate are at opposite ends of the Ellipse and extend into the same direction
3. Ends of spirals are diagonal from each other with the core at the center of the diagonal
4. Spirals are equidistant from the core

Fundamentals:

The formation of the spirals and their origin from the core are based on two fundamental and indisputable facts:

1. Mass to Energy conversion caused Mass/Gravity-loss of galaxy-cores since galaxy formation.
2. When the eccentricity of the outermost orbits exceeds the limiting value of 1.0, the elliptic orbits open into two hyperbolas.

Conclusions:

(1) The major Spirals originated at the same time from the Core; (2) Formation and Expansion are

caused by radiative Mass and Gravity Loss of the galactic cores; (3) The gravity of the core forces the released stars into elliptic Orbits. Further mass-loss by the Core will cause these Orbita to expand; (4) Expansion of the Core increases the orbit eccentricity, as determined experimentally for the Solar system;(5) When the eccentricity of outermost orbits exceeds the limiting value of 1.0, the orbits open to two hyperbolas. The stars of the outer orbit follow two of the hyperbola paths to leave the Core;(6) Only the two diagonal paths of the hyperbola which follow the orbital direction of the core-stars are available for the stars to leave the core;(7) for a given rotational direction, the two hyperbolas will lead to release of stars at opposite ends of the Core, but with the same spacial direction;(8) The first stars to leave the core will be furthest from the core, others following in the time-order of their release from the core;(9) According to Kepler's Law, stars further from the core have longer rotational periods than later formed, and thus closer, parts of the Spirals;(10) The observations and the model predict that the stars of the cores of the MW and NGC4321 rotate in anti-clock direction as seen from the Earth.

ISOLATION OF STAPHYLOCOCCUS BACTERIOPHAGE FROM HUMANS.

James P. Lioi, Mark A. Gallo Ph.D.

Biology Department, Niagara University

Staphylococcus is a normal inhabitant of humans. Certain strains of *Staphylococcus* exhibit pathogenic characteristics with Methicillin-resistant *Staphylococcus aureus* being the most prevalent. Numerous strategies, including antibiotics, are failing due to the increased resistance of many *Staphylococcus* strains. New methods are constantly being explored in order to combat this ever-growing problem; one involves the use of bacteriophage to kill the target bacteria. The current investigation involves the isolation of bacteriophage from student facial skin and the ability of the bacteriophage to kill the *Staphylococcus*.

CALL TYPES IN KILLER WHALES (*ORCINUS ORCA*)

Lindsey Machnica, Michael Noonan

Canisius College

Killer whales live in complex social groups, and rely upon communication through vocalizations. This study aims to determine the types of vocal calls used by orcas, the frequency with which each type occurs, and whether or not specific calls are common between populations in this species. Vocalizations of two killer whales at Marineland of Canada were compared over a span of ten years. The results suggest that a unique repertoire of calls have developed in the Marineland population, and this indicates that a process of vocal learning occurs in this highly social species of cetacean.

WESTERN LOWLAND GORILLA BEHAVIOR DEVELOPMENT FROM 0 – 12 MONTHS OF AGE

Macy Madden, Lindsey Perkes-Smith

Canisius College

Few gorillas are born in zoos each year; therefore it is important to look at each one's behavior in order to determine what is normal. Having a baseline of normal behavior allows abnormal patterns of behavior and development to be detected. We studied the behavioral development of an infant gorilla at the Buffalo Zoo for the first 12 months of her life. Sixty-two observations were collected throughout the year using focal animal sampling and an established ethogram from October 2010 to October 2011. We analyzed her changes in activity budget and independence from her mother throughout those 12 months. As expected, we found that the infant increased independent behaviors such as foraging, terrestrial locomotion, and object play while exhibiting a decreased time in contact with her

mother. The infant's behavior appears to follow normal patterns. These results contribute to the growing basis of normal patterns of behavioral development in zoo-born gorillas.

ANALYSIS OF STAPHYLOCOCCI ISOLATED FROM WHITE TAIL DEER.

Alexandra Mancuso, Lynnea Felton, Mary Gallo, Mark A. Gallo

Biology Department, Niagara University, NY 14109

Staphylococcus is a gram-positive bacterium that appears under the microscope in grape like cocci in clusters. *Staphylococcus* is found in many environments including being a normal inhabitant of many warm-blooded mammals. One particular species, *S. aureus*, is a pathogenic bacterium member of this genus. Certain strains of this species are resistant to numerous antibiotics, these strains have become a major problem in the clinical setting. One hundred twenty three putative Staphylococcal isolates were obtained from the nasal passages of white tail deer, *Odocoileus Virginianus*. Metabolic and antibiotic resistance profiles were determined for the strains. An analysis of 16S ribosomal RNA was also performed on the isolates and phylogenetic analysis was completed.

PIEZO, A NEW MECHANICALLY GATED ION CHANNEL, IS EXPRESSED IN THE ZEBRAFISH GASTROINTESTINAL TRACT

Kelly Marchionda, Alexander Viavattine, and Adam Rich

The College at Brockport

Introduction: Piezo is a newly discovered ion channel that changes gating properties in response changes in plasma membrane tension. Therefore it is involved in mechanotransduction. Piezo ion channels have been shown to be essential components that regulate sensation of painful touch stimuli and cell division. The gastrointestinal tract regulates absorption of nutrients and elimination of waste, and control of gastrointestinal motility patterns involves responding to luminal contents. Therefore it is possible that Piezo is involved in mechanotransduction in the gastrointestinal tract.

Objective: Design and perform experiments to learn if Piezo is expressed in the zebrafish gastrointestinal tract.

Methods: Total RNA was isolated from the gastrointestinal tract of adult zebrafish and 7 dpf larvae, and also from whole embryos at 6 hours post fertilization. Complimentary DNA was synthesized, and reverse transcriptase polymerase chain reaction was performed using primers specifically designed for Piezo.

Results: Expression of Piezo was observed in adult zebrafish GI tissues, and at 7 dpf, but not at 6 hours post fertilization.

Summary: Expression of Piezo was confirmed in zebrafish GI tissues. Piezo expression was not identified in embryonic zebrafish. The results are consistent with a role for Piezo in sensory transduction in the GI tract. Future experiments are planned to pharmacologically inhibit Piezo currents in the zebrafish to characterize the physiological role of this new mechanosensory ion channel.

REGULATION OF IFN mRNA EXPRESSION IN VSV-INFECTED L929 CELLS

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Gosnell School of Life Sciences, Rochester Institute of Technology

We are investigating how Vesicular Stomatitis Virus (VSV) evades the interferon- β (IFN) response, a key cellular antiviral pathway. If produced in an infected cell, the IFN protein activates a signal transduction cascade that creates an antiviral state in neighboring cells. Wild type (wt) VSV suppresses the IFN response, allowing a successful infection to occur. In comparison, mutant T1026R1 (R1), which contains

mutations in the M, G, and L genes, is unable to suppress the IFN response. Using quantitative Real-time PCR analysis, we found little to no IFN mRNA produced in wt-infected cells, however high levels of IFN mRNA was produced in R1-infected cells. Moderate levels of IFN mRNA was produced in cells infected with the M-defective recombinant strain r1026M, which contains a single mutation in the M protein. These findings suggest that the M protein alone may not be sufficient to regulate IFN mRNA expression. To further investigate the components involved in regulation of IFN mRNA production, cells were coinfecte with R1 and r1026M. Compared to R1-infected cells, IFN mRNA production was significantly reduced in coinfecte cells, further suggesting that a second viral component is involved. To determine if the M protein alone is able to suppress IFN mRNA production, transfection experiments were carried out. Cells were transfected with an wt M or R1 M expression plasmid via a lipid-based transfection method or an electroporation-based transfection method. Following transfection, IFN was activated by R1 infection and total RNA was isolated. Preliminary results indicate that the M protein alone is not able to suppress IFN mRNA expression in nucleofector-transfected cells, however it does limit IFN mRNA production in lipofetAMINE transfected cells. Further work is necessary; however our results may indicate that the VSV M protein alone is not sufficient to regulate the IFN pathway.

PERIODICITY IN THE CALL PRODUCTION OF CAPTIVE KILLER WHALES (*ORCINUS ORCA*)

Susan May, Michael Noonan

Canisius College

The pattern of vocalizations that are produced by killer whales are very likely reflective of the social behavior shown by this species. The present study was designed to assess whether there is a systematic periodicity to killer whale call production. This question was tested using six hours of previously recorded epochs over a ten-year period, utilizing the program Spectrogram™. Evidence of short-term periodicity—alternations of high and low call production over the course of hours—is discussed with respect to the role(s) that such cycles may play in killer whale society.

A LEFT-PREDOMINANT TURNING BIAS IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Lauren Mazikowski, Michael Noonan

Canisius College

Until recently, population-wide lateral biases (like right-handedness) were thought to be an exclusively human trait. This supposition can be explored by testing the presence of a left-right behavioral asymmetry in the beluga whale. Twice a week, for three weeks, the turning behavior of ten captive beluga whales was tallied. In all ten animals, left turning was far more predominate than right turning. Lateral behavioral asymmetry of this type is highly suggestive of an underlying cerebral asymmetry akin to that in humans.

PREVIOUSLY IDENTIFIED *GLDE* IS NOT INVOLVED IN *FLAVOBACTERIUM JOHNSONIAE* GLIDING MOTILITY.

Reed McElfresh, Ryan Rhodes

Department of Biology, St Bonaventure University

Cells of *Flavobacterium johnsoniae* move rapidly over solid surfaces by a process known as gliding motility. The molecular mechanisms underlying this type of movement remain undefined; however, a number of genes involved in the process have been identified. Previous research demonstrated that *glfD* is necessary for gliding motility and suggested that *glfE*, which encodes a cytoplasmic membrane protein and lies immediately upstream of *glfD* is also involved. However, we provide genetic evidence

demonstrating that *glcE* is not necessary for gliding motility. A recently developed allelic exchange system was used to delete *glcE* and its paralogs *fjoh_0419* and *fjoh_1414*. Deletion of these genes individually or in combination resulted in spreading colonies on an agar surface and motile cells on glass in wet mount. Additionally, these mutants digested chitin and were susceptible to bacteriophages that infected wild-type cells. Together these results demonstrate that *glcE* and its paralogs are not necessary for gliding motility.

THE ROLE OF DNM1 IN MITOCHONDRIAL GENOME STABILITY IN BUDDING YEAST.

Julie McGrath, Rachel Folts, and Rey A. Sia.

