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FUTURE ACADEMY MEETINGS

2018 April 14 Bowling Green State University, Bowling Green, Ohio

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The Ohio Academy *of* Science

Hosted by
University of Cincinnati
April 8, 2017

Cover photo of Tangeman University Center, University of Cincinnati - Photo courtesy of the University of Cincinnati, http://www.uc.edu/

The Ohio Academy of Science 126th Annual Meeting

Hosted by
University of Cincinnati
Cincinnati, OH 45701
April 8, 2017

ABOUT THE ANNUAL MEETING

The Ohio Academy of Science's Annual Meeting is for academic, governmental, and industry scientists and engineers, university and pre-college educators and teachers, and pre-college, undergraduate, and graduate students, and interested lay citizens in the Ohio region.

Welcome!

The University of Cincinnati welcomes you to the 126th Annual Meeting of The Ohio Academy of Science. We invite you to explore our campus and to share in the excitement and opportunities provided in this program.

REGISTRATION

Registration is required for all meeting attendees and is included in the abstract submission fee. Register online at: **http://www.ohiosci.org/am-2017.**
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Saturday, April 8: Registration in the The Tangeman University Center, 4th Floor
7:30 AM - 12:00 Noon. On-site registration at a higher rate by check, VISA, or MasterCard. Cash is discouraged.

PARKING ON CAMPUS: Closest parking to the Tangeman University Center is at the CCM Garage. Additional parking is available at the Clifton Court Garage and Woodside Garage. See map on Page 41.

SMOKING POLICY: Smoking is not permitted in any building.

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MEALS: Saturday, April 8th - Box lunches may be pre-ordered with registration for $10.00 and will be available for pick-up at noon on the 4th floor of the Tangeman University Center Room 400ABC.

GENERAL SCHEDULE

Saturday, April 8, 2017

All events take place in Tangeman Univ. Center, 4th Floor.

7:30 AM - 9:00 AM	Breakfast
7:30 AM - Noon	Meeting Registration
9:00 AM - 10:15 AM	Poster Session Note: All posters will be displayed in both morning and afternoon sessions.
10:30 AM - Noon	Podium Sessions
Noon	Box lunch pick up
12:15 PM - 1:15 PM	Lunch State of the Academy All-Academy Lecture
1:30 PM - 3:00 PM	Poster Session Note: All posters will be displayed in both morning and afternoon sessions.

All-Academy Lecture

Tom Rudin
Board Director,
Board on Higher Education & Workforce,
National Academies of Science

Tom Rudin is the new board director of the Board on Higher Education and Workforce (BHEW) at the National Academies of Science—a position he assumed in mid-August 2014. BHEW provides government, academic and industry leadership with analyses, insights, and recommendations designed to inform action on issues in higher education and the science and engineering workforce. BHEW is a unit of the Policy and Global Affairs Division of the National Research Council.

Prior to joining the National Academies, Mr. Rudin served as senior vice president for career readiness and senior vice president for advocacy, government relations and development at the College Board from 2006-2014. He was also vice president for government relations from 2004-2006 and executive director of grants planning and management from 1996-2004 at the College Board. Before joining the College Board, Mr. Rudin was a policy analyst at the National Institutes of Health in Bethesda, Maryland.

In 1991, Mr. Rudin taught courses in U.S. public policy, human rights, and organizational management as a visiting instructor at the Middle East Technical University in Ankara, Turkey. In the early 1980s, he directed the work of the Governor's Task Force on Science and Technology for North Carolina Governor James B. Hunt, Jr., where he was involved in several new state initiatives, such as the North Carolina Biotechnology Center and the North Carolina School of Science and Mathematics.

He received a Bachelor of Arts degree from Purdue University, and he holds master's degrees in public administration and in social work from the University of North Carolina at Chapel Hill.

Our Institutional Host

The University of Cincinnati serves the people of Ohio, the nation, and the world as a premier, public, urban research university dedicated to undergraduate, graduate, and professional education, experience-based learning, and research.

We are committed to excellence and diversity in our students, faculty, staff, and all of our activities. We provide an inclusive environment where innovation and freedom of intellectual inquiry flourish.

Through scholarship, service, partnerships, and leadership, we create opportunity, develop educated and engaged citizens, enhance the economy and enrich our University, city, state and global community.

The College of Education, Criminal Justice, and Human Services (CECH) is committed to the pursuit of discovery and excellence in research, teaching, and service that addresses real world challenges and opportunities to create positive social change. CECH prepares students to maximize their ability to have a positive impact and to be contributing members to society.

To this end, CECH embraces five key values:

- Innovation: exploring, discovering, and implementing new ideas, methods, and applications
- Partnership: seeking out opportunities for partnership in our academic, research, and community pursuits
- Diversity: embracing and celebrating variation in styles, cultures, and disciplines
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- Support: providing an environment where faculty, staff, and students thrive

The University of Cincinnati research enterprise **integrates the arts, sciences, and technology** to provide unique opportunities for creation, discovery, innovation, and education that cross the traditional academic boundaries. Our mission is to create an agile research enterprise that can address current challenges and discern future possibilities for exploration that will benefit the greater Cincinnati community and the world beyond.

Dr. Patrick Limbach
Vice President for Research

Brief Schedule of Abstracts

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and
Poster Session 1:30 - 3:00 PM

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Located in the
Tangeman University Center, 4th Floor

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Microbiology and Genetics
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10:30 - 11:30 AM
Podium Session
Session 01
Lake Erie Ecosystems
Room 427

10:30 - FRESHWATER MUSSEL ASSEMBLAGES AT THE LOTIC-LENTIC INTERFACE ALONG LAKE ERIE. Robert A. Krebs (r.krebs@csuohio.edu). Dept. of Biological, Geological and Environmental Sciences, Cleveland State University.

Where a stream enters a large lake, the mouth will likely represent a mixed environment that is neither truly lotic nor lentic in nature. Consequently, what freshwater mussel (Unionidae) assemblages live in this heterogeneous system is poorly understood. The lower reaches of nine small tributaries of the western and central basins of Lake Erie were sampled for mussels in 2010 by sight, feel and with mussel rakes followed by similar surveys in 2011-2012 on three more streams and the large embayments of Muddy Creek and Sandusky Bay. Together, these systems composed 15 localities varying from 10 to 4000 km2 in watershed size. Regional land use was assessed by remote sensing, and basic water chemistry was measured by standard protocols. Evidence of unionid mussels occurred in all 15 localities, with 13 species found alive, but no live unionids were found in two streams. Dreissenid mussels were rarely encountered. The intercept of a regression of log-watershed size on species number approached zero, meaning mussels can occur in very small lake-influenced inlets, but the slope was just 1/6 that for rivers, indicating that species numbers increase slowly with greater watershed size. Low variation in both water chemistry and land use reduced their explanatory power although presence of bare fields probably contributed to high turbidity, the one water quality measure correlated with abundance. That feature may explain the increased presence of *Quadrula quadrula* and *Pyganodon grandis*, which tolerate depositional, low-flow environments, while the interchange of water may provide a refuge habitat for these native mussels.

10:45 - VARIATION IN FINGERNAIL AND PEA CLAM (SPHAERIIDAE) POPULATIONS IN LAKE ERIE. Taylor R. Schilling (t.schilling@vikes.csuohio.edu) and Robert A. Krebs (r.krebs@csuohio.edu). Dept. of Biological, Geological and Environmental Sciences, Cleveland State University, 28886 Alton Rd, Wickliffe, OH 44092.

Small clams in the family Sphaeriidae consist of the genera *Musculium*, *Sphaeriium*, and *Pisidium*. Although these clams are known from the Laurentian Great Lakes of the United States and Canada, this study focuses on the variation of sphaeriids between the central and western basins of Lake Erie. Since the samples were collected from this one body of water, less variation within a species was predicted compared to published literature on samples taken from across North America. The height/length (H/L) and width/length (W/L) ratios of the clams were used to aid in species identification and then to compare size and meristic variation within species. Surprisingly, variation levels in the lake were as high as that reported in the northern United States as a whole, and similarly, community composition was as diverse. But, while the western basin contained all three genera with *Pisidium* least common, the deeper waters of the central basin contained almost entirely *Pisidium*, and the assemblage consisted of up to 12 species at one site and 19 species across the central basin. Samples from Old Woman Creek (OWC), a freshwater estuary near Huron, Ohio, were also surveyed to test whether communities would follow that predicted for shallow waters or for the central basin fauna to which it drained. An initial survey identified a *Pisidium-Musculium* mix, however, recent hypoxic conditions led us to find no additional living clams.

11:00 - THE ROLE OF TRACE NUTRIENT LIMITATION IN THE CENTRAL BASIN OF LAKE ERIE CYANOBACTERIAL BLOOMS. Brittany Dalton[1,2] (b.m.dalton@vikes.csuohio.edu) and Justin Chaffin[1] (chaffin.46@osu.edu). [1]Franz Theodore Stone Laboratory, The Ohio State University, P.O. Box 119, 878 Bayview Road, Put-In-Bay, Oh 43456, [2]Cleveland State University, 2121 Euclid Avenue, Cleveland, Oh 44115.