Department of Biology, The College at Brockport – State University of New York

Mitochondria are essential organelles in eukaryotes. Known as the “power house” of the cell, mitochondria manufacture ATP which is required for the successful completion of many cellular processes. Mitochondria have individual genomes, separate from the nuclear DNA, which encode for proteins required for the production of ATP. In humans, mutations in the mitochondrial DNA (mtDNA) resulting in the loss of mitochondrial function lead to neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene DNM1 in maintaining mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. Dnm1p is a dynamin-related GTPase protein localized to the outer membrane of mitochondria. Mitochondria undergo a constant state of fusion and fission within the cell which allows for mitochondrial segregation during cellular division. Dnm1p is a key regulator of mitochondrial fission. Loss of Dnm1p leads to the formation of large lattice-like structures of mitochondria. The lab is interested in determining whether loss of the dnm1 gene plays a role in mitochondrial genome stability. We observed in dnm1 Δ mutants a 3-fold increase in spontaneous respiration loss which may be a result of altered mtDNA stability.

THE ISOLATION AND IDENTIFICATION OF A CAUSATIVE AGENT TO THE FEATHERLOSS DISORDER FOUND IN AFRICAN PENGUINS (*SPHENISCUS DEMERSUS*).

Stephen Mele, Kristin Picardo, Gregory Cunningham, Daryl Hurd

Beginning in 2006, wild juvenile African Penguins (*Spheniscus demersus*) began to prematurely lose their juvenile feathers without immediate regrowth and were brought to the South African Foundation for the Conservation of Coastal Birds (SANCCOB) for rehabilitation⁵. Without immediate regrowth of feathers, energy is shunted away from growth and used for thermoregulation and metabolism. It has previously been hypothesized that potential viral and bacterial infections may be causing this disorder^{3,4}. To test for this, Avian Polyomavirus (APV) nucleic acids, Budrigars Beak and Feather Disease Virus (BFDV) nucleic acids, and any bacterial nucleic acids were attempted to be isolated from the blood of affected penguins. Blood was drawn from affected and non-affected African Penguins at SANCCOB and stored in 70% ethanol. These samples were collected in 2008 and 2010. The samples were shipped to St. John Fisher College in Rochester, NY during the winter of 2011. Nucleic acids were then extracted from the blood using a QIAamp Blood DNA Mini. After confirmation of DNA via gel electrophoresis, PCR was performed using 2X OneTaq Megamix, water, and primers specific to the targeted viral and bacterial DNA. Gel electrophoresis was run on the PCR products. If DNA was observed at an expected range, then the PCR product was purified using a QIAquick PCR Purification Kit using the protocol included. The purified samples were sent to ATCG, Inc. for sequencing. The results were analyzed using NCBI BLAST. To date, six sequencing samples have shown the prevalence of APV, BFDV, and/or bacteria in the blood of affected penguins.

A COMPARITIVE STUDY OF ENVIRONMENTAL CONDITIONS FOUND AT A NEAR SHORE AND OFFSHORE REEF USING THE REEF CHECK PROTOCOL, ST. KITTS AND NEVIS, W.I., SUMMER 2012.

Melissa Miller, James Hewlett
Finger Lakes Community College

Environmental conditions found on reefs can be an indication of overall ecosystem health. This is important not only to the organisms making up and living on the reef but to the people of St. Kitts and Nevis that heavily depend on them as a main source of nourishment and revenue. By comparing data collected from two reef sites using the Reef Check protocol, we were able to observe some of the impacts activities such as shoreline development and ecotourism may have had on species richness and diversity, hard coral cover, recruitment of new corals, and economically important fish species. We found that the near shore site experienced higher siltation, less recruitment of new corals, and less species diversity than the offshore site. We conclude that while both sites have been negatively impacted, the offshore site was not as affected by shoreline development due to its distance from the shoreline.

ARTIFICIAL MICRORNA KNOCKDOWN OF HAP1 DISTURBS POLLEN FORMATION AND SPERM DEVELOPMENT IN ARABIDOPSIS THALIANA.

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Mago serves as a critical component of the eukaryotic exon-exon junction complex (EJC), a multiprotein unit involved in gene regulation on the post-transcriptional, pre-translational level. Although Mago has been implicated in the processes of mRNA nuclear export, nonsense-mediated decay, and cytoplasmic localization in animal cells, its functional significance as a core protein of the plant EJC is less understood. *HAP1* gene is the *Mago* ortholog in Arabidopsis. In order to study how *Mago* affects plant development, we knocked down *HAP1* expression in *qrt* mutants using artificial microRNAs (amiRNAs). Two amiRNAs were designed and tested under the control of either a constitutive promoter (35S) or the native promoter (*HAP1*). The transgenic plants exhibited atypical pollen development and sperm formation. qPCR results for most of the 35S promoter-driven knockdown lines confirmed that *HAP1* was downregulated as a consequence of amiRNA expression. The use of two different promoters did not cause obvious developmental differences in transgenic plants, except that the *qrt* phenotype was reversed in several overexpression lines, resulting in single pollen grains. Histone H3.3-RFP was subsequently introduced into native promoter-driven *HAP1* knockdown lines to visualize sperm viability. In the wildtype, 5% of the total pollen observed was shriveled. In the *HAP1::amiR1* and *HAP1::amiR2* transgenic lines, the percentages of shriveled pollen were 16.5% and 12.5%, respectively. Sperm counts were also determined. In the wildtype, 8% of the sperm were not successfully developed. In the knockdown lines, 29% (*HAP1::amiR1*) and 16% (*HAP1::amiR2*) of the sperm were not successfully developed. We propose that inadequate levels of *HAP1* result in aberrant post-transcriptional regulation of EJC targets, thus producing insufficient or defective transcripts that ultimately alter the proper development and maturation of the plants.

WHICH FACTORS INFLUENCE THE LENGTH OF STAY OF CATS IN A NO-KILL ANIMAL SHELTER?

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Very few studies have evaluated factors that affect how long cats remain at animal shelters before being adopted. The aim of this study was to analyze the influence that breed, sex, and age had on the

length of stay (LOS), in days, of cats at the Tompkins County SPCA, a no-kill shelter in Ithaca, NY. LOS was calculated for cats adopted between 2008 and 2012 ($n = 5,653$) by subtracting the adoption date from the intake date. Eight breeds (including mixes) were identified: American Shorthair, Manx, Domestic Longhair, Domestic Mediumhair, Domestic Shorthair, Maine Coon, Siamese, and Other ($n > 10$ for each category). Differences in LOS among breed categories were examined with ANOVA. A *t*-test was used to determine the difference in LOS between the sexes, and LOS was regressed on age (years) to explore if older cats had a greater LOS than younger cats. LOS differed among breeds ($F_{7,5651} = 11.3, p < 0.0001$). American Shorthair cats had the greatest LOS (125.9 days) and Siamese cats had the shortest LOS (40.0). LOS for females (85.1 days) was greater than that of males (77.4; DF = 2,345, *t* = 2.9, *p* = 0.004). LOS increased linearly as age increased ($y = 10.427x + 47.055, F_{1,2,347} = 167.8, p < 0.0001, R^2 = 0.07$). Other studies also indicated that older animals remain longer in shelters but LOS due to breed and sex are unique findings.

INFLUENCE OF ALKYL SPACER ON PROPERTIES OF L-PHENYLALANINE ESTER CHIRAL IONIC LIQUIDS.

Lydia Morris, Nicole Savage, and Irene Kimaru

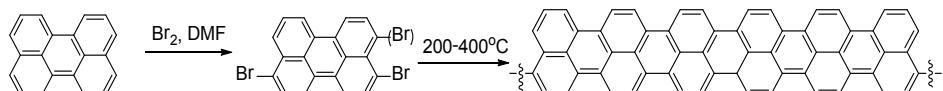
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In this work, we report on the preparation of new chiral ionic liquids (CILs) using L-Phenylalanine as the source of chirality and different alkyl spacers attached on the oxygen atom of the carboxylic group. The main alkyl spacers considered were methyl, ethyl, tert-butyl and benzyl. Four different CILs were synthesized by ion exchange between L-phenylalanine (L-Phe) alkyl esters as the cation and bis-(perfluoroethylsulfonyl) imide (BETA) as the anion. The structure-properties relationship of the CILs was evaluated by NMR, TGA, DSC and Fluorescence Spectroscopy. H1 and C13 NMR analysis indicated that the CILs were pure. They were found to be thermally stable up to 288.10 °C. Their glass transition temperature ranged from -49.47 °C to -29.51 °C and melting points from 85.33 °C - 112.63 °C. Variations were observed in the viscosity of the CILs as the alkyl spacer changed. The fluorescence spectral behavior of each of the four neat CILs was different when excited at the same wavelength and the emission spectra shifted to longer wavelengths as the excitation wavelength was increased. The ethyl-based CIL demonstrated chiral discrimination for the pure enantiomers of 2,2,2-trifluoroanthylethanol via fluorescence. Studies are in progress to test the ability of the CILs to discriminate between the pure enantiomers of propranolol and mandelic acid. These results demonstrate that the ethyl-based CIL has great potential to act as chiral solvents and stationary phase for GC.

DIHALIDE MONOMER SYNTHESIS FOR USE IN GRAPHENE NANORIBBON FABRICATION

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Nanotechnology is becoming increasingly important in scientific applications, especially in electronics and medicine. Despite many advances, there is still work to be done to increase the efficiency of production and learn about nanochemical physical properties and how they affect function. Graphene nanoribbons (GNRs) are extremely thin, single layers of graphite which have significantly different properties ranging from metallic to semiconducting depending on the edge patterns. In studying the bottom-up approach towards the synthesis of graphene nanoribbons, eight precursors have been prepared through electrophilic aromatic substitution, and Suzuki coupling reactions. These polyaromatics give rise to a variety of potential nanoribbon patterns and sizes as well as different edge

properties. The eight dihalo-monomers can be linked using surface-assisted coupling followed by subsequent cyclodehydrogenation to generate the desired nanoribbons.

ANALYSIS OF BONE MORPHOGENIC PROTEIN GENES FROM WHITE TAIL DEER.

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White tail deer, *Odocoileus virginianus*, can be found in abundance in the Eastern United States. The sexual dimorphism of white tail deer can be seen in the size and presence of antlers in male deer. The males grow their antlers yearly, typically starting in March or April, for fighting or display during mating season. Length and branching of antlers is believed to be determined by nutrition, age and genetics. Antler development is the fastest known bone growth. This study examines if there is a specific gene or variation in genes that causes more pronounced antler growth. Our objective is to determine the extent that genetics plays in the size of antlers in white tail deer. Genes related to bone morphogenetic proteins are believed to play a role. Primers were designed to amplify particular segments of the exons in several bone morphogenic protein genes. The products will be sent off for sequencing, and the sequence obtained will be compared to antler development to see if any correlations exist between the two.

STRUCTURAL ANALYSIS OF HIV-1 INHIBITOR DRUG CANDIDATE BMS-378806: THE ROLE OF BENZYL DERIVATIVES.

McKenna Murphy, Emily Triplett, Stephen Tajc

Since the discovery of HIV in 1981, AIDS has caused the deaths of millions of people. The current treatment requires high dosages and results in unfavorable side effects that discourage long-term use. BMS-378806 is a small molecule HIV-1 inhibitor that is preferable to the current therapy. However, little is known about the mechanism of this drug. This research aims to identify the most effective functional groups by attaching structural variations to the piperazine-adjacent phenyl ketone. Previous research has shown five-member rings to be the most favorable. These structural variants may be analyzed by isothermal titration calorimetry (ITC) to determine thermodynamically favorable binding conditions. This data may be used to construct an even more effective HIV-1 inhibitor.

INVESTIGATION OF THE STRUCTURAL ORDERING IN MAGNETRON SPUTTERED CO/PT FILMS

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Physical and structural properties can influence the magnetic properties of a system, including hysteretic behavior. We will present the results of X-ray scattering performed on six Co/Pt multi-layer thin films with perpendicular magnetic anisotropy. The films were grown by 50 alternating layers of 0.7 nm Pt and 0.4 nm Co with chamber pressures between 3 and 20 mTorr. Measurements of the crystallinity from the bulk lattice peaks of the Pt provide an additional metric for determining the structural ordering of the films. We will compare the results of our current efforts to results obtained from earlier x-ray reflectivity, atomic force microscopy, and electron microscopy experiments from similar samples, as well as the magnetic properties obtained from magnetometry and magnetic force

microscopy measurements. Understanding the correlation between the crystallinity and the hysteretic behavior and magnetic properties for these samples may help improve designs for magnetic media and increase the storage capacity of hard disk drives.

A THEORETICAL EXAMINATION OF PENTACENE DERIVATIVES FOR LOW COST ORGANIC SEMICONDUCTORS.

Ross Netusil¹, Thorin Kane², Carolina C. Ilie²

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Pentacene is an organic molecule composed of five edge-sharing aromatic six member rings of carbon. In recent research into organic semiconductors, pentacene derivatives have received a great deal of attention. Of particular interest are the effects of the substituent groups on the properties and stacking of the molecules. Several different pentacene derivatives are here examined by vibrational analysis using both Hyperchem and Spartan analytical software. The infrared spectra of these molecules can give us important data about how these pentacene derivatives will function as semiconductors by measuring the optical conductivity.

SYNTHESIS AND STUDY OF 1-AMINO-1-CYCLOPROPYLCARBOXYLIC ACID DERIVATIVES ON THE ETHYLENE PATHWAY IN ARABIDOPSIS THALIANA.

Tri Nguyen, Michael Coleman

School of Chemistry and Material Sciences, Rochester Institute of Technology

Annually, post-harvest crop losses range from 15 - 50%. The primary loss often occurs in developing countries where the utilities to protect and transport post-harvest produce are not readily available. Thus, these post-harvest crop losses are a significant contributing factor to world hunger. In the food industry, ethylene is a gaseous organic compound that is commonly used to accelerate ripening of fruits. Conversely, there are few publish reports of organic compounds investigating the biochemical regulation of the ripening process. 1-aminocyclopropanecarboxylic acid (ACC) oxidase is a particularly attractive enzymatic target as it facilitates the conversion of ACC into ethylene in plant. We wish to present the synthesis of a target-oriented library of 2-arylACC derivatives that are designed to regulate the ACC oxidase mechanism of action. *Arabidopsis thaliana* will be used as model plant to observe the biological activity of 2-arylACC derivatives on plant ethylene pathway.

CHARACTERIZATION OF STAPHYLOCOCCI ISOLATED FROM MASTITIC CATTLE.

Kyle Nugent, Mark A. Gallo

Biology Department, Niagara University

Mastitis is an inflammation of the udders that is one of the most common diseases in dairy cattle. It is a costly disease, both in terms of lost production or life of the animal, and in treatment with antibiotics. One of the causes is *Staphylococcus* species, with *S. aureus* being the major microorganism responsible for this ailment. There is great interest in determining the epidemiology behind this disease. This study involves the analysis of the biochemical properties of strains of *Staphylococci* provided by Quality Milk Production Services, a program that is part of Cornell University School of Veterinary Medicine.

TOWARDS THE ANALYSIS OF SMALL MOLECULE HIV-1 VIRAL ENTRY INHIBITOR WITH GP120 ON SOLID SURFACE.

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Department of Chemistry and Biochemistry, Nazareth College of Rochester

The number of people dying from HIV/AIDS infection continues to escalate throughout the world. There is a critical need for smaller, inexpensive molecules for the diagnosis of the virus to help minimize the proliferation of this pandemic. Currently, a rapid HIV test that utilizes antibodies is available for diagnosing an HIV infection¹. However, a large antibody protein is less stable and cost more to produce large quantities than a small molecule with similar binding capabilities. This project is geared towards the exploration of NBD-556, which binds to the HIV-1 envelope glycoprotein gp120². Understanding the solid surface binding capabilities of this small molecule HIV-1 viral entry inhibitor may lead to fast and affordable diagnosing tools for lower income areas both domestic and worldwide.

CHARTING A NEW ENERGY FUTURE IN CAROLINE, NY: PLANNING AND EVALUATING A PUBLIC PARTICIPATION PROCESS.

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Climate change has been recognized as one of the most serious environmental issues of our time. A large proportion of the human contribution to climate change is by burning of fossil fuels in the energy sector. Local initiatives aimed at transitioning to renewable energy resources are a valuable part of the solution, and have the advantage of being visible and tangible to participating community members. Such efforts at the local level must involve the public in a meaningful and effective manner, which requires establishing specific and appropriate goals for public participation. Furthermore, the success of public participation and the extent to which goals have been met must be adequately and objectively evaluated. This work describes how a public participation event was planned for a local energy resource initiative in the town of Caroline. The major goals were 1) to develop a plan for effective involvement of the public, and 2) to develop an associated evaluation plan that would assess if specific goals of the public participation process were indeed met. The outcomes of this work have utility in further efforts to engage the public in the town of Caroline, and also have applicability to other communities involved in similar efforts around New York State. The work was conducted with oversight by Cornell Cooperative Extension and through internship and senior thesis work at Wells College.

PRODUCTION OF TISSUE-SPECIFIC NANOPARTICLES FOR BIOMOLECULE DELIVERY.

Fernando Ontiveros

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Targeted delivery of biomolecules to cells and tissues provides biologists with an opportunity to develop improved approaches to treat and prevent disease. At the Nanobiology Lab at St. John Fisher College we intend to produce lipid-based nanoparticles that specifically target eukaryotic cells to deliver a cargo consisting of a range of biomolecules, particularly small interfering RNAs (siRNAs).

Immunotargeted nanoparticles (ITNPs) are a recently developed molecule-delivery system. They consist of stabilized unilamellar vesicles with a diameter of approximately 100nm. Monoclonal antibodies raised against cell-surface molecules are covalently bound to the surface of the particle, providing the

required specificity. One of our primary objectives is to silence the inflammasome, a cytoplasmic macromolecular complex involved in the immune response induced in pathologies like atherosclerosis and gout. With an aging population in the developed world, the treatment of inflammatory disorders will remain relevant for years to come. Furthermore, our research can be expanded to address two clear alternative avenues for the use of ITPNs: drug delivery to tumor cells and vaccination. In contrast to soluble antigen preparations, particle-associated molecules are generally acknowledged to be efficient at eliciting immunity against infectious diseases. Likewise, targeted nanoparticles can also take advantage of surface molecules known to be over-expressed in tumor cells. The ability of ITNPs to deliver both vaccine preparations to leukocytes or deliver oncology drugs to cancer cell lines can be tested both *in vivo* and *in vitro*. The Nanobiology Lab involves students in basic research with the potential to produce real advances in the field, and provides them with an opportunity for interdisciplinary research.

THE ROLE OF Rad52p ISOFORMS IN NUCLEAR AND MITOCHONDRIAL HOMOLOGOUS RECOMBINATION EVENTS.

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Mitochondria are responsible for generating ATP molecules, which are the energy currency of the cell. The proteins necessary for oxidative phosphorylation are encoded on mitochondrial DNA (mtDNA) which is independent of nuclear DNA. Similar to nuclear DNA, an accumulation of mutations in mtDNA can be detrimental to the host. In humans, mutations that lead to neuromuscular and neurodegenerative diseases have been implicated to mutations in the mitochondrial genome. A common form of mutation found is a deletion of mtDNA between homologous sequences. Budding yeast are facultative anaerobes that can survive in the absence of oxidative phosphorylation by undergoing fermentation to meet their energy needs. For this reason, the lab uses the budding yeast, *Saccharomyces cerevisiae*, to examine genes that may be involved in regulating homologous recombination in the mitochondrial genome.

One such gene product is *RAD52*. *RAD52* is a nuclear gene that codes for a protein, Rad52p, which is essential for nuclear homologous recombination and double-strand break repair. It has been directly implicated in maintaining the integrity of nuclear DNA. The open reading frame of *RAD52* contains a total of five potential start codons that may drive expression. The goal of the lab has been to determine whether one of the first three start codons is responsible for creating a Rad52p isoform that is localized to the mitochondria. Experiments required the creation of site-directed mutations of the various start codons. Cells with these mutations were then tested for their ability to undergo nuclear and mitochondrial homologous recombination events. A mutation in the first *RAD52*ATG reduces mitochondrial (~ 3-fold) but not nuclear homologous recombination events.