Periodic summer blooms of the diazotrophic cyanobacterium *Dolichospermum* occur in the central basin of Lake Erie. High concentrations of nitrates and low phosphorus (P) make the presence of *Dolichospermum* in the central basin enigmatic. Trace nutrients molybdenum (Mo) and iron (Fe) are needed for nitrate-nitrogen (N) assimilation and low concentrations of these nutrients may create N limitation even with nitrate present. Six nutrient enrichment bottle bioassays were conducted using offshore central basin water from June 2 to August 26 in 2016 to determine which nutrient(s) limited algal growth and we hypothesized that more growth would occur when P(1µM) and trace nutrients, Fe(0.5 µM), Mo(0.1 µM), were enriched together compared with P-only enrichment. Chlorophyll *a* (Chla) (proxy for phytoplankton biomass) and ambient nitrate concentration were measured before and after incubation. In all experiments, P-only treatments demonstrated significantly ($P<0.001$, ANOVA) higher Chla (2.70 µg/L to 15.92 µg/L) than control (1.09 µg/L to 3.33 µg/L), which indicated a primary P-limitation. Enrichments of P with trace nutrients resulted in higher Chla than P-only in 3 of the 6 experiments and enrichments of P and ammonium-N resulted in highest Chla in 5 of the 6 experiments, indicating that other nutrients constrained growth. However, ambient nitrate concentration post incubation did not differ ($P > 0.05$) between P-only and P with trace nutrients in any experiments, indicating that Fe and Mo did not limit nitrate assimilation. Therefore, the trace nutrient colimitation in the central basin may favor *Dolichospermum* typically associated with high P and low N.

11:15 - ACCURACY OF DATA BUOYS FOR MONITORING HARMFUL ALGAL BLOOMS IN LAKE ERIE. Justin D. Chaffin[1] (Chaffin.46@osu.edu) and Douglas D. Kane[1,2] (dkane@defiance.edu). [1]Franz Theodore Stone Laboratory, Ohio State University, 878 Bayview Ave., Put-in-Bay, Ohio 43456, [2]Defiance College.

Real-time data buoys have become a valuable tool for lake managers, water treatment plant operators, and the public to monitor cyanobacterial (cHAB) abundance in Lake Erie. However, the buoys utilize sensors that measure total algae and cHABs by fluorescence, which is an indirect proxy for chlorophyll concentration. Furthermore, the sensors on the buoys are located about 0.6 m from the surface, whereas cHABs can regulate buoyancy and may be over or underestimated by the buoy sensors. The objective of this project was to determine how accurate data buoys are at monitoring for cHABs. Surface water samples (0-2 meter, n=147) were collected next to a data buoy located near Gibraltar Island throughout summers 2015 and 2016 and analyzed for total chlorophyll and with a fluorometric instrument (FluoroProbe) to determine cHAB-specific chlorophyll. Additionally, on a subset of dates (n=34) water was collected at every meter throughout the water column to determine vertical position of cHAB. cHAB-specific chlorophyll concentration measured in surface water samples peaked in late July 2015 at 116 ppb and had a very strong positive linear relationship with the buoy cHAB sensor ($R^2 = 0.96$). However, there was a weaker relationship between total chlorophyll and the buoy chlorophyll sensor ($R^2 < 0.50$). The every-meter sampling indicated that cHAB were spread evenly throughout the

water column or increased in concentrations towards the surface. Surface cHAB accumulations led to a few inconsistencies between the buoy data and every-meter data that could potentially lead to inaccurate warnings and water treatment procedures.

11:30 - 12:00 Noon
Podium Session
Session 02
Physics and Chemistry
Room 427

11:30 - THE NON-APPLICABILITY OF THE PRINCIPLE OF GALILEAN ADDITION OF VELOCITIES TO PROPAGATING SOUND WAVES. Gerald B. Harris (gbharris57@gmail.com). 335 Sentry Hill Road, Toledo, OH, 43615.

It is a premise of the Galilean principle of relativity that every reference frame behaves mechanically like an enclosed compartment at rest. As a consequence of this premise it is presumed to be mechanically impossible to discern the motion of any reference frame by observing experiments conducted within that reference frame. Material objects in flight within an enclosed compartment will manifest a particular velocity that arises from momentum transfer through physical contact with the compartment walls. Objects in flight outside of the compartment will exhibit essentially the same behavior via contact with the external physical structure of the moving compartment. However, a sound wave in flight through an enclosed compartment where the air has no wind currents in it will manifest one particular velocity while a sound wave propagating through the still air outside the compartment will manifest some other velocity—in a moving enclosed compartment the contained air's velocity is the same as the compartment's velocity and would add to or subtract from the sound wave's propagation velocity. There is then a difference in the mechanical behaviors of material objects and sound waves when they are moving through any particular medium based on whether that medium is within or outside of a moving enclosed compartment. Under certain conditions an observer in a stationary or moving reference frame may not have to apply the principle of addition of velocities from the Galilean or Lorentz transformation equations to the propagating sound wave. Not every reference frame is an enclosed compartment.

11:45 - GC-MS ANALYSIS OF CHINESE BAIJIU LIQUOR FLAVORED AS AMERICAN BOURBON WHISKEY. Heather Ketchum (hketchum17@sslcs.org), Regan Silvestri (rsilvestri@lorainccc.edu). Department of Chemistry, Lorain County Community College, 1005 N. Abbe Rd., Elyria, OH 44035.

Gas Chromatography-Mass Spectroscopy (GC-MS) is routinely used to profile the flavor compounds in alcoholic beverages. This method has been applied to unique experimental samples of Chinese Baijiu liquor flavored to taste more similar to American bourbon whiskey. Chinese Baijiu is a clear liquor, usually considered strong in flavor by the western palate. In an effort to modify these liquors into something more akin to the routine western palate, experimental samples have been produced of Chinese Baijiu liquors flavored to taste similar to American bourbon. This has been accomplished by subjecting Chinese Baijiu liquor to a novel accelerated aging process which employs pressure, as opposed to conventional time, to mature the spirit quickly and impart wooden barrel flavors. By processing Chinese Baijiu liquor via this innovative technology of accelerated pressure aging, the clear spirit becomes colored and flavored with wood in the short time of a few days. The distinct flavor compounds in these experimental liquors have been identified and profiled using routine straight injection GC-MS. Foremost, the wood aged Chinese Baijiu flavor is characterized by an increase in ethyl hexanoate, which imparts a sweet and fruity nuance.

10:30 - 12:00 Noon
Podium Session
Session 03
Microbiology and Genetics
Room 419AB

10:30 - IN SEARCH OF A COUNTER YOU CAN COUNT ON. Dustin J. Rieman (d-rieman.1@onu.edu). Ohio Northern University, 402 College Rd., Pandora, OH 45877. [Advisors: LMYoung, VAMotz. Ohio Northern University].

Colony quantification is essential in the clinical setting. Many methods exist for quantification. Human visual counting (HV) is the most common but is time consuming. Automated colony counters range from professional models costing thousands of dollars to phone apps costing under $100. The time, accuracy and precision of the professional Neutec Flash N'Go (FNG) counter was compared to the phone HGColony app (HGC) and HV counting. Cultures of *Escherichia coli*(ATCC 25945), *Staphylococcus epidermidis*(ATCC 12225), *Streptococcus pyogenes*(ATCC19615), *Streptococcus pneumonia*(ATCC49619) were prepared at 0.5 McFarland standard and serial dilutions performed. Plates were inoculated with 50CFUs, 125CFUs, 250CFUs and 500CFUs. Colony count (6 tests x 4 bacteria) and counting time were recorded. Comparison of three human counters to FNG and app indicated significant differences in count ($p=0.002$) While HV and FNG were not significantly different ($p=0.10$) the HGC is significantly different than both HV and FNG ($p=.0001$ for both). The pattern of efficacy for all bacteria was similar: plates with low counts were similar for all methods; HGC differed significantly from the other two as bacterial counts rose; in all cases counts were 40-50% of expected based on spectrophotometric measurements of applied cells. Importantly, The FNG mean time (16.4 +/-10.3 seconds) was significantly faster than human 45.8 +/-30.3s) but not as fast as the HGC (7.17 +/-1.34s) (ANOVA $p=<.0001$; ad hoc t-tests all $p<0.005$) Accuracy of visual count decreases as colony count increases (mean deviation at 500CFU = 12.08 +/-7.9 decreasing to 2.32 +/- 1.24 at 50CFU). The FNG is considerably faster than HV and as accurate; the HGC while fast is unreliable.

10:45 - DIFFERENTIAL SEXUAL SURVIVAL OF *DROSOPHILA MELANOGASTER* ON COPPER SULFATE. Michael A. Balinski (mbalins@bgsu.edu) and Ronny C. Woodruff (rwoodru@bgsu.edu). 417 Life Science Building, Bowling Green State University, Bowling Green, Ohio 43403.

Previous studies investigated the influence of X-chromosomes on the viability of *Drosophila melanogaster* exposed to cadmium, and on the role of X-linked genes in copper homeostasis. Based on these studies the effect of copper sulfate ($CuSO_4$) on offspring viability was examined using three independent, inbred D. *melanogastercrosses* with different genetic backgrounds (ensuring identical autosomes for males and females within each cross). Each cross was performed with attached X-chromosome females and single X-chromosome males, allowing estimations of diplo and haplo-X-chromosome affects upon offspring viability exposed to $CuSO_4$. Based on previous studies, it was hypothesized that gender-based viability differences to $CuSO_4$ are a result of X-chromosome ploidy and genetic

variation affecting metallothionein expression. Following ANOVA and Bonferroni post-tests of the 450 lines, two of three crosses had significantly higher numbers of male offspring compared to female offspring upon $CuSO_4$ exposure (Cross 1: 88%- 96%, Cross 2: 69%-93%). Cross 3 showed significantly different offspring viability at all $CuSO_4$ exposure levels compared to other crosses. Crosses 1 and 2 differed significantly at all but 1.25mM $CuSO_4$ exposure level (Cross 1: 96%, Cross 2: 93%). Differential offspring viability among *D. melanogaster* crosses suggests that different genetic backgrounds (autosomal and/or X-chromosome) can result in significant differences in heavy metal and metallothionein regulation. This study suggests that the effect of copper on offspring viability depends on both genetic background and gender, as both factors affected survival, presumably due to differential metallothionein regulation as well as the homeostasis of biologically necessary heavy metals.