THE FIRST INTACT SCAPULAR GLENOID REGION OF *DEINONYCHUS ANTIRRHOPUS* AND THE CONSEQUENT RE-INTERPRETATION OF DROMAEOSAURID FEATURES THAT ENHANCED THE EVOLUTION OF AVIAN FLIGHT

Parsons, William L., Parsons, Kristen M.
Buffalo Museum of Science

Within Dromaeosauridae, the morphology of the glenoid region of the scapula is the key to understanding the overall mobility of the shoulder and thus the extent to which this joint functioned to enhance the evolution of avian flight. The discovery of the proximal ends of two scapulae of *Deinonychus*, each possessing a shallow, posterolaterally facing glenoid, helps to elucidate this

understanding. The dorsal edge of the glenoid possesses a considerably curved embayment that would have presented no obstacle to the raising of the forelimb above the horizontal plane of the shoulder girdle; rather, it would have facilitated such upward arcing movement. Within this embayment there is a robust scapulohumeral ligament fossa. The humerus was held within the glenoid by a combination of the acrocoracohumeral ligament and the scapulohumeral ligament. The positioning of the scapulohumeral ligament fossa is at a pivot point along the rostral/caudal axis of the dorsal edge of the glenoid; this fossa is an anchoring point for the upward movement of the forelimb. The morphology of the glenohumeral joint of *Deinonychus* differs considerably from that of *Velociraptor mongoliensis*. Along with the fusion of the scapula/coracoid suture on *Velociraptor*, the posteroventral orientation of the glenoid of *Velociraptor* is secondarily derived from the more primitive posterolateral orientation as is found in *Deinonychus* and a number of other dromaeosaurids. Also, the embayment of the glenoid of *Velociraptor* is deeper than that on *Deinonychus*, and the movement of the humerus would have been restricted by a rostral coracoidal tuber and a less robust caudal scapular tuber. Various features of the *Deinonychus* shoulder joint can be interpreted as possessing all the necessary elements for the evolution of the triosseal canal. This current reinterpretation of the mobility potential of the shoulder joint of *Deinonychus* along with the unfused mobile suture between the coracoid and scapula and the relationship between the acrocoracohumeral ligament, M. deltoideus clavicularis, and M. supracoracoideus present a combined mechanical morphology that would allow for an alternative form of “wing-flapping” without humeral rotation. Additionally, it raises questions as to the functional aspects of other features that enhanced the evolution of flight, such as the flexibility of the cervical vertebral articulations and the caudal modular muscular contribution to mobility possessed by this and other taxa within Dromaeosauridae.

MAGNETICALLY SENSITIVE PVA NANO-FIBERS SYNTHESIZED BY ELECTROSPINNING

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

Electrospinning is a process generating nanofibers from polymer solutions or melts using an intense electric field. Nano-fibers can have great applications in the making of filters, tissue engineering, textile industry, or sensor technology. We electrospun polyvinyl alcohol (PVA) fibers in a classical needle-plate configuration using a syringe pump set for a 0.05 mL/min flow rate and a 16 G needle. By changing the voltage, gap distance, flow rate, and concentration the creation of nano-fibers can be optimized. The needle-plate distance was varied within 5 to 15 cm. Voltages of 15 to 35 kV were used for the study of PVA solutions in water with concentrations from 4% to 15%. Mixtures of PVA solutions and ferrofluids were also electrospun with the purpose of synthesizing magnetic nanofibers. Scanning electron microscopy (SEM) was used for the analysis of the fibers. A dependence of fiber properties on the PVA and ferrofluid concentrations is reported. The synthesized fibers embedding ferric oxide nanoparticles from the ferrofluid could be used for manufacturing magnetically controlled filters.

MELANIN-CONCENTRATING HORMONE RECEPTOR 1 IN CHO-K1, SH-SH5Y AND 3T3-L1 CELLS: A PATHWAY TO PRIMARY CILIA.

Bryan H. Pratt, Nico N. Covello and Laurie B. Cook

Obesity results when caloric intake exceeds metabolic needs over an extended period of time. The condition predicates heart disease and diabetes – two pathologies that diminish the quality of life and increase risk of premature death. Melanin-concentrating hormone (MCH) acts via a G protein-coupled receptor on the plasma membrane of neurons to stimulate appetite, and fat cells to stimulate feedback secretion of leptin. Dysregulation of MCH signaling is hypothesized to be a contributing factor in select appetite disorders. Little is known about how cells regulate MCH receptor signaling however plasma

membrane localization of MCHR1 has been implicated as a contributing factor. We previously reported that caveolae, a cholesterol like protein, enhances MCH signaling in CHO cells. This, together with recent reports of MCHR1 localization to primary cilia in neurons located in the hypothalamus led us to hypothesize that organization of MCHR1 in the plasma membrane might be important to MCH function in other cell types as well. When VSVg-tagged MCHR1 is expressed in CHO-K1 cells, the tagged receptor can be found on the plasma membrane, but occasionally localizes to two small dots near the nucleus, particularly after starvation. We next studied two cell lines which naturally express the receptor: human SH-SY5Y neuroblastoma cells and murine 3T3-L1 pre-adipocytes, which both responded to MCH by activating ERK. Using immunostaining, diffuse plasma membrane-localized MCHR2 was detected in SH-SY5Y cells. Although MCHR1 plasma membrane expression was confirmed in both SH-SY5Ys and 3T3-L1s, both cell types had distinctive MCHR1 patterning; SH-SY5Ys had clusters of MCHR1-positive vesicles and 3T3-L1 cells revealed MCHR1-positive primary cilia during differentiation. Together, these results suggest movement of MCHR1 to a centrosomal-location prepares receptor for entry into primary cilia, and that a role for primary cilia in the regulation of receptor signaling may be more widespread than originally thought. Future experiments will be aimed at determining the role that this localization plays in the regulation of MCH signaling.

INVESTIGATION OF BACTERIAL SPECIES IN LEAD-CONTAMINATED SOIL

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High concentrations of lead in Rochester area residential soils have been of concern because of negative effects on human health. Lead cannot be destroyed, but can be converted to a less toxic form using microorganisms, a process known as bioremediation. Soil samples were taken from known lead-contaminated residences in Rochester and bacteria were isolated on Nutrient Agar and stored at -80°C. Isolates will also be grown on Nutrient Agar containing 4mM lead nitrate, to select for species with lead resistance. Bacterial isolates will be identified by 16S rDNA sequencing and lead-resistant species will be compared to a bacterial species already known to confer lead resistance, *Cupravidus metallidurans*. This research aims to find bacterial species for potential use in bioremediation, making homeowners' soils less toxic to humans.

THE EFFECT OF UV AND GRAZING BY DAPHNIA PULICARIA ON E. COLI.

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Natural ecosystems depend on checks and balances to maintain order within the system. Much of this order is established through the evolution of predator-prey relationships. Anthropogenic influences on freshwater systems have been shown to disrupt this natural order, in some cases, contaminating the freshwater supply of communities. Potable water must be protected from harmful pathogens, and some communities, particularly in developing countries, have come to rely on natural regulators, such as natural predators and sunlight. *Daphnia pulicaria*, a freshwater microcrustacean, is a size-discriminatory filter feeder, known to consume various pathogenic species. It has been observed that pathogens such as *Giardia* spp. and *Cryptosporidium* spp. are rendered non-viable (unable to infect) after traveling through the digestive tract of *Daphnia* spp. In the presence of low levels of ultraviolet (UV) –A radiation, some pathogens show an increased viability when exposed to low amounts of UVA radiation, while the fitness (survival and reproduction) of *Daphnia* spp. decreases. In a balanced ecosystem, pathogens, such as *Escherichia coli*, would be affected by both of these environmental stressors, in a multitude of

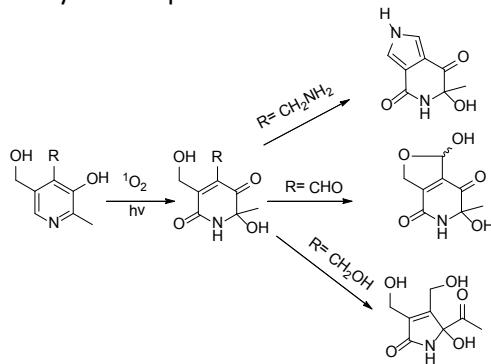
ways. We hypothesize that the ingestion of *E. coli* by *D. pulicaria* will have a more significant negative effect on the pathogens viability than potential positive effects via its exposure to UV-A. Preliminary results demonstrate decreased viability of the *E. coli* following a 24 h grazing period by *D. pulicaria*, and other work has shown an increase in *E. coli* viability with low-dose UV-A. Our current work is testing the interaction of *D. pulicaria* grazing and chronic low-dose UV-A on *E. coli*. The results of this work will provide important information for alternate pathogen removal water-treatment protocols in both developed and developing countries.

A COMMON [3+2] CYCLOADDITION OF SINGLET OXYGEN TO VITAMERS OF VITAMIN B₆.

Aditya G. Rao, David Samuel, Kirsten Norrell, David G. Hilmey

Department of Chemistry, St. Bonaventure University

In addition to functioning as a coenzyme in biological systems, Vitamin B₆ has been previously reported to display antioxidant properties against reactive oxygen species in plants. Here, we report that subjecting singlet oxygen to B₆ vitamers pyridoxine, pyridoxamine, and pyridoxal resulted in unique oxidized products with a structural similarity: positions 2 and 6 of the pyridine functionality were oxidized. Based on low-temperature studies of pyridoxine oxidation, an identified bicyclic endoperoxide intermediate suggested a [3+2] cycloaddition of singlet oxygen to the studied B₆ vitamers. The isolated product from oxidation of pyridoxine was a ring-contracted compound, while oxidation of pyridoxamine and pyridoxal resulted in a fused bicyclic compound.



OPTIMAL FORAGING OF SMALL MAMMALS: PREDATION OF HIGH AND LOW CALORIE PLANT SPECIES SEEDS IN FOREST AND OPEN MEADOW HABITATS

Nikolaus N. Reff and C. Eric Hellquist

SUNY Oswego

Optimal foraging strategies in animals are based on the balance between the energy and time required to obtain food in relation to the energy reward of the food consumed. An individual that has access to abundant food may forage more selectively for more desirable food sources than an individual that rarely encounters food. Typically, small mammals are granivorous predators. They face a, instead of chasing their prey, foraging challenges. They do not need deal a high-energy loss by chasing down their prey. Instead they have to not only avoid becoming prey, but also forage efficiently to find a proper food source to replace what energy was put into finding food and avoiding predation. The objective of this research is to observe food selectivity of small mammals when provided a choice of seeds. In this study, small mammals were given access to highly nutritious (high calorie 1-9 calories based on one seed) and a less nutritious (low calorie 1-4 calories based on one gram of seeds) seeds. Preliminary data were collected in Little Falls, New York. In the Little Falls study, I placed seeds in a forest and meadow habitat in 15 m x 15 m sampling grids. Preliminary results showed there was no significant difference in feeding

on high and low calorie seeds in either habitat (ANOVA; $p=0.56$ forest habitat: $p>0.99$ meadow habitat). However, when total seed removal was analyzed, more high calorie seeds were eaten. Of the four seed species used as high calorie seed, *A. occidentale* (cashew) was eaten the most in both habitats; *S. bicolor* (red milo) was the most eaten low calorie seed in both habitats. The secondary data were collected in Based on these results; I established a second study in forest and meadow habitats at the Rice Creek Field Station (Oswego, NY). Preliminary results of the Rice Creek study indicate that there is a slight preference for the higher calorie cashew nut over the less nutritious red milo seed, although there may be no significant difference in seed preference. The results of these studies indicate that optimal foraging theory predictions may not always accurately predict foraging preferences of small mammals. We cannot account for different factors that may affect what food source a small mammal may choose. Something such as the size of the food item may dictate whether the animal can carry that item to another location to feed or even the weather at a given point in time may dictate what decision an animal may make in food choice.

CONSTRUCTION OF AN *E(R)* VECTOR LACKING THE PROTEIN CODING REGION FOR USE IN STUDYING THE CONSERVATION, EXPRESSION, AND FUNCTION OF THE *E(R)* GENE.

Theodore Ryan, Stuart Tsubota

State University of New York, The College at Brockport, Department of Biology

The *enhancer of rudimentary gene*, *e(r)*, encodes a small protein, ER, that is expressed in the ovaries, central nervous system and gut of developing *Drosophila melanogaster*. ER has been found in plants, animals, protists, and to date is mysteriously absent in fungi. *Drosophila* ER is 76% identical to the human counterpart, ERH, which has been found to be expressed at high levels in cancer cells. Data suggests that *e(r)* might have a causative role in cancer progression and that high levels of ERH are necessary for tumor progression. One objective of our lab was to construct a plasmid vector containing all the necessary 5' and 3' non-coding region sequences of *e(r)*, but lacking the protein coding region. In its place, the recognition sequence for the restriction enzyme *NcoI* was created between the non-coding regions. This vector allows for the use of the *NcoI* site for the insertion of almost any coding region. The fusion gene can be used to transform *Drosophila*. The expression of the inserted coding region will be governed by the *e(r)* regulatory regions contained in the 5' and 3' non-coding sequences. The current objective of this lab is to ligate a reporter gene, *Green Fluorescent Protein*, into the plasmid construct. This will allow us to determine the exact locations of gene expression of *e(r)* in the soft tissues and organ systems in the *Drosophila* using various fluorescence microscopy techniques.

PHYSICAL PROPERTIES OF THE BINARY SYSTEM CHLOROFORM WITH THE IONIC LIQUID 1-HEXYL-3-METHYLIMIDAZOLIUM BIS(TRIFLUOROMETHYLSULFONYL)AMIDE ([C₆MIM][NTf₂]).

David R. Saeva, Markus M. Hoffmann

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The interest in and the breadth of applications using Ionic Liquids (ILs), salts that melt below 100°C, continues to grow near exponentially. Our studies focus on binary IL systems with organic solvents of low polarity because ILs are frequently brought in contact with such solvents. Specifically, we will report on NMR self-diffusion and relaxation results of the [C₆mim][NTf₂]-CHCl₃ binary system covering the entire composition range and temperatures from 15 to 45°C. Combined with prior work the following picture is emerging. At very low x_{IL} from 0.0001 to 0.01 there is a progression from ion pairing to aggregate formation. At $x_{IL} > 0.01$ aggregation is dominant and fast exchange of ion pairs between aggregates becomes an important mechanism for self-diffusion. For $x_{IL} > 0.1$ it appears that the IL in the binary system behaves principally the same as the neat IL.

THE SPATIAL DISTRIBUTION OF *IXODES SCAPULARIS* AND THE LYME DISEASE BACTERIUM, *BORRELIA BURGDORFERI* AT SUNY OSWEGO'S RICE CREEK FIELD STATION.

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Recent studies show that more than 75% of emerging human pathogens are zoonotic and that their prevalence is due to ecological factors, wildlife host abundance/behavior and human behavior. Lyme disease in North America is primarily transmitted by the blacklegged tick, *Ixodes scapularis*, which acquires the bacteria, *Borrelia burgdorferi*, during a blood meal. When bitten by *Ixodes*, humans can become an accidental blood meal and acquire *Borrelia* and thus Lyme disease. *Ixodes* are highly concentrated in the northeastern and north central United States. In New York the majority of *Ixodes* are found in the southern part of the state but are becoming more common in central New York. *Ixodes* are mostly found in forested areas with shrubby vegetation. The Rice Creek Field Station (RCFS) at SUNY Oswego has a variety of habitats where *Ixodes* has been encountered. Ticks surveys were conducted from May-October 2012 at 13 locations in meadows, hardwood forests, edges (between meadows and forests) and walking trails. Surveys were conducted along transects using drag sampling of a 1 m² white corduroy cloth. The cloth was dragged across the ground and examined every 20 meters along each transect. A total of 213 ticks were collected. Ticks were found only in the forested (n=210) and trail (n=3) habitats. Ticks were most often found in August-October. Following collection of ticks, we used polymerase chain reaction (PCR) of homogenized *Ixodes scapularis* to determine the presence of ticks infected with *Borrelia* within each habitat at RCFS. Of the 213 ticks collected, 52 have been tested for the presence of *Borrelia*. To date, one tick has tested positive for *Borrelia*. We will complete testing on all ticks collected. With this knowledge of tick and *Borrelia* abundance we can contribute to baseline management and public outreach at RCFS by creating an ecological risk map for faculty, staff, students, and members of the public that use the RCFS grounds.

EXPRESSION PATTERN OF ANOCTAMIN 1 IN THE ZEBRAFISH

Cyrus Salehi, Tyler Steinhilber, Julie McGrath, Adam Brooks, Edward Capurro, Kris Dewaters, Kelly Hasman, Nataliya Ponomarova, Alesya Poplavskiy, William Valentino, and Adam Rich

The College at Brockport

Introduction: Anoctamin 1 (Ano1) is a calcium activated chloride selective channel that was recently discovered as a marker for gastrointestinal stromal tumors. It is functional important for exocrine fluid secretion and for pacemaker activity in several different tissues. Alternative splicing of pre-mRNA is a regulatory mechanism that increases variation of mRNA expression pattern and ultimately of protein function. Anoctamin 1 is alternatively spliced in mouse and human. A group of students participating in Systems Physiology at The College at Brockport are designing and executing experiments to better understand Ano1 expression patterns and to identify potential alternative splice variants in the zebrafish.

Objective: Identify zebrafish orthologs and alternative splice variants, and determine spatial expression patterns of Ano1 in the zebrafish.

Methods: NCBI and Ensemble databases were used to identify Ano1 orthologs. Two distinct sets of primers were designed for each Ano1 transcript using NCBI Primer Blast. Total RNA was isolated from whole larvae, and from dissected adult heart and gastrointestinal tract of zebrafish. Complimentary DNA was synthesized and tested for Ano1 expression using reverse transcriptase PCR.

Results: 5 anoctamin 1 transcripts were identified and expression of 4 were confirmed in 6 day old whole larvae. Expression of anoctamin 1.1 and 1.4 was detected in adult gastrointestinal tract, and 1.11 and 1.3 in adult heart.

Summary: Expression of Ano1.1, 1.2, 1.3, and 1.4 (transcript 1) was observed in zebrafish larvae, but only 1.1 and 1.3 were detected in heart and 1.1 and 1.4 in gastrointestinal tract. Future experiments will sequence the PCR products to verify these results. Possible expression of alternative transcripts under control conditions, and using a diabetic model, will be explored.

HEAD-FIRST AERIAL BEHAVIOR IN THE CAPTIVE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Christi Schultz, Michael Noonan
Canisius College

Head-first aerials (aka spy hopping) by cetaceans can be either exploratory or social in nature. This behavior was examined in eleven captive beluga whales at Marineland of Canada. The occurrence of this behavior is discussed with respect to sex, age and apparent function. Since this is a highly energetic behavior, it is suspected that its value to the animal is influenced by both age and body size, and it is recommended that these factors be taken in to account when considering its function.

CONFERRING RESISTANCE AGAINST PLANT-PARASITIC NEMATODES.

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Some microbial symbionts have been found to protect their host against naturally occurring enemies. One such symbiont is *Spiroplasma*, which confers resistance to parasitic nematodes (*Howardula aoronymphium*) in *Drosophila neotestacea*. If *D. neotestacea* is parasitized by *H. aoronymphium* and *Spiroplasma* is not present *D. neotestacea* become sterile. However, if *D. neotestacea* is infected with *Spiroplasma*, fertility is restored and the abundance of *H. aoronymphium* diminishes. Based on this finding we hypothesize that *Spiroplasma* from *D. neotestacea* can confer resistance against a genetically similar parasitic nematode found in plant species (root-knot nematodes). We are testing this by utilizing the following methods: (1) Sequencing the genome of various strains of *Spiroplasma* (including the strain found in *D. neotestacea*) to look for specific genes that may be responsible for this anti-nematode effect. (2) Testing whether *Spiroplasma* has the same anti-nematode effect on plant parasitic nematodes as it does in *D. neotestacea*. (3) Using methods (surface abrasion, microinjection, etc.) to test if *Spiroplasma* can grow and replicate in plants. The overall goal of this project is to find a method that can be used to immunize crops against pests that attack crops in developing countries, causing over 100 billion dollars in damage annually.

GENE ANNOTATION OF *HYDROGENOBACTER THERMOPHILUS* DSM 6534.

Henry Shawna, Roll David, Joint Genome Institute
Roberts Wesleyan College Rochester, DOE Joint Genome Institute

Roberts Wesleyan College has been collaboratively working with the Joint Genome Institute (JGI), as part of the Undergraduate Research Program in Microbial Genome Annotation. Given the predicted genomic and protein sequence of *Hydrogenobacter thermophilus* DSM 6534, data was analyzed, interpreted and evaluated using a series of web-based, community-accessible, sequence databases including the Integrated Microbial Genomes Education Site (IMG-ACT), NCBI, and the Protein Data Bank. The genome size of *Hydrogenobacter Thermophilus* DSM 6534 is 1,742,932 bp long. In addition, out of the 1,948 genes predicted, 1,899 (97.5 %) are considered protein coding genes. The annotations proposed from Roberts Wesleyan College commenced in January of 2012 and is still being annotated today. Four genes, gene 0078, 0088, 0077, and 0099 have been successfully annotated. The proposed annotations for those genes are as follows; integral membrane protein, TonB periplasmic transporter

protein, Cytochrome oxidase synthase subunit, and Ribosome maturation factor rimP respectively.