11:00 - ANALYSIS OF SIMPLE MATHEMATICAL MODELS OF CIRCADIAN RHYTHMS IN *NEUROSPORA CRASSA*. Kairavee K. Thakkar (thakkakk@mail.uc.edu). University of Cincinnati, 2667 Highland Avenue, Cincinnati, OH 45219.

Circadian rhythms are biological clocks featured in a variety of living organisms ranging from unicellular organisms to mammals. These clocks have a period of approximately 24 hours in humans. Understanding the circadian rhythm is quite significant because of its importance in understanding sleep disorders like insomnia and other psychological illnesses. This report provides two mathematical models that describe circadian clocks in *Neurospora crassa*, a filamentous fungus. Mathematical models, in this research, are representations of molecular mechanisms of core clock components in the form of equations (ordinary differential equations, in this case). These two mathematical models have been compared and analyzed based on the numerical solutions and parameter analysis. Two types of degradation of messenger RNA were considered – linear type degradation and Hill type degradation. The circadian clock that has been studied in this research is that of *Neurospora crassa* because of its simple clock model and its similarity with the circadian oscillators of humans and other mammals. The mathematical models were simulated using the software MATLAB and the detailed analysis of each parameter in the ordinary differential equations of mathematical models was done by using the program XPP. Based on the results obtained from XPP and comparing both models, it is observed that Hill type degradation of messenger RNA keeps the circadian rhythm more stable than the linear type degradation of messenger RNA.

11:15 - EFFECT OF ASCORBIC ACID ON THE MAIN GENES INVOLVED IN THE PHYSIOPATHOLOGY OF PROGRESSIVE OSSIFYING FIBRODISPLASIA. Deborah R. Nascimento[1] (deborahrn19@gmail.com), Sarah F. Martins[2] (sarahebreia@yahoo.com.br), Fabiana Alves[2] (alves.bio@gmail.com), Francisco O. Vieira[2] (chicobrant@gmail.com), Liane R. Giulliani[1] (lrossog@yahoo.com), Marilene G. Palhares[1] (marilene.palhares@bol.com.br), Adam C. Underwood[3], (aunderwood@walsh.edu), Elaine M. S. Fagundes[2] (elainefagundes@gmail.com), Durval B. Palhares[1] (dbpalhares@hotmail.com), Amy Milsted[4] (milsted@uakron.edu), and Almir S. Martins[2] (alisbetermster@gmail.com). [1]Universidade Federal de Mato Grosso do Sul, Campo Grande/MS, Brasil and The University of Akron, Department of Biology, 302 Buchtel Commons, Akron, OH 44325-3908. [2]Universidade Federal de Minas Gerais, Belo Horizonte/MG, Brasil. [3]Walsh University, School of Arts and Sciences, Division of Mathematics and Science 2020 East Maple Street North Canton, OH 44720. [4]University of Akron.

Fibrodysplasia Ossificans Progressiva (FOP) is characterized by congenital skeletal malformations presenting postnatal heterotopic ossification. Classic FOP patients have mutation in heterozygous (c.617G> A, p.R206H) in the ACVR1 gene. There is no treatment, while management of FOP is often carried out by anti-inflammatories. Ascorbic acid (AA) may play a role in the stabilization of FOP (Palhares, 1997), however AA mechanism of action is unknown. Previous demonstrated that peripheral blood mononuclear cells (PBMC) were useful for in vitro studies of mechanisms of FOP Pathophysiology. The present investigation, using PBMC, is aimed to analyze mRNA expression of FOP targets ACVR1, BMP4, COL1 e COL3, linked to pathophysiology. PBMC of volunteer patients (n=4) versus healthy controls (n=4), treated with 2mM AA for 24h in culture. Total RNA was extracted followed by reverse transcription and real time PCR. The mRNA expression levels of the four evaluated genes in control individuals were not statistically different in PBMC when compared before and after AA treatment. PBMC of the FOP patients, before AA treatment, showed lower mRNA expression for ACVR1 and COL3, while presented higher expressions of BMP4 *and* COL1,compared to normal control individual (0.4 fold for each, $p<0.01$). Nevertheless, PBMC of patients when treated with AA showed that the relative levels of mRNA expression of the four genes studied were brought back to normal values equal to those of control subjects. Therefore, in this study a possible modulation of expression of key genes involved in the pathophysiology of FOP would explain the AA usage for the stability of flair-ups in FOP patients.

10:30 - 12:00 Noon
Podium Session
Session 04
Ecology and Environmental Science
Room 417ABC

10:30 - PRIMARY AND SECONDARY INSECT HOST PLANTS: FIELD OBSERVATIONS ON THE BASSWOOD LEAFMINER. Curtis E. Young (young.2@osu.edu). Ohio State University Extension, Van Wert County, 1055 South Washington Street, Van Wert OH 45891.

The basswood leafminer (BLM) (*Baliosus nervosus*) is a native beetle that primarily feeds on the foliage of the American basswood (*Tilia americana*) as both larvae (leafminers) and adults (skeletonizers). As the primary host plant for BLM in Ohio, basswood supports all aspects of the beetle's life cycle. BLM also completes its life cycle on littleleaf linden (*T. cordata*) and silver linden (*T. tomentosa*). BLM has additionally been reported to use or has been observed on a multitude of other trees, shrubs, and herbaceous plants. These other hosts might be primary, secondary, or non-hosts. Secondary hosts marginally support the beetle's life cycle or only support a portion of the life cycle. A list of host trees includes several species of oak (*Quercus*), elm (*Ulmus*), maple (*Acer*), and apple (*Malus sylvestris*). Reported herbaceous plant species include soybeans (*Glycine max*), lima beans (*Phaseolus lunatus*), green beans (*P. vulgaris*), and asters (*Aster*). However, these reports may be based on misidentifications of the beetle. There are closely related beetle species that do feed on herbaceous plants while BLM only feeds on trees. All of the above host trees naturally occur in Ohio, but no activity of BLM had been reported on them. In 2016, observations made on BLM populations in northwest Ohio were begun in April and continued through October. These observations included the beginning of activity, mating, oviposition, mining, new adult emergence, and cessation of activity. They also revealed an unexpected shift in the new adults from their primary hosts to secondary hosts. The shift in host species did not occur until late in the season. If observations had not been conducted multiple times

and late into the season, the evidence of the utilization of the secondary hosts would have been missed. These observations help to clarify some of the vague reports of BLM's host range.

10:45 - SLOWING THE SPREAD OF WINTERCREEPER IN WOODED NATURAL AREAS IN OHIO. Denis G. Conover (denis.conover@uc.edu), Donald R. Geiger (dgeiger1@udayton.edu), and Tim Sisson (tsisson@fuse.net). Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221-0006.

Wintercreeper, *Euonymus fortunei*, is an evergreen trailing shrub or climbing vine introduced from Asia. It is an easily propagated ground cover that is widely used by landscapers and homeowners. Wintercreeper seeds are eaten by birds which spread them into natural areas through their feces. The trailing vines form dense mats of ground cover that decrease native plant diversity in wooded natural areas. The objective of this study is to slow the spread of wintercreeper in these areas without damaging the native vegetation. The method involves foliar spraying of the evergreen wintercreeper vines with either Glyphosate or Triclopyr herbicide on warm days in late winter when the shoots of native plants are leafless or absent from above the ground. The goal is to apply a fine spray of herbicide to as many of the wintercreeper leaves as possible. Susceptibility of wintercreeper to late winter foliar application of herbicide was verified by the failure of the wintercreeper plants to grow normally with the return of warm weather. Growth was slow and distorted and approximately 95% of the plants were killed. Clearly the herbicides were taken up by the leaves and distributed throughout the plants resulting in lethal processes after warming activated plant metabolic processes. Native plants showed no visible ill effects. To totally eliminate winter creeper from an area it may be necessary to spray again the following winter to kill plants that were not killed by the first spraying. The program shows potential for offering a practical means for preventing the loss of native spring wildflowers and serious deterioration of woodland natural areas by wintercreeper.

11:00 - HARVESTING OF ENERGY POTENTIAL FROM CONSERVATION RESERVE PROGRAM LAND FOR WIN-WIN SITUATION. Y. Raut (raut.2@osu.edu). The Ohio State University, South Centers, 1864 Shyville Road, Piketon, OH 45661.

The United States 1985 Conservation Reserve Program (CRP) is the largest (10 million hectare) public-private partnership initiative for federally incentivizing land owners to retire their environmentally sensitive land from intensive production. CRP lands planted with a warm-season perennial mix have not been harvested for any use for thirty years which might lead to land degradation process. The hypothesis of this study was that CRP lands have been degraded, but can be beneficially used and its quality restored with proper management. Ten year unharvested warm-season perennial prairie mix CRP land in Piketon, OH was selected in 2009 for the study. Treatments imposed on this land were five levels of Nitrogen (N) (0, 10, 20, 40 and 80 kg N ha^{-1}) and three management strategies (-A: Harvest in March or April; -B: 1st harvest in May and 2nd harvest in March or April of the next year; and -C: Multiple harvests during May through October) with four replications. Aboveground Net Primary Production (ANPP) biomass sampling, the proper utilization of biomass as bioenergy feedstock without harmful effects on the soil environment, was conducted from 2009 through 2014. Another tool used to determine the quality of the soil is Soil Carbon Sequestration (SCS), which is the desired process of harvesting atmospheric carbon dioxide (CO_2) and storing it into the soil. Energy yields from ANPP (GJ ha^{-1} yr^{-1}) increased in all management strategies between 2009 and 2014 (-A: 96 to 287; -B: 83 to 202; -C: 83 to 194, respectively). Ecosystem losses of desirable nutrients were significantly lower with Management-A compared to the other two management strategies ($p \leq 0.05$). SCS (CO_2-C Eqvt Mg ha^{-1}) increased by 70% and 3% with Management-A and -B, respectively; whereas, a significant decrease of 21% in SCS was found with -C ($p \leq 0.05$). Results show that management strategies, specifically -A, contributed to the greatest restoration of the system.