COUPLING A SMALL TORSIONAL OSCILLATOR TO LARGE OPTICAL ANGULAR MOMENTUM.

Hao Shi, Mishkat Bhattacharya

School of Physics and Astronomy, Rochester Institute of Technology

We suggest a novel configuration to achieve torsional optomechanics using coupling between a windmill-shaped dielectric and a Laguerre-Gaussian cavity mode with both angular *and* radial nodes. In contrast to previous schemes, our method can exploit the in-principle unlimited angular momentum carried by a single photon without increasing the size of the mechanical object to achieve single photon strong coupling. Featuring the advantages of small mass, large optomechanical coupling, and low clamping losses, our suggestion paves the way to experimentally observe quantum mechanical effects for torsional oscillators.

TORSIONAL OPTOMECHANICS AND THE DETECTION OF QUANTUM BACK-ACTION.

Hao Shi, Mishkat Bhattacharya

School of Physics and Astronomy, Rochester Institute of Technology

The optical measurement of the position of a harmonically oscillating mass is a technique of fundamental importance to gravitational wave detection and quantum information science. The detection sensitivity of such a measurement is quantum limited by noise in the phase of the coherent optical radiation, which has been detected and characterized. It is also limited by the quantum back-action on the oscillator due to fluctuations in the radiation pressure force. Back-action is a phenomenon of fundamental scientific interest, plays a critical role in the low-frequency operation of gravitational wave detectors, and has been observed only recently with macroscopic oscillators that vibrate linearly. In this work, we explore the use of torsional oscillators for detecting back-action noise. We find that due to their small center-of-mass moment of inertia, and hence high resonant rotational susceptibility, torsional oscillators exhibit much larger back-action noise than linearly vibrating oscillators. We demonstrate our conclusions using a recently suggested configuration which couples the rotation of a small optically trapped dielectric rod to radiation in a high finesse cavity.

INVESTIGATION OF THE KINETIC ISOTOPE EFFECT WITH TIN (II) BROMIDE AS A LEWIS ACID CATALYST FOR THE ESTERIFICATION OF OLEIC ACID

Nandini Singh, Nicole Bayona, Richard W. Hartmann

Department of Chemistry and Biochemistry, Nazareth College

Biodiesel made from waste cooking oil is a popular substitute for petroleum diesel. However, due to its high content of free fatty acids (FFA), waste oil must undergo an initial acid catalyzed esterification. This process typically employs concentrated H₂SO₄ but we chose a milder Lewis acid, tin (II) bromide, as our catalyst. Our investigation is part of a larger project which uses oleic acid as a model FFA, and the tin II halides ((SnF₂, SnCl₂, SnBr₂, and SnI₂) as catalysts. Methanol-D was substituted for methanol in order to assess the role of this species in the overall mechanism. Through the use of NMR, we have determined that methanol-D does eventually make methyl ester, but it takes substantially more time for the reaction to occur. This poster will present our interpretation of the data, how it relates to potential mechanisms, and the broader impact for the series of tin II halides.

“...A LOVELY, CHARMING LITTLE COTTAGE”: THE ARCHAEOLOGY OF RURAL LIFE AT THE WESTFALL-MERCIER HOUSE, GREECE.

Kyle Somerville

Farmsteads and other 19th century domestic sites are often the focus of archaeological excavations because former farm lands are increasingly being turned over to modern development. Rather than viewing urban and rural areas as separate entities, a dialectical model reveals a more nuanced picture in which these areas are interdependent and linked by deep social and economic ties. This paper examines archaeological excavations at the Westfall-Mercier House, a cobblestone home located on Ridge Road in Greece. In conjunction with the documentary record, examination of material remains from the farmstead site can help determine the occupants’ standard of living, a farm’s production and subsistence strategies and, ultimately, the nature and degree of the integration of the farmstead and its occupants into a larger socioeconomic and ideological system.

AVOIDANCE BEHAVIOR RESPONSE TESTS IN TERRESTRIAL ISOPODS.

Harshita Sood, F. Harvey Pough.

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Isopods are sensitive to organic and inorganic pollutants, and are considered useful species for bioassays. Laboratory trials have shown that a terrestrial isopod (*Porcellio scaber*) avoids soil to which copper sulfate has been added. Those trials did not address the question of whether the isopods were detecting Cu²⁺ ions or an organocopper complex formed by a reaction between organic chemicals in the soil and the copper that was added. That distinction is critical for evaluating the potential of isopods for use in bioassays, because different soils will form different organocopper complexes. We tested the ability of *Porcellio* sp. to differentiate between filter paper moistened with solutions of copper chloride and filter paper moistened with solutions of sodium chloride. The isopods avoided the copper solutions, indicating that they are able to detect Cu²⁺ ions.

ISOLATION AND IDENTIFICATION OF ANTIBIOTIC RESISTANCE IN BACTERIAL SAMPLES FROM LAKE ONTARIO.

Aaron N. Spacher, Maryann A.B. Herman

Department of Biology, St. John Fisher College

Antibiotic-resistant bacteria are an increasing public health concern and recently the Food and Drug administration has been pressured to withdraw approval of the use of subtherapeutic doses of antibiotics in livestock. In upstate New York, sewage and agricultural run-off may contain microbes that are selected for by antibiotics excreted in humans and livestock waste. Monthly water samples were collected from six different locations in Lake Ontario over the summer of 2011 and 2012 to isolate and characterize antibiotic resistance in bacteria. Samples were taken from near a treated sewage outflow pipe and the mouth of the Genesee River. Water temperature and clarity were measured for each sample location. Water samples were filtered to collect bacteria and the resulting filtrate was grown on R2A medium. Gram character and resistance to five clinically relevant antibiotics (gentamicin, ampicillin, erythromycin, ciprofloxacin and sulfamethoxazole trimethoprim) was assessed.

DISSOLVED ORGANIC CARBON PROFILE OF SUBWATERSHEDS OF CONESUS LAKE.

Ryan Spector¹, James Macisco¹, Morgan Bida², Annemarie D. Ross, Susan B. Smith², A. Christy Tyler², and Todd Pagano¹

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Dissolved Organic Carbon (DOC) is a natural pollutant that has been shown to be increasing in natural waters and is a cause for concern in the treatment of drinking water with chlorine. These higher concentrations of DOC in natural water may be a result of climate change. In recent decades, the water quality of Conesus Lake in the Finger Lakes Region of New York State has also declined, suggesting that the ability of Conesus Lake to sustain its multiple uses may be threatened. Samples from identified subwatershed tributaries that supply Conesus Lake were analyzed in this study. Land use in the different subwatersheds was investigated as an indicator of DOC quality. We performed analyses of DOC, and specifically its phenolic content, in natural waters using multidimensional fluorescence, a Total Organic Carbon analyzer, and advanced chemometric methods.

UNDERWATER BUBBLING IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Laura Stevens, Michael Noonan

Canisius College

It is becoming increasingly clear that underwater bubbling is a widespread type of communication in cetaceans. The goal of the present investigation was to characterize the types of underwater bubbling that occurred in captive population of beluga whales, held in captivity at Marineland of Canada. Results are presented with respect to both the source (blowhole vs. mouth) and shape (drip, burst, stream, ring, hoop), as well as sex and age of the animal. The findings suggest that the characteristics of bubbles correspond to differences in the motivational state of the beluga whales.

ANTI-CANCER PROPERTIES OF WATERCRESS'S (*Nasturtium officinale*) GLUCONASTURTIIN.

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Cancer is the second most common cause of death in the US, exceeded only by heart disease, accounting for nearly 1 of every 4 deaths. With the vast amount of people dying from cancer, searches for new cures are essential. This includes doing pharmaceutical research, and bioprospecting (the isolation and characterization of biologically important secondary metabolites) of plants to determine if species have anticancer compounds within them to cure or prevent the disease has taken on increased importance. The associations between cruciferous vegetable intake and reduced cancer abnormalities has started a large increase in the amount of studies of anti-cancer effects of specific cruciferous vegetables, and the resulting isothiocyanates that humans produce.

In particular, the cruciferous vegetable, watercress (*Nasturtium officinale*) is uniquely high in glucosinolates, which are precursors to cancer-fighting molecules, that humans produce called isothiocyanates (ITCs). Watercress is rich in gluconasturtiin, which is the precursor to an ITC, phenethyl isothiocyanate (PEITC). PEITC blocks degradation of structural proteins in cancer cells and reduces tumor cell survival. Reduced tumor cell survival decreases the action of hypoxia-inducible factor (HIF), a molecule that stimulates angiogenesis (blood vessel development), a process that allows a tumor to

obtain a blood supply. When humans consume watercress, PEITC levels elevate, and HIF activity is reduced, suggesting that watercress may have anti-cancer properties.

The goal of our work was to extract watercress's anti-cancer compound, gluconasturtiin, to be further tested. We were not able to extract gluconasturtiin during the experiment, but a similar compound, 6-Octadecenoic, was extracted. 6-Octadecenoic was found to be very similar to gluconasturtiin with its potential anti-cancer and medicinal properties. Some examples of 6-Octadecenoic medicinal properties include that it is a global central nervous system depressant that decreases cerebral oxygen consumption, which reduces intracranial pressure and has potent anti-convulsing properties. 6-Octadecenoic was also found that it is a potent antioxidant and bronchodilator, and has anti-inflammatory properties along with anti-cancer tumor suppressing properties. Thus, it appears that watercress may have multiple compounds with anti-cancer properties.

THE EFFECT OF DAM REMOVAL ON PLANT SUCCESSION ALONG A RIPARIAN ZONE AT FALLBROOK POND, SUNY OSWEGO, NY.