11:15 - COMPETITION AND PREDATION THREAT: NUTRITIONAL PLASTICITY IN GRAY TREEFROGS. Troy C. Neptune (troy.neptune@otterbein.edu) and Sarah S. Bouchard (sbouchard@otterbein.edu). 1 S Grove St. Otterbein University SMC 11051, Westerville, OH 43081.

Anurans utilize physiological tradeoffs to best fit their environment. In some larval anurans, intraspecific competition induces longer guts, providing a digestive advantage under limiting resources. However, a predation threat can stimulate deeper tails and an associated shorter gut. The purpose of this study was to describe plastic responses of larval gray treefrogs, *Hyla versicolor*, reared with simultaneous environmental stressors: predation and competition. Specifically, do larvae guts lengthen to increase digestive efficiency or will longer tail lengths increase escape rates? *H. versicolor* larvae were reared in 410 L mescocosms with and without a caged *Anax sp*. (dragonfly) predator. *Anax* predators were fed five *H. versicolor* hatchings daily to generate kairomones in the larval environment. Larvae were maintained at 10 individuals (N = 5) and 60 individuals (N = 4) per tank. Larvae reared at high-density developed longer guts than those reared at low density. Predation threat did not influence gut length. Larvae reared with predators had smaller livers and deeper tails than those reared without a predator. These differences suggest that larvae have lower fat stores when they grow larger tails, which supports a tradeoff. Further analyses will determine if larvae in competitive environments maintain the capacity to develop deep tails in addition to long guts.

11:30 - EXOTIC TREES CONTRIBUTE TO URBAN FOREST DIVERSITY AND ECOSYSTEM SERVICES IN INNER-CITY CLEVELAND, OH. Christopher B. Riley (riley.595@osu.edu), Daniel A. Herms (herms.2@osu.edu), and Mary M. Gardiner (gardiner.29@osu.edu). Department of Entomology, Ohio Agricultural Research and Development Center, The Ohio State University, 1680 Madison Avenue, Wooster, OH 44691.

Vacant land, a product of population and economic decline, has increased substantially in shrinking cities around the world. In Cleveland, Ohio, vacant lots are minimally managed, concentrated within low-income neighborhoods, and support a large portion of the urban forest. The composition, structure, and value of the forest on this property type remains largely unknown, as do differences between it and forests found on lots containing standing residential structures. Abundance, taxonomic richness, taxonomic diversity, and size class of native and exotic tree species on inner-city vacant lots, inner-city residential lots, and suburban residential lots were quantified, and i-Tree Eco was used to model the quantity and economic value of regulating ecosystem services provided by their respective forest assemblages. Inner-city vacant lots supported three times as many trees, more exotic than native trees, and greater tree diversity than inner-city and suburban residential lots, with the plurality of trees being naturally-regenerated saplings. The urban forest on inner-city vacant lots also had two times as much leaf area and leaf biomass, and more tree canopy cover. The quantity and monetary value of regulating ecosystem services provided by the urban forest was greatest on inner-city vacant lots, with exotic species contributing most of that value, while native taxa provided more monetary value on residential lots. The predominately naturally-regenerated, minimally managed exotic tree species on vacant land

provide valuable ecosystem services to the inner-city neighborhoods of Cleveland, OH.

11:45 - REVIVAL OF NATIVE PLANTS AFTER REMOVAL OF INVASIVE ALIEN PLANTS. Tim Sisson (tsisson@fuse.net). 956 Anderson Ferry Road, Cincinnati, OH 45238.

Several species of invasive alien plants including amur honeysuckle (*lonicera mackeii*), winter creeper (*euonymous fortunei*) and garlic mustard (*alliaria petiolata*) had become quite numerous at a nature preserve, Bender Mountain, in Hamilton County, Ohio. They are all very competitive and because of their presence native plant populations at the preserve were severely reduced. We decided to see if it would be possible to remove these alien plants so that the native populations could return. A variety of control techniques were used at the preserve. Cutting, with subsequent treatment of the stumps with a 20% glyphosate mixture, was used on large amur honeysuckle. Foliar spraying with a 2% mixture of glyphosate was used on small amur honeysuckle and small garlic mustard. Larger garlic mustard were pulled out mechanically. Foliar spraying with a 2.5% Triclopyr herbicide solution and an added nonionic surfactant was used on winter creeper. This program of invasive control was started in 2004 and continues to the present. It was possible to remove virtually all of these alien plants over the study area. The result was a resurgence of the native plants. A recent plant survey has shown a total of about 400 species of vascular plants in the preserve.

10:30 - 12:00 Noon
Podium Session
Session 05
Human and Public Health
Room 415AB

10:30 - IMPACT OF α-ALKYL CHAIN LENGTHENING ON SYNTHETIC CATHINONE "BATH SALT" PLASMA AND BRAIN PHARMACOKINETICS. Gregory G. Grecco[1] (ggrecco@bgsu.edu), David F. Kisor, Joseph S. Magura, and Jon E. Sprague. [1]Ohio Attorney General's Center for the Future of Forensic Science, Bowling Green State University, Bowling Green, OH 43403.

Since 2009, the synthetic cathinones ("bath salts") have risen in popularity as drugs of abuse. However, there is a paucity of studies that have determined the impact of functional group modifications in the synthetic cathinone chemical structures on plasma and central nervous system (CNS) pharmacokinetics. In the present study, we investigated the *in vivo* plasma and CNS pharmacokinetics of three synthetic cathinones whose structures differ by lengthening of the α-alkyl chain: methylone ($-CH_3$), butylone ($-CH_2CH_3$), and pentylone ($-CH_2CH_2CH_3$). Male Sprague-Dawley rats (n=3-4) were treated with a 20 mg/kg subcutaneous dose of the individual synthetic cathinone. Plasma samples were obtained at specific times from a jugular vein cannula over an eight hour period. Over a three-hour period, CNS samples were obtained using a microdialysis cannula surgically implanted into the lateral ventricle. In the plasma, pentylone, with the greatest lipophilicity, displayed the highest C_{max} and $AUC_{0-\infty}$, and the longest $t_{1/2}$. Decreasing the α-alkyl chain length as in butylone and methylone significantly decreased the C_{max}, $AUC_{0-\infty}$, and $t_{1/2}$. Conversely, in the CNS, methylone and butylone displayed larger C_{max} and $AUC_{0-\infty}$ than pentylone. These findings demonstrate that methylone, butylone, and pentylone have access to the CNS resulting in greater CNS exposure as compared to plasma exposure which may be ostensibly linked to CNS toxicity.

10:45 - FACTORS CONTRIBUTING TO VARIATIONS IN MULLEIN ANTIBIOSIS AND ANTI-INFLAMMATORY ACTIVITY. Kristina Myers (k-myers.5@onu.edu), Cole Pelger (c-pelger@onu.edu), Dustin Rieman (d-rieman.1@onu.edu), Tommy Troy (t-troy.1@onu.edu), Sara Landis (s-landis.1@onu.edu). Ohio Northern University, 402 West College Ave., Unit 1532, Ada, OH 45810.

Native Americans infused the flowers of Common Mullein (*Verbascusm thapsus* L.) in oil to treat earaches; leaves were smoked or made into a tea to treat respiratory infections and inflammation. Both flower and leaf extracts inhibit growth of *Streptococcus pneumoniae*, a common causative agent of ear aches and respiratory infections. However, this inhibition of *S. pneumoniae* is not consistent for extracts from plants grown in different locations. This project sought to determine the reason for inconsistent antibiosis and to determine whether anti-inflammatory actions also varied. *Verbascum thapsus* leaf samples were collected at various locations in the United States from June-August, 2016 in different reproductive stages (pre-flower, in flower, post-flowering) and a soil sample was taken at each site. Leaves were extracted in aqueous 50 mM pH 4 phosphate buffer. Extracts were chemically analyzed for constituents and assessed for anti-inflammatory action using an HT-29 colon cancer based assay examining expression of inflammatory cytokines following carageenan exposure. Extracts were also tested for antibiosis by Kirby Bauer analysis against the respiratory bacteria (*S. pyogenes, S. pneumoniae,* and *K. pneumoniae*) and against non-respiratory bacteria (*S. epidermidis, B. subtilis,* and *E. coli*). Additionally, leaves were burnt; the smoke exhibits antibiotic efficacy and is being assessed for constituents. Soil pH was determined and nitrogen, phosphorous, and potassium nutrient values were measured. Once all data are obtained, correlations will be sought between biotic and abiotic assessments.

11:00 - TICKBORNE DISEASE BURDEN AND PREVENTION EDUCATION IN OHIO. Jeff Vasiloff (vasiloff@ohio.edu). Ohio University, Dublin Campus, 6805 Bobcat Way, Dublin, OH 43016. Alex Feldstein (alex.feldstein@otterbein.edu).

Background: Tickborne diseases have become increasingly common nationwide. Four Ohio reportable tickborne diseases include Lyme disease, Rocky Mountain Spotted Fever (RMSF), Erlichiosis, and Anaplasmosis. The purpose of this study was: a) to calculate the recent burden of these diseases in Ohio; and b) to develop a low-cost intervention to assist health educators and public health agencies in preventing these illnesses. Methods & Materials: Using data provided by the Ohio Department of Health, we analyzed the case counts of 4 tickborne diseases from 2009-2015. Cases were characterized by age, sex, and month of diagnosis. Using public health education principles, we developed an educational poster. Results: From 2009-2015, there was a total of 762 cases of 4 tickborne diseases. The case counts of the 4 diseases were: 17 (2%) Anaplasmosis, 60 (8%) Erlichiosis, 124 (16%) RMSF, and 561 (74 %) Lyme disease. Of cases in 2013, 56.3% were in females, and 43.7% in males. Also in 2013 the age distribution was < 20 years: 18.5%, 20-39: 16%, 40-59: 37%, and 60+: 28.6%. Finally, 73.1% of cases were diagnosed between May 1 and August 31. The educational poster featured the acronym, TICKSAFE, where each of the 8 letters represented the beginning of a key preventive message. Conclusion: Tickborne diseases are endemic in Ohio. While they occur mostly in late spring and summer, they affect both sexes and all ages. Use of TICKSAFE posters, pamphlets, face-to-face presentations, and public service announcements can be used to combat these illnesses and keep Ohioans safe.

11:15 - MULTITASKING STRATEGY: ANALYSIS OF MATB COMPONENT SPECIFIC PARAMETER TYPES. Lanie A. Monforton (monforton.2@wright.edu) and Chandler A. Phillips (chandler.phillips@wright.edu). Department of Biomedical, Industrial and Human Factors Engineering, Wright State University, Dayton, OH 45435.

Research on multitasking strategies is limited. In order to describe the human operator's (HO's) multitasking strategy, identification of multitasking parameter categories is required. These categories include sensory input, temporal domain, and operator action. A computer-based multitasking simulation software Multiple-Attribute Task Battery (MATB) assesses four task components Monitoring, Communications, Resource and Targeting. The parameter types for Monitoring are visual, continuous and stimulus-response. The parameter types for Communication are auditory, discrete and stimulus-response. The parameter types for Targeting are visual, continuous and manual control. Finally, the parameter types for Resource are visual, continuous and stimulus-response. In order to describe the HO's multitasking strategy by parameters, thirty-four subjects operating MATB were instructed to equally divide their attention between the four equally weighted task components. We anticipated that the HO's would equally divide their time and attention among the four task specific components. Data analysis made comparisons between the four component specific operator weighting and equal component specific weighting. Results indicate that HOs are unable to divide equally their attention between the four task components. The three visual tasks (Monitoring, Resource and Targeting) were equally weighted. The auditory task (Communication) was overweighted. In summary, HOs prioritized the auditory cuing of Communication over the other three visual tasks. By identifying the prioritization of parameter types, strategies can be used to design better multitasking systems. Future research will aid our understanding of how human operators' multitasking strategies are affected by other combinations of component-specific parameter types.

11:30 - TYPHOID FEVER AND SALMONELLA BIOFILMS: AN INVESTIGATION OF THE AMINO ACIDS INVOLVED IN CHOLESTEROL BINDING. Halley J. Alberts[1] (s300629041@students.rio.edu), John S. Gunn[2] (john.gunn@osumc.edu), John A. Means[1] (jmeans@rio.edu). [1]School of Mathematics and Natural Sciences, University of Rio Grande, P.O. Box 500, Rio Grande, OH 45674, [2]The Ohio State University, College of Medicine, Biomedical Research Tower, Rm. 794, 460 W. 12th Ave., Columbus, OH 43210.

Typhoid (or enteric) fever remains a prominent source of morbidity and mortality worldwide, accounting for 155,000 deaths annually, with a majority of these deaths being in children under five years of age. Upon mitigation of the disease, approximately 2-5% of those affected by typhoid fever progress to a state of chronic, asymptomatic carriage, to which antibiotics are ineffective. This is mainly thought to be due to *Salmonella enterica* serovar Typhi colonization and persistence in the gallbladder and is strongly associated with the presence of bacterial biofilms on gallstones and the gallbladder epithelium. Some studies have suggested that *Salmonella*'s flagella initiate cholesterol binding and, thus, biofilm formation. Crawford et al. determined the significance of one of *S. enterica*'s flagellar subunits, FliC, in cholesterol binding. The binding pocket of FliC has been further explored, and several amino acids are thought to be critical for cholesterol binding. Using a model strain, point mutations were made, targeting each of these critical amino acids. Each of the strains will be tested for cholesterol-binding abilities by initiating biofilm growth in cholesterol-coated 96-well plates. Planktonic cells will be removed, and cholesterol-bound biofilm will be quantified using a crystal violet assay. Cholesterol binding levels of each of the mutant strains will be compared to determine which amino acids are most critical for biofilm initiation. Once these subunits are identified, exploration of small molecule inhibitors may begin.

Pre-college Poster Sessions
9:00 – 10:15 AM
and
1:30 – 3:00 PM
Tangeman University Center
Great Hall (4th Floor, Room 465)

Note: All posters will be displayed in both morning and afternoon sessions.

Poster Board No. 001 DESIGN OF LOW EARTH ORBIT SAMPLE HOLDERS FOR DETERMINATION OF CHAMFERED EDGE EFFECTS ON ATOMIC OXYGEN EROSION YIELDS. Kshama Girish[1] (kgirish18@hb.edu), Bruce A. Banks[2] (bruce.a.banks@nasa.gov), Kim K. de Groh[3] (kim.k.degroh@nasa.gov). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122. [2]SAIC at NASA Glenn Research Center, Cleveland, OH, [3]Environmental Effects and Coatings Branch, NASA Glenn Research Center, Cleveland, OH.

The exteriors of low Earth orbit (LEO) spacecraft are subjected to many environmental threats that can cause the surface materials to degrade. One of these threats is atomic oxygen (AO), which is formed by photodissociation of molecular oxygen by short wavelength UV radiation. Atomic oxygen exposure can result in oxidative erosion of polymers leading to structural or thermal failure of spacecraft components. The amount of AO erosion expected during a mission can be calculated by knowing the AO erosion yield (E_y, thickness loss per incident atomic oxygen atom) of the material and the AO fluence expected for the mission. The E_y can be determined through dehydrated mass loss measurements of test samples if one knows the AO fluence, density, and area of exposure. Such measurements have been made as part of flight experiments, such as the Materials International Space Station Experiment 2 (MISSE 2) Polymers Experiment. The MISSE 2 Polymers Experiment sample holders had chamfered circular apertures that controlled the exposure area, but also allowed AO to scatter from the chamfered surfaces onto the samples. This scattering increases the local flux and therefore results in an E_y which is higher than simply computing it based on the sample area. In addition, some MISSE 2 samples peeled at their edges due to this scattering effect. Sample holders with different chamfered-perimeter to exposed-area ratios have been designed for future spaceflight experiments that allow more accurate determination of the E_y for large area polymers, representative of their functional use on spacecraft surfaces.

Poster Board No. 002 EFFECT OF RAM EXPOSURE ON THE OPTICAL PROPERTIES OF POLYMERS IN SPACE. Yuanchun Li[1] (jli18@hb.edu), Kim K. de Groh[2] (kim.k.degroh@nasa.gov), Bruce A. Banks[3] (bruce.a.banks@nasa.gov), Halle Leneghan[1] (hleneghan16@hb.edu), Olivia Asmar[1] (oasmar16@hb.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Environmental Effects and Coatings Branch, NASA Glenn Research Center, Cleveland, OH, [3]SAIC at NASA Glenn Research Center, Cleveland, OH.

The temperature of spacecraft is influenced by the solar absorptance and thermal emittance of the external spacecraft polymer materials. Optical and thermal properties can degrade over time in the harsh low Earth orbital (LEO) space environment where polymers are exposed to radiation, thermal cycling, and atomic oxygen. Therefore, it is important to test their durability in the space environment. One objective of the Polymers Experiment was to determine the effect of long term LEO space exposure on the optical properties of various spacecraft polymers for each one's performance prediction purposes. This experiment was flown as part of the Materials International Space Station Experiment 7 (MISSE 7) mission on the exterior of the International Space Station (ISS) for 1.5 years. Samples were flown in the ram and zenith orientation, receiving different atomic oxygen and solar radiation exposures. Total diffuse reflectance and transmittance of seven ram and two zenith flight and corresponding control samples were obtained post-flight using a Cary 5000 UV-Vis-NIR Spectrophotometer. Integrated air mass zero solar absorptance (α_s) of the flight and control samples were computed from the total transmittance and reflectance, and compared. White Tedlar samples became brighter and decreased in α_s (up to 0.078), while polypropylene became darker and increased in α_s by 0.050 with ram exposure. Results show that prolonged space exposure increases the solar absorptance of some materials. Knowing which polymers remain stable will benefit future spacecraft design.

Poster Board No. 003 OVERVIEW OF THE FLEXURAL STRESS EFFECTS EXPERIMENT AFTER 1.5 YEARS OF WAKE SPACE EXPOSURE. Kathleen E. Snow[1] (ksnow18@hb.edu), Kim K. de Groh[2] (kim.k.degroh@nasa.gov), Bruce A. Banks[3] (bruce.a.banks@nasa.gov). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Environmental Effects and Coatings Branch, NASA Glenn Research Center, Cleveland, OH, [3]SAIC at NASA Glenn Research Center, Cleveland, OH.

Low Earth orbit space environment conditions, including ultraviolet radiation, thermal cycling, and atomic oxygen exposure, can cause degradation of exterior spacecraft materials over time. Radiation and thermal exposure often results in bond-breaking and embrittlement of polymers, reducing mechanical strength and structural integrity. An experiment called the Flexural Stress Effects Experiment (FSEE) was flown with the objective of determining the role of on-orbit flexural stress on the environmental degradation of polymers in space. A non-standard bend-test procedure was designed to determine the surface strain at which embrittled polymer crack. The FSEE samples were flown in the wake orientation on the International Space Station for 1.5 years. Twenty-four samples were flown: 12 bent over a 0.375 in. mandrel and 12 were over a 0.25 in. mandrel. This was designed to simulate flight configurations of insulation blankets on spacecraft. The samples consisted of assorted polyimide and fluorinated polymers with various coatings. Half the samples were designated for bend testing and the other half will be tensile tested. Five flight samples and all control materials have been bend tested to date. None of the control samples' polymers cracked, even under surface strains up to 19.7%, although one coating cracked. Of the five flight samples tested, four show increased embrittlement through bend-test induced cracking at surface strains from 0.70% to 11.73%. These results show most test polymers are embrittled due to space exposure, when compared to their control samples. Determination of the extent of space induced embrittlement of polymers is important for designing durable spacecraft.