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Dam construction on a creek or river changes the physical conditions and biotic communities of impacted riparian zones. Following dam removal, plant communities re-establish following successional trajectories influenced by sediment, hydrology, and topographic conditions as well as seed banks and seed dispersal events. Fallbrook Dam (Oswego, NY) was built across Rice Creek before 1895 to power a mill on the adjacent farm. Behind the dam, an approximately 2 ha (4 acre) pond was created. In the summer of 2012, the US Fish and Wildlife Service and the New York Department of Environmental Conservation notched the dam to drain Fallbrook Pond in order to promote cold water fish habitat in Rice Creek. In 2010, in anticipation of the planned stream restoration at Fallbrook Pond, the littoral and submerged aquatic vegetation of the pond was sampled ($n=24\text{ m}^2$ plots). After the dam was notched in June 2012, the pond basin was drained leaving behind a mudflat that was rapidly colonized by a variety of native and exotic wetland plants. By late summer the basin was transitioning to a wetland meadow dominated by forbs and woody plant seedlings. Our goal was to quantify the initial transition of plant communities following dam notching and compare those data to the 2012 data collected at Fallbrook Pond. Vegetation data were collected across nine transects ($n = 62\text{ m}^2$ plots) in the former Fallbrook Pond basin. Initial analysis indicates that plant biomass was not significantly different following dam removal (t-test; $p = 0.91$). Species richness was greater in the wetland compared to the pond (t-test; $p = 0.002$). We anticipate that as the Fallbrook Pond basin continues to dry following water level reduction, vegetation in the basin will transition from a flora dominated by obligate wetland plants to facultative wetland plants with occasional upland colonists and greater woody plant cover.

EFFECTS OF BPA ON STEROID HORMONE RECEPTOR mRNA'S IN ZEBRAFISH (*DANIO RERIO*)

Lindsay Sturnick and Edward Freeman, PhD.

The endocrine system, using chemical messengers called hormones, works to keep the numerous complex systems within metazoans in communication. This hormonal system allows for the maintenance of a stable internal environment. Endocrine Disrupting Compounds (EDCs) have a negative impact upon the endocrine system and its ability to regulate a stable internal environment through variable mechanisms including interference with hormone synthesis & function as well as hormone mimicry (4).

In early animal development Primordial Germ Cells (PGCs), the progenitors of the adult gametes, migrate from the position where they are specified towards the region where the gonad develops. This

migration is directed by chemical cues (3). The migration of PGCs depends on the ability of the gonad to secrete chemical cues, such as the chemokine SDF-1 and on the expression of SDF-1 receptors on PGCs (Cxcr-4). In addition, PGC specific genes such as *vasa*, *stauffen 1*, and *stauffen 2* have been associated with PGC migration in various species.

It has been reported that exposure of early Zebrafish embryos to endosulfan results in an aberrant PGC migration pattern. The mechanism(s) behind this finding is unclear but may involve a negative impact of endosulfan on various PGC specific genes including those involved with SDF-1 mediated PGC movement (1). Therefore, our goal was to study the impact of endosulfan exposure, in early Zebrafish embryos, on genes known to regulate PGC function. Specifically, we evaluated *Cxcr-4* (the SDF-1 receptor in PGCs) and *staufen2* transcript levels in control and endosulfan exposed embryos (2, 5). Our results demonstrate a trend toward increases in each of these transcripts following endosulfan exposure. Further statistical analysis is required to verify the significance of these trends.

PREPARTION OF CHIRAL IONIC LIQUIDS.

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Ionic liquids (ILs) are defined as salts that are stable in the liquid state at 100°C or less [1]. ILs have long been considered as designer solvents in preparatory chemistry because they can be made task-specific for a specific synthetic challenge. Chiral compounds are molecules that are not super imposable because they possess asymmetric carbon centers. They are generally difficult to synthesize but ILs that are chiral themselves can be used to direct asymmetric organic reactions. The goal of this research was to synthesize ILs that are chiral. There are generally two routes to synthesize ILs commonly referred to as the conventional and the unconventional synthesis of ILs, and both have been utilized in our research. For the conventional synthesis an amine and an allyl chloride lead to the IL by alkylation. The unconventional synthesis is a one-pot-synthesis where five molecules react to the desired ionic liquid: formaldehyde, glyoxal, an acid and two molar equivalents of an amine. The findings from our synthetic experiments will be presented.

References: [1] K.R. Seddon, Nat. Mater. 2 (2003) 363.

INTRODUCTORY BIOLOGY TEXTBOOK REPRESENTATIONS OF GENETIC PHENOMENA MAY FOSTER CONFUSION.

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Most college biology instructors use textbooks to guide their instruction and as a source of visual aids. Due to the unfamiliar (molecular) scale of particular biological phenomena, such as transcription and translation, figures and representations from textbooks may be difficult for students to decipher. Previous work has shown that students have difficulty interpreting the symbology of standard representations, such as the structure of an operon. We hypothesize that textbook diagrams related to molecular genetics and information flow often contain unclear or even contradictory representations, which may lead to misunderstanding and confusion. We analyzed diagrams from the genetics sections of two Introductory Biology textbooks to elucidate how colors, shapes, words, and photographs depict biological meaning or concepts. Neither textbook provided a key for any of the diagrams, thus putting the responsibility on the reader to decipher what the various colors, shapes, etc. represent and to determine which features are important. We also found inconsistencies within the same textbook (e.g. in one figure the color green was used to represent RNA, but purple was used for the same purpose in a

separate figure). We argue that textbook representations could be more accessible to students of all levels with the inclusion of keys and consistent use of color and shape throughout the entire book. Future work will investigate how students interact with original and modified figures.

THE USE OF A GENE CONSTRUCT THAT LACKS THE PROTEIN CODING REGION IN THE STUDY OF THE CONSERVATION, REGULATION, AND FUNCTION OF THE *ENHANCER OF RUDIMENTARY* GENE IN *DROSOPHILA MELANOGASTER*

Stuart Tsubota, Theodore Ryan

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The *enhancer of rudimentary* gene is a highly conserved gene. Originally identified in fruit flies, it has been implicated in transcriptional regulation in cell division, tumorigenesis, pyrimidine biosynthesis, *Notch* signaling, and neurogenesis. In our lab, we use a variety of genetic and molecular approaches to examine diverse aspects of the gene, including conservation of function, regulation of expression, post-translational modification, and the identification of binding partners of the protein. To facilitate these studies, we have constructed an *e(r)* gene in which the protein-coding region has been replaced with a single restriction site, *Ncol*. This site allows us to insert any protein-coding region that has been generated by PCR with terminal *Ncol* sites. This results in a fusion gene in which the inserted coding region carries the normal regulatory regions of *e(r)*, and thus has the normal *e(r)* expression pattern. Our initial test of this construct and the use of this construct in studying the conservation of the function of the gene, the expression patterns of the gene, and the post-translational modification of the protein will be presented.

VALIDATION OF A RAMAN SPECTROSCOPY METHOD FOR QUANTITATIVE ANALYSIS OF PHARMACEUTICAL COMPOUNDS

Zachary L. VanAernum, Nicole M. Gombert, Kacie L. Rich, Irene Kimaru, Fang Zhao, Parag Budukh, and Kimberly Chichester

Chemistry Department, St. John Fisher College

Pharmacists currently do not have a fast, accurate or cost effective method of ensuring accuracy of their compounded formulations. Without proper analysis, human error can result in dangerous and even life threatening mistakes in formulation products. Current research at St. John Fisher College has proposed using Raman spectroscopy to address this issue due to its relatively inexpensive cost and ease of sample preparation. A Raman spectroscopy method was developed and data was obtained for acetaminophen slurries, which were prepared by students at The Wegman's School of Pharmacy. In order to validate the findings from the Raman Spectroscopy data, a second quantitative method was developed. HPLC with UV/Vis detection was used, as it is currently the USP standard for quantitative analysis of acetaminophen. Several sample preparation methods were developed to release the acetaminophen from the suspension vehicle, followed by dilution and filtration of the sample prior to HPLC analysis.

THE EFFECT OF 20-HYDROXYECDYSONE ON THE REVERSIBLE MITOCHONDRIAL TRANSHYDROGENASE IN *MANDUCA SEXTA*.

Kurt P. Vandock, Emily C. Perregaux, and Brianna M. Consiglio

The reversible, mitochondrial membrane-associated transhydrogenase from the midgut of *Manduca sexta* catalyzes hydride-ion transfer between NADP(H) and NAD(H). The effect of ecdysone and 20-hydroxyecdysone was evaluated and compared to both the NADH → NAD⁺ and NADPH → NAD⁺ transhydrogenations. In the direction of NADPH-formation, the developmentally significant

transhydrogenations occurs as non energy- or energy-linked reactions. The energy-linked activity couples with either electron transport-dependent NADH, succinate utilization, or ATP hydrolysis by Mg⁺⁺-dependent ATPase. Upon the addition of ecdysone alone, all energy-linked reactions in the direction of NADPH formation exhibited a notable increase in activity level over the control reaction. The addition of 20-hydroxyecdysone yielded no significant increase in the activity of any of the transhydrogenations. Synergistic addition of both ecdysone and 20-hydroxyecdysone resulted in no significant effect on transhydrogenase activity. The results of this study make evident a relationship between the presence of ecdysone and 20-hydroxyecdysone on the overall activity of *Manduca sexta* midgut mitochondrial transhydrogenations. The potential mediation of the energy-linked mitochondrial transhydrogenations involved with NADPH synthesis through the developmental relationship of ecdysone and 20-hydroxyecdysone is considered.

THE LOSS OF CADHERIN-11 IN THE MAMMARY GLAND RESULTS IN INCREASED APOPTOSIS AND DECREASED PROLIFERATION DURING BRANCHING MORPHOGENESIS IN THE ADULT MOUSE.

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St. Bonaventure University

The development of the mammary gland depends on interactions of the mesenchyme and epithelial cells. During development the epithelial cells grow and invade into the mammary fat pad. We hypothesize that cadherin-11 (Cdh11) is required for branching morphogenesis. In Cdh11 knock-out (KO) mice, we examined branching morphogenesis of mammary glands at 5 weeks of age. We detected an increase in end bud size and a decrease in secondary and tertiary branching in five week old Cdh11 KO mice when compared to the wild-type (WT) mice. To determine whether a decrease in proliferation or an increase in apoptosis was the reason, we examined levels of proliferation and apoptosis in these mice. Proliferation was decreased in the Cdh11 KO mammary gland when compared to the WT mice as seen by decrease in BrdU incorporation. Apoptosis was measured by injecting the mice with SR FLIVO in vivo. The SR FLIVO circulated within the mouse for six hours and the tissue was examined for indication of cell death by fluorescence on a confocal microscope. The SR FLIVO binds covalently to caspases, which is an indicator of cell death. It is evident that there is an increase in cellular apoptosis at three week and five week old time points with the loss of CDH11. TUNEL analysis on 5 week old mammary glands confirmed the increase levels of apoptosis. Further, using the mesenchymal C3H10T1/2 cells transfected with Cdh11 siRNA, we determined that caspase 8 and caspase 2 are the first two caspases increased with the loss of Cdh11. This suggests that the loss of Cdh11 in the mesenchymal cells may triggers anoikis in the mammary gland and that Cdh11 is required for proper development of the mammary gland.