Poster Board No. 004 ORGANIC CORROSION INHIBITORS IN WATERBORNE PAINT COATINGS. Jennifer R. Wang[1] (jwang19@hb.edu), Brylee B. Tiu[2] (bbt11@case.edu), Rigoberto C. Advincula[2] (rca41@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]School of Engineering, Case Western Reserve University, Cleveland, OH.

Corrosion is an extensive and costly threat to infrastructure and technology commonly addressed with techniques such as protective coatings. As environmental awareness progresses, traditional inorganic coatings are ceding to organic waterborne alternatives. The corrosion resistance of two organic inhibitors in acrylic water-based-paints were determined through electrochemical measurements, spectroscopy, and microscopy. Carbon steel substrates were coated with various concentrations of the organic

inhibitors H650 and H570. Electrochemical measurements were performed on coated substrates using 5% NaCl as an electrolyte. After an hour, open-circuit potential (OCP) showed that the potential differences between the substrate surface and reference electrode (E_{OCP}) of H570 and H650 coated steel approached -0.1 V and stabilized around -0.3 V after starting around -0.2 V to -0.15 V. This suggested a passive layer was formed by the organic inhibitors and slowed electrolyte movement across the coating. Electrochemical impedance spectroscopy (EIS) discerned increased charge-transfer resistance (R_{CT}) with increasing concentrations of inhibitor, peaking at 98% protection efficiency in a concentration of 5% H570. After three weeks immersed in 5% NaCl solution, Attenuated Total Reflectance-Infrared and Raman Spectroscopy displayed magnetite peaks characteristic of corrosion in pure steel and degradation of water-based-paint peaks in coatings without inhibitors. Overall, H570 and H650 additives performed more proficiently than uncoated carbon steel and water-based-paint without additives, with 5% H570 displaying peak performance. Thus, organic corrosion inhibitors in waterborne paints improve corrosion resistance and paint stability, varying with concentration.

Poster Board No. 005 FABRICATION AND TESTING OF GRAPHENE OXIDE HOLE TRANSPORT LAYERS IN ORGANIC PHOTOVOLTAIC CELLS. **Farah Sayed[1] (fsayed19@hb.edu), Kyle Peters[2] (kcp24@case.edu), Kenneth Singer[2] (kds4@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Department of Physics, Case Western Reserve University, Cleveland, OH.**

Solar cells can provide an environmentally friendly alternative source of energy. Solar cells made from organic materials, opposed to their silicon-based counterpart, can be solution processed, fabricated to create thin, semi-transparent, flexible devices, and are overall more cost-effective. Electro-coating, fabrication of a film by applying an electric field through an aqueous dispersion of coating material, is already a well-known technique in industry. Adapting electro-coating to fabricate films within a photovoltaic cell would be a cheaper method for large scale production, reduce wasted material, and create thin conformal films with fine controllability. This project optimizes graphene oxide to meet the level of a current standard material, Poly3,4-ethylenedioxythiophene-polystyrenesulfonate (PEDOT:PSS), as a hole transport layer (HTL), which is a key layer for charge separation within a photovoltaic cell. After parameters for desired film thickness were found, HTLs were then fabricated with graphene oxide (GO) by means of electro-coating (eGO) and spin-coating (scGO). The efficiencies of eGO and scGO cells were tested by a solar cell simulator. As controls, devices without HTLs were tested as well as devices with PEDOT:PSS. The highest efficiency from cells with eGO HTLs was 1.4% compared to 0.8% for cells with scGO HTLs. The devices with no HTLs performed highest at 1.8%, and the PEDOT:PSS devices performed highest at 3.3%. Continuing work will focus on improving the films and devices to produce higher power conversion efficiencies. To this end, investigation into the electrical conductivity and hole transport properties of eGO and scGO films is in progress.

Poster Board No. 006 EFFECT OF EMPENNAGES ON AIRCRAFT DRAG, LIFT AND EFFICIENCY. **Rahul Jagetia[1] (jagetia18@us.edu), David Friedlander[2] (d.j.friedlander@nasa.gov). [1]University School, 2785 SOM Center Rd., Hunting Valley, Ohio 44122, [2]NASA Glenn Research Center.**

The empennage, or tail, of an aircraft plays a vital role in aircraft structure and function. Four forces act upon each part of an aircraft: lift, drag, weight, and thrust, with lift and drag determining the aerodynamic efficiency of an object. The purpose of this experiment is to examine the effect of aircraft empennages on the efficiency of an aircraft through the lift:drag ratio. As a hypothesis, the T-tail would have the highest lift:drag ratio due to the placement of the ventral fins of the plane, allowing for smoother fluid flow, decreased drag and increased lift. In order to determine each lift:drag ratio, four different aircraft empennages were placed in a subsonic wind tunnel: standard, V-shape, T-shape, and twin tails. Then, drag force and lift force were measured for each of the empennages at varying speeds. Then, the lift:drag ratio was found by dividing the lift and drag coefficients. The lift:drag ratio for the standard tail was 0.837, 0.452 for the V-tail, 0.4224 for the twin tail, and 0.853 for the T-tail. Therefore, the T-tail has the highest lift:drag ratio followed by the standard tail, V-tail, and the twin tail. The low drag of the T-tail as well as the high lift produced during takeoff would allow the T-tail to be the most efficient empennage, supporting the initial hypothesis.

Poster Board No. 007 NATURAL OR SYNTHETIC ANTACIDS: EFFECTIVENESS AT ELEVATING THE PH OF STOMACH ACID IN THE SHORTEST AMOUNT OF TIME. **Grace E. Bradley (bradleyg@alterhs.org). Archbishop Alter High School, 940 East David Road, Kettering, OH 45429.**

Do natural (chamomile and ginger) or synthetic (Tums® and Pepto-Bismol®) antacids raise the pH of stomach acid more efficiently? This topic was chosen due to the commonly disputed question whether one should treat heartburn with natural or synthetic antacids, and to assist the millions of people who suffer from heartburn-related issues. The student thought the synthetic antacids would raise the pH of stomach acid more efficiently because the antacids contain calcium carbonate, a known component in raising the pH of gastric acid. To test this project, a synthetic gastric acid solution was created in an Erlenmeyer flask, and the pH was measured at 0, 30, 60, 90, and 120 seconds with a Vernier pH probe and monitor, after the antacid was added and churned. The mean percent changes in the pH of the "gastric acid" before and after the addition of the antacids after 120 seconds were 239% for Tums®, 10% for Pepto-Bismol®, 5% for chamomile, and 5% for ginger. The mean rate of change in the pH of the antacids was at the highest rate in the first 30 seconds. The data collected shows that synthetic antacids, especially Tums®, raise the pH of stomach acid more efficiently than natural antacids for heartburn treatment.

Poster Board No. 008 AMMONIUM NITRATE VS. UREA: CONCENTRATION EFFECTS IN INSTANT COLD PACKS. **Faith C. Myers (myersfc@embarqmail.com). Big Walnut High School, 4251 N. County Line Rd., Sunbury, OH 43074.**

The purpose of this experiment was to determine if ammonium nitrate or urea, in water, produce and maintain lower temperatures for use as a cold compress, and to study concentration effects. Literature searches led to the hypothesis: ammonium nitrate will produce lower temperatures, reached more quickly, and maintained for longer durations than urea at all equivalent concentrations. The hypothesis was tested evaluating minimum water temperatures produced with 25/50/100g of ammonium nitrate or urea poured into a styrofoam cup containing 100ml of distilled water. An infrared thermometer was immediately started, recording temperatures at 1s intervals. The solution was constantly stirred for 200s, and temperatures recorded for 20 minutes. The lowest temperature reached for each trial was recorded. Ten trials were performed for each chemical and mass (25/50/100g), a total of 60 trials. Mean minimum temperatures and times were calculated. Five additional trials were conducted using 25g of ammonium nitrate to gather additional data. The mean minimum solution temperature was 3.7°C (25g, σ=1.5), -6.8°C (50g, σ=0.3), and -13.2°C (100g, σ=0.6) for ammonium nitrate and 6.5°C (25g, σ=0.9), -1.9°C (50g, σ=0.4), and -4.5°C (100g, σ=0.4) for urea. This result supports the hypothesis. The mean time to reach the minimum temperature was

47s (25g), 76s (50g), and 150s (100g) for ammonium nitrate and 79s (25g), 170s (50g), and 139s (100g) for urea. This experimental data supports the hypothesis that ammonium nitrate produces lower temperatures reached more quickly for all concentrations tested, resulting in a more effective cold pack.

Poster Board No. 009 LEAD IN LIPSTICK? Adriana R. Gildone (18agildone@beaumontschool.org). Beaumont School, 8280 Wembley Court, Chagrin Falls, OH 44023.

Is it possible for lipstick purchased daily in society to contain lead? Recent science suggests that a safe level of lead exposure is nonexistent. Research has shown that NARS lipstick (#1005 Red Lizard) contains just under five parts per million (ppm) of lead and that L'Oreal lipstick (#410 Volcanic) contains about seven ppm of lead. In this project, these lipsticks and three lipstick brands from the dollar store were tested for lead. The purpose of this project was to see if the lead concentration in lipstick changed depending on the price of the lipstick. The hypothesis for this experiment is the following: If different lipstick brands are tested for lead concentration, then the amount of lead present in the lipstick sample will decrease as the price of the lipstick increases. The experimental procedure was to process three samples of five different lipstick brands in a microwave digestion apparatus, followed by injection into a Perkin Elmer Plasma 400 Emission Spectrometer to analyze each sample for lead concentration. The results were measured by lead concentration, which was measured in parts per billion (ppb). Based on the results, no lead was detected in the samples because the machine used for analysis had a detection limit of 200ppb. To better the analysis, a Graphite Furnace Atomic Absorption Spectrometer could be used in the future to obtain more accurate and clearer results. The set-up of this experiment can help contribute to chemical science when testing for the lead concentration in consumer products such as lipstick.

Poster Board No. 010 BREAST CANCER CELL PATTERNING USING MICROMECHANICAL RESONATORS. Anika S. Rede[1] (arede18@hb.edu), Hao Jia[2] (hao.jia2@case.edu), Hao Tang[2] (hao.tang5@case.edu), Xia Liu[3] (xia.liu2@case.edu), Huiping Liu[3] (hliu@case.edu), Philip Feng[2] (philip.feng@case.edu). [1]Hathaway Brown School, Shaker Heights, OH 44122, [2]Department of Electrical Engineering, Case Western Reserve University, Cleveland, OH 44106, [3]Department of Pathology, Case Comprehensive Cancer Center, Case Western Reserve University, Cleveland, OH 44106.

About 1 in 8 women in the U.S. develop invasive breast cancer during their lifetime. Metastasis, the invasion of cancer cells from the primary tumor to other healthy organs, causes much lower survival rates among Stage IV cancer patients. We explore a new approach to study cellular-level properties of cancer cells, which may lead to discoveries regarding cancer metastasis. This approach involves the manipulation (controlled vibration) of cancer cells to observe the effect on spatial arrangement (pattern) of the cells on the device surface. The objective of this research is to fast manipulate and pattern single cancer cells with microscale accuracy via a micromechanical resonator platform. Two types of suspended Si_3N_4 membrane resonators (square: $350\times350\mu m^2$, rectangular: $300\times120\mu m^2$) were fabricated by Tetramethylammonium hydroxide (TMAH) backside etching of Si substrates. The resonators were mounted onto piezoelectric shakers, moving vertically (10kHz–1MHz). Breast cancer cells (green fluorescent MDA-MB-231, ~25μm-diameter) was dispersed onto the resonator, and the cell patterning created specific patterns known as 'Chladni figures.' Multiple distinct two-dimensional (2D) dotted patterns were observed between 55–389kHz on the square device, and one-dimensional (1D) patterns were observed between 197–391kHz on the rectangular device. In conclusion, micromechanical resonators can provide a unique platform for manipulating/patterning breast cancer cells, as seen with these completed mode shapes. This accurate, versatile cell patterning method may lead to further understanding of the metastasis mechanism, cancer cell behavior, cell-cell interaction, and how to engineer cancer cell layers for studying tumor formation.

Poster Board No. 011 NANOPARTICLE-MEDIATED DELIVERY OF MIR-200 TO TRIPLE NEGATIVE BREAST CANCER. Michelle M. Yin[1] (myin18@hb.edu), Nadia R. Ayat[2] (nra21@case.edu), Zheng-Rong Lu[2] (zxl125@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122, [2]Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH.

MicroRNAs have become prominent in cancer therapy due to their ability to regulate cancer-related genes through promoting or inhibiting gene-translation. Specifically, this study centers on the delivery of the miR-200 family in triple negative breast cancer. The miR-200 family was used because of its role in suppressing epithelial-to-mesenchymal transition (EMT): a critical biological process in the metastasis of cancer cells. The effectiveness of miR-200 sequences in inhibiting EMT were determined by their respective RNA and protein expressions of ZEB1, ZEB2 and E-cadherin, using PCR and Western Blot. ZEB1 and ZEB2 are transcription factors that are upregulated in mesenchymal breast cancer cells. In contrast, E-cadherin is downregulated in mesenchymal breast cancer cells. To analyze these gene levels, two sequences were delivered to MBA-MD-231 cells. Duplex sequences dramatically improve accuracy by sequencing both strands of each DNA duplex, but they denature quickly due to their mismatched nucleotides. Conversely, complementary sequences are more stable because of their perfect pairing of nucleotides. Both DNA and protein data from PCR and Western Blot show downregulation of ZEB1 and ZEB2 markers after treatment, resulting in an upregulation of E-cadherin in the MBA-MD-231 cell line, most prominently in the complementary sequence. The decrease of ZEB1 and ZEB2 and the increase of E-cadherin demonstrates the suppression of EMT, therefore supporting miR-200 as a potential target for cancer therapy. Looking forward, patient-derived tumor xenograft models will be used in place of in vitro experiments to ensure more accurate results of the effectiveness of miR-200 sequences in cancer therapy.

Poster Board No. 012 QUANTIFICATION OF FLOW IN VASCULATURE FLOW PHANTOMS USING CONTRAST-ENHANCED ULTRASOUND METHOD. Alyssa Jhirad[1] (ajhirad18@hb.edu), Mark Howell[2] (howellm2@ccf.org), Dr. Greg T. Clement[3] (clemeng@ccf.org). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Lerner Research Institute at The Cleveland Clinic, Cleveland, OH, [3]Department of Biomedical Engineering, The Cleveland Clinic Foundation, Cleveland, OH.

Ultrasound technology uses sound waves to project images inside the body. It's noninvasive, inexpensive and shows the basics of biological structures. However, low resolution and surface-only display can sometimes result in misdiagnosis. A clearer picture of arteries, veins, and capillaries is needed for a quicker detection of abnormalities, but the near microscopic vasculature present in some areas of the body makes imaging difficult. Presence of contrast agents assist in ultrasonic detection in small, low-flow areas, which then generates clearer images at higher resolutions. The contrast agents are microbubbles, which are created in the laboratory, and used to analyze flow (for example, blood flow) at a depth that ultrasound previously was unable. Phantoms are commonly used in research to simulate parts of the body. The purpose of this project aims to design a flow phantom that mimics veins and arteries in the circulatory system and analyze the flow through the phantom with ultrasound. In previous studies, phantoms consisted of an agar mixture to mimic soft tissue. Current-

ly, different materials for flow phantoms are being tested, including flexible, acrylic-based polymers created on Stratasys-3D printers, elastomeric polyurethane created by Carbon-CLIP 3D printing, and simple silicone molds. After testing silicone, we found it is suitable in comparison to other materials. It is used with ultrasound to detect and quantify flow through phantoms using Contrast Enhanced Ultrasound. This imaging method is used to help improve the number of misdiagnoses, and should help physicians detect abnormalities with greater accuracy, especially in small vasculature areas of low-flow.

Poster Board No. 013 HIGHLY ELASTIC AND TOUGH IPN-STRUCTURED HYDROGELS FOR CYCLIC MECHNICAL LOADING ENHANCED TISSUE ENGINEERING. Tae-Hee Kim[1] (tkim18@hb.edu), Oju Jeon[2], Eben Alsberg[2]. [1]Hathaway Brown High School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH.

Ionically crosslinked alginate hydrogels can be permantly deformed and break under mechanical stimulation due to their low elasticity and brittleness. In this study, we engineered highly elastic and tough hybrid hydrogels resulting from an interpenetrating polymer network (IPN)-structure of ionically crosslinked alginate and photocrosslinked methacrylated gelatin (GelMA) and examined their utility as bone tissue engineering scaffolds. IPN-structured hydrogels were prepared by mixing two different polymers at an equal volume ratio and crosslinking them: ionically crosslinked alginate and photocrosslinked GelMA. The elasticity of the hydrogels was measured with unconfined cyclic compression testing up to 50% strain. To evaluate the capacity of these gels to support osteogenesis, the human mesenchymal stem cell (hMSC)/hydrogel constructs were subjected to strain controlled, unconfined, dynamic compression using a BOSE bioreactor (ElectroForce BioDynamic test instrument). While alginate-only hydrogels exhibited significant permanent deformation after unloading, the IPN-structured hydrogels fully recovered their original thickness after each unloading. The viability of encapsulated hMSCs was higher than 90 % in the IPN-structured hydrogels, and mechanical stimulation lead to more than 1.5-fold increase of their proliferation at day 7 (N=6) and 1.7-fold increase of calcium deposition, which is the definitive marker of stem cell osteogenic differentiation, at day 28 (N=6). This hydrogel system may be valuable for biomedical applications that require a biomaterial to fully recover from large strains and long-term cyclic compression.

Poster Board No. 014 EFFECT OF PRENATAL ALCOHOL EXPOSURE ON NERVES AND BLOOD VESSELS IN THE HEART. Angela H. Zhu*[1] (azhu19@hb.edu), Nikhita Kumar*[1] (nkumar19@hb.edu), Yehe Liu[2] (yxl448@case.edu), Michael W. Jenkins[2] (michael.jenkins@case.edu), Michiko Watanabe[2] (mxw13@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Department of Pediatrics, Case Western Reserve University, Cleveland, OH. * have equally participated

When alcohol is consumed during pregnancy, abnormalities in the embryo and the fetus may result from abnormalities of neural crest cell biology. The consequences, Fetal Alcohol Syndrome (FAS), persist as a major problem worldwide. The hypothesis tested is if alcohol damages neural crest cells, then their derivatives, smooth muscle cells around some coronary vessels and autonomic cardiac innervation, would grow abnormally, possibly leading to arrhythmias and coronary anomalies. Twelve quail eggs were injected with alcohol to mimic a session of binge drinking early in pregnancy and six control eggs were injected with saline. Both sets were incubated until embryos formed four chambered hearts with coronaries and autonomic innervation. The ethanol-exposed embryos had a 58.3% survival rate, while 83.3% of the control embryos survived. To visualize cardiac innervation, hearts were permeabilized with detergent, and an immunostaining technique was used to fluorescently label neuron-specific tubulin (TUJ1). TUJ1 stained nerves of ethanol-exposed embryos covered a smaller area of the heart surface and branched with more acute angles compared to hearts of control embryos. A novel technique, SLIME (Scatter labeled imaging of microvasculature in excised tissue) was used to detect coronaries. A titanium solution was injected into the aorta while vessels were visualized with optical coherence tomography during the filling of the coronaries. The sequence of vessel filling was atypical in ethanol-exposed quail embryos, indicating abnormal connections of the coronary vasculature. The results suggest that early ethanol exposure mimicking early binge drinking during pregnancy lead to abnormal autonomic innervation and coronaries.