MITOCHONDRIAL HAPLOTYPE VARIATION IN LAKE STURGEON, *ACIPENSER FULVESCENTS* (RAFINESQUE, 1817), OF THE GREAT LAKES BASIN

Michelle Lynne Weatherell and Larry Buckley
Rochester Institute of Technology

Lake sturgeon, *Acipenser fulvescens*, is one of twenty-five extant species of sturgeon; five of which reside in North America. Despite being a part of one of the most ancient lineages of modern vertebrates (Actinopterygii: Acipenseriformes) and having a vast geographic range, their populations are dwindling. Without knowing if these populations are genetically diverse or impoverished, it is difficult to determine how conservation efforts should be continued to help save the “dinosaur” fish species. The hypothesis

of this study was that populations of lake sturgeon, residing throughout the Great Lakes Basin and their tributaries are genetically depauperate; few mitochondrial haplotypes are present either from recent range expansion (10-20k years) or recent over-exploitation and habitat loss (<500 years). Using the mitochondrial DNA cytochrome *b* locus, the genetic diversity of these sturgeon populations was determined. Three distinct haplotypes of lake sturgeon were detected within the forty-two samples of this study. These haplotypes were segregated to: 1.) the St. Lawrence River (New York, U.S.A.), 2.) the Mattagami River (Ontario, Canada) and 3.) all remaining areas sampled within the Great Lakes Basin (both the USA and Canada). Another individual haplotype was also discovered after the addition of four of eight GenBank samples into the initial dataset. All four haplotypes show strong correlation to one another in both parsimony and maximum likelihood analysis. The genetic diversity seen within the lake sturgeon in this study is comparable to that found in other members of the Acipenseridae. Despite the low overall genetic diversity observed by this study, it is believed that this information can be useful in determining how to more efficiently allocate resources (monetary or otherwise) for the conservation efforts of this species.

VISUALIZATION OF NOVEL GUIDEPOST CELLS IN DROSOPHILA OLFACTORY MAP DEVELOPMENT

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Our ability to discriminate different smells depends on the systematic organization of olfactory sensory inputs, or glomeruli, in the olfactory bulb. This stereotyped arrangement of glomeruli is also called the olfactory map. Understanding how the map forms during embryogenesis is therefore critical for understanding how our sense of smell develops. However, little is known about how the pattern of glomeruli is organized. We observed that the Wnt5 protein is expressed in a dorsolateral-to-ventromedial gradient in the developing antennal lobe and may act as a prepattern. Consistent with the notion that the Wnt5 gradient acts as a template for glomerular patterning, the loss of the wnt5 gene severely disrupted the patterning of the glomeruli. We propose that novel Wnt5-expressing "Guidepost Cells" create the pattern of the Wnt5 protein. To characterize these guidepost cells we have placed the Gal4 gene under the control of the wnt5 promoter by homologous recombination to produce the wnt5-Gal4 driver. When we drove the expression of the UAS-GFP gene under the control of the wnt5-Gal4 driver we observed cells that are intimately attached to the dorsal-lateral pole of the developing antennal lobe, consistent with the cells being the sought-after Guidepost Cells. The Guidepost Cells are continuously associated with the antennal lobe during the period of dendritic patterning. During development Projection Neuron Dendrites migrate ventrally (down the Wnt5 gradient) but remain stationary in the wnt5 mutants. This led us to hypothesize that Wnt5 has a repulsive effect on Projection Neuron dendrites. We are currently testing the hypothesis that Wnt5 acts as a repulsive dendritic cue.

STABLE ASSOCIATIONS AMONG MALE BELUGA WHALES (*DELPHINAPTERUS LEUCAS*)

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In the wild, it is common for beluga whales to segregate themselves into male-only and female-only groups. The goals of the present study were to determine if evidence of this tendency was present in a captive population, and to assess whether stable associations among specific individual males are formed. The results are discussed with respect to a possible role for male-male alliances in this species.

TEMPORARY ASSOCIATIONS AMONG YOUNG BELUGA WHALES (*DELPHINAPTERUS LEUCAS*)

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The beluga whale is a highly social species that inhabits the high arctic. This study looked at the associations between baby belugas when away from their mothers, with particular focus on how often newborns (0-3 month old) associated with other calves. Observations were made on four baby whales (held in captivity at Marineland of Canada), over a three-month period. The results compare the associations they have with same-aged, and older-aged, juveniles. The findings are discussed with respect to the role that age stratification may play in the socialization of young whales.

MCHR1-EYFP AND RHODAMINE-MCH COLOCALIZE TO PRIMARY CILIA IN 3T3-L1 CELLS.

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Melanin concentrating hormone (MCH) is a peptide which plays a role in regulating appetite and energy levels in humans. It signals by binding to the melanin concentrating hormone receptor, classified as subtype 1 (MCHR1) or 2 (MCHR2). MCHR is part of the G-protein coupled receptor (GPCR) family. Primary cilia are microtubule-based appendages that serve an important role in cell development and differentiation. In Bardet-Biedle Syndrome (BBS), primary cilia are absent or formed defectively. One defining phenotype of this disease is obesity. Several BBS genes have been identified which are responsible for the localization and signaling of MCHR1 on the primary cilia (Berbari et al, 2008). The goal of this study was to determine if MCHR1-eYFP localizes to the primary cilia of differentiating 3T3-L1 cells. 3T3-L1 cells were plated on glass coverslips and transfected with MCHR1-eYFP. The media was changed every other day according to the differentiation protocol. Each day, one dish was treated with rhodamine-MCH on ice for 30 minutes then observed in the red and green channels of a fluorescence microscope. On day 0, fluorescence intensity was distributed throughout the cell. On days 1 -3, fluorescence became increasingly concentrated, causing the shape of cilia to be observed. Intense fluorescence was observed in the same location in both the red and green channels, indicating that the rhodamine-MCH co-localized with the MCHR-eYFP on the primary cilia. No visible change in fluorescence intensity or localization to cilia was observed over a 60 minute time period. This data confirms that MCHR1 localizes to primary cilia in non-neuronal tissues. Future experiments will determine which MCH signaling partners are present in cilia and whether ciliary localization of MCHR1 affects receptor sensitivity.

EXPLORATION OF NOVEL PHOSPHORUS(III) COMPLEXES OF 2-HYDROXOPYRIDINE N-OXIDE.

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There are only three reports in the literature of phosphorus compounds bearing the 2-hydroxopyridine N-oxide ligand. We sought to prepare the homoleptic and phenyl-substituted phosphorus(III) derivatives of this ligand in order to explore their general behavior and structural characteristics. The attempts to prepare these derivatives will be discussed.

ASSESSING TOTAL PHENOLIC CONTENT IN NATURAL WATER AND WILD FRUITS.

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Phenolic compounds in nature can be both beneficial and harmful to living organisms. This project uses spectroscopic techniques to quantify phenols in both natural waters (related to drinking water supply) and fruits (related to bird nutrition). My focus of the research is to find if different locations of water contains different concentrations of problematic phenols, if different fruit species consumed by migrating birds contains vary concentrations of beneficial phenols, and if the fluorescent method of phenol quantification can be proven to be a surrogate for the reagent-based Folin method.

LONG-TERM STABILITY THE VOCALIZATIONS OF KILLER WHALES (*ORCINUS ORCA*)

Paul Wirth, Michael Noonan
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Killer whales are a long-lived species that depend heavily on vocal communication. This study investigated the degree to which their vocalizations change over time. Recordings collected over a ten-year period at Marineland of Canada were compared. Results indicate very little change in call type, call frequency and call length. Overall, the findings indicate a long-term stability in the approximately twenty known calls that exist in the Marineland repertoire.

POSITIVE RELATIONSHIP BETWEEN FACULTATIVE BACTERIAL ENDOSYMBIANTS.

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Vertically transmitted bacterial endosymbionts are very common throughout the insect world. These organisms are transmitted through their hosts exclusively from mother to offspring. One factor that determines whether or not transmission is successful is infection density: bacterial titer must be high enough to guarantee success, while being low enough at the same time to avoid causing detrimental effects on the host's fitness. This experiment assessed the relationship between the presence of *Wolbachia* on *Spiroplasma*, two such endosymbionts, in the same host, *Drosophila neotestacea*. By using quantitative real-time PCR to measure *Spiroplasma* titer, we found evidence of a positive correlation between *Wolbachia* infection on *Spiroplasma* titer, suggesting the presence of *Wolbachia* positively impacts *Spiroplasma*. These results lend support to the possibility of a developing mutualism between *Wolbachia* and *Spiroplasma* in *D. neotestacea*.

RELATING SOIL FERTILITY AND PLANT COMPETITION TO COMMON BUCKTHORN (*RHAMNUS CATHARTICA L.*) INVASION SUCCESS.

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Rhamnus cathartica (common buckthorn) is a deciduous shrub or small tree that has invaded disturbed areas, open fields and meadows, wetlands, and young forests throughout New York. Buckthorn decreases native plant abundance directly through competition and indirectly by increasing soil nitrogen content, nitrogen and carbon cycling rates, and decomposition rates. Previous work has shown that buckthorn seedlings have higher mortality rates when grown under native herbaceous

plants; however, the inhibitory effects of native competitors may be less pronounced in low fertility environments. Thus, buckthorn's ecosystem-altering properties may provide buckthorn a competitive advantage in low fertility environments, such as abandoned agricultural fields common in western New York. We investigated the combined effects of competition and soil nitrogen availability on the growth of buckthorn. We transplanted buckthorn seedlings into experimental plots in which three levels of competition (above-ground, below-ground, and no competition) were combined in a factorial design with three levels of soil fertility (increased, decreased, and ambient). The plots were located in three successional habitats (meadows, shrublands, and forest edges) in six locations throughout western New York. We measured the change in seedling height and diameter following planting in the 2012 growing season and will continue during the 2013 growing season. When completed, our research will be used to determine how competitive ability and soil fertility interact to influence buckthorn invasion success in order to improve buckthorn management strategies.

DO STUDENT CURIOSITY QUESTIONS IN PHYSICS COURSES PREDICT FUTURE SUCCESS?

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This research was done to determine what the students are curious about in topics related to physics. This was done by surveying students about what questions they had about the class that they were in or what questions they had about physics in general. We found that the majority of the students at the beginning of the class were concerned with factual and fundamental physics questions. We also found that there was a correlation between the student's curiosity and their final grade. The higher the students' curiosity, the better motivation they have to perform well in class.