Poster Board No. 015 DEVELOPING A VIRTUAL MODEL FOR PREDICTION OF MEDICATION AFFINITY TO CYCLODEXTRIN. Alison W. Xin[1] (axin19@hb.edu), Dr. Edgardo Rivera-Delgado[2] (edgardo.rivera@case.edu), Dr. Horst A. von Recum[3] (hav1@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH.

Affinity-mediated medication delivery utilizes interactions between medication molecules and a delivery system to extend the rate of drug release and improve treatment. Cyclodextrin is a promising affinity drug delivery system due to its versatility and ability to bind to hydrophobic drugs. Unfortunately, affinity testing for various medications is a time-consuming process, creating the need for a virtual model. The most popular methods for determining affinity have been docking algorithms and statistical models; the effectiveness and suitability of both were analyzed in this project. To start, affinities of 1500 molecules were collected from publicly available research. The docking program PyRx was used to determine theoretical affinities and model binding configurations. Various chemical descriptors were analyzed with PaDEL-Descriptor to create a statistical model. Analysis using different factors adjustable in PyRx, such as energy calculation algorithms and the molecular force field, did not yield significant differences in predictive capacity. Furthermore, the predictiveness of docking algorithms underperformed the predictive capacity of published models, yielding an R^2 value of 0.13. R^2 measures predictiveness of a model compared with data; an R^2 of 1 indicates a perfect fit. Attempts to create a linear model using chemical descriptors have yielded an R^2 of only -0.01934. Though not capable of being used as reliable predictors yet, these results serve as a base to launch further refinement of the virtual model for the prediction of binding affinities. Improvements may include use of principal component analysis as well as alternative modelling methods such as artificial neural networks.

Poster Board No. 016 ASSESSING ANTI-OXIDANT PROPERTIES OF FULLERENES IN ABDOMINAL AORTIC ANEURYSM CELL CULTURES. Stephanie T. Zhou[1] (szhou18hb.edu), Shataakshi Dahal[2] (dahals@ccf.org), Anand Ramamurthi[2] (ramamua@ccf.org). [1]Hathaway Brown School, 19600 North Park Boulevard, Shaker Heights, OH 44122, [2]Department of Biomedical Engineering, Cleveland Clinic, 9500 Euclid Ave, Cleveland, OH 44195.

Abdominal aortic aneurysms (AAA) occur due to gradual thinning and weakening of the aortic wall because of chronic disruption of enzymatic activities in the extracellular matrix – collagen and elastic fibers. Since elastic fibers, which impart tissue elasticity, do not regenerate automatically in adults, AAAs slowly grow towards eventual catastrophic rupture. For the same reason, AAA growth arrest or reversal of this growth is a challenge. Since surgery interventions are not effective

for treating AAAs and carry a high risk, our lab focuses on developing modalities to regenerate the elastic matrix inside the AAA wall to arrest growth of AAA. Fullerenes, nanosized spherical carbon lattices, have been shown to have a) antioxidant properties related to their high electronegativity and consequent reactivity with free radicals, and to b) attenuate apoptosis. Since oxidative damage/stress and apoptosis are involved in AAA pathology and could have adverse impact on elastic matrix repair, we are investigating the anti-oxidant (fluorogenic OS/ROS assay) and anti-apoptotic effects (caspase assay) of fullerenes (0.1 µg/ml) on the viability (LIVE/DEAD assay) of cultured aneurysmal smooth muscle cells (AAA SMCs) from a rat AAA model. We will investigate effects on cell proliferation (DNA assay), elastic matrix deposition (Fastin assay), fiber formation and crosslinking (desmosine assay), and elastic matrix breakdown processes mediated by matrix metalloproteases (MMPs) (western blot, gel zymography). If the fullerenes are effective in augmenting elastic matrix formation and inhibiting breakdown, they could potentially serve as nanotherapeutics for AAA wall repair or as a platform for delivery of drugs and imaging agents.

Poster Board No.017 EVALUATING PLATELET-TARGETING VERSUS FIBRIN-TARGETING IN THROMBUS SPECIFIC NANOMEDICINE DELIVERY. Amaya Razmi[1] (mayanraz13@gmail.com), Neil Orton[2] (nro5@case.edu), Michael Sun[2] (mbs109@case.edu), Dr. Anirban Sen Gupta[2] (axs262@case.edu). [1]Hathaway Brown School, 19600 North Park Boulevard, Shaker Heights, OH, 44122, [2]Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH.

Thrombus formation leading to blood vessel occlusion is a pathological event in cardiovascular diseases. Therefore, it is critical to remove the clot and restore blood flow to vital organs. One way to remove clots is by administering clot-busting drugs, but this strategy often results in off-target drug action and hemorrhagic risks, which can be minimized by localizing the drug to the clot site. A nanoparticle technology that can bind to active platelets and thereby provide a way to deliver drugs to areas of active platelet localization has previously been developed in the lab. Building on this, the focus of this project is to explore other components of a clot that can enhance nanoparticle targeting beyond active platelet targeting. One component is fibrin, which is the product of coagulation that happens on the surface of clot-associated active platelets. The hypothesis of the project is: Combining fibrin targeting with active platelet targeting can lead to a superior design of clot-targeted vehicles of clot-busting drugs. To test this hypothesis, two different peptides binding to either GPIIb/IIIa or fibrin were evaluated on liposomal nanoparticle surfaces. Resultant peptide-decorated liposomes will be studied for their abilities to bind and stay retained on platelet and fibrin rich clots, under simulated blood flow environment using microfluidic chambers. Binding to a non-specific substrate was used as control condition. Preliminary study results demonstrate no significant binding of the peptide-decorated nanovesicles to the control surface but significant binding to the clot surface, suggesting the clot-specificity of the binding interactions.

Poster Board No. 018 COMPARATIVE GENOMIC AND STRUCTURAL ANALYSIS OF HOMOLOGOUS SFP CODING GENES IN CLOSELY RELATED SPECIES OF *DROSOPHILA*. Uzo Ahn[1] (uahn18@us.edu), Matthew Logan Johnson[2] (mjohnson@ndc.edu). [1]University School, 2875 SOM Center Rd., Hunting Valley, OH, 44022, [2]Department of Biology, Notre Dame College, South Euclid, OH 44121.

Seminal fluid proteins (SFPs) are produced in the male accessory gland tissues and secreted into the seminal fluid. While these proteins are assumed to be significant factors in reproductive process with rapid evolutionary rate, comparison of potential conserved regions is limited because subsets of SFPs have not been successfully annotated. In particular, groups of extremely small SFPs that encode proteins between 35-169 amino acids in length were detected using a proteomics approach in *Drosophila melanogaster*,but not all of these genes are accounted for in closely related species. With this list of extremely small SFPs in *Drosophila melanogaster*, this study used a comparative genomic approach to locate homologous SFP genes in closely related species of *Drosophila* and to identify conserved protein sequences. Using available genomes from NCBI and FLYBase, and the common annotation tools such as BLAST and ExPASy translation tool, sequence analyses identified several previously unreported homologues. Furthermore, some of these proteins appear to have a conserved amino acid sequence shared among the homologues and other SFPs. Structural analysis using HHpred, a protein-folding program, revealed that this conserved amino acid sequence likely forms a ß-sheet near the C-terminus of these proteins. To further evaluate phenotypic significances, available heterozygous null mutants in *Drosophila melanogaster* are being analyzed to determine if some of the identified genes play a significant role in reproductive success. Together, this process shows the use of a comparative genomics approach to identify previously unannotated SFP genes, potential candidates for functional analysis, which are subject to rapid evolutionary expansion and contraction in *Drosophila*.

Poster Board No. 019 THE INHIBITION OF ROCK SIGNALING AND TRACTION FORCE MICROSOPY IN HUMAN MENSENCHYMAL STEM CELLS. Katerina Aris[1] (karis18@hb.edu), Kuo-Chen Wang[2] (kxw160@case.edu), Jean Welter[2], Emily Kwan[2] (exk271@case.edu), Larissa Rizzi de Freitas[3] (lrr30@case.edu), Dustin Thomas[4] (dgt23@case.edu), Thomas Egelhoff[4], Harihara Baskaran[5] (hxb35@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44124, [2]Department of Biology, Case Western Reserve University, Cleveland, OH, [3]Faculdade de Engenharia, Pontificia Undersidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil, [4]Department of Cell and Molecular Medicine, Cleveland Clinic, Cleveland, OH, [5]Deparment of Chemical and Biomolecular Engineering, Case Western Reserve University, Cleveland, OH.

Developing engineered articular cartilage would benefit people suffering from osteoarthritis. Human mesenchymal stem cells (hMSCs) can undergo chondrogenesis when exposed to transforming growth factor-ß (TGFß) *in vitro*. These experiments aimed to construct cartilage comparing to native tissue in strength and function. Past research shows inhibiting canonical Wnt signaling enhances chondrogenesis but the role of Rho-associated protein kinase (RhoA/ROCK) signaling is not well known. The authors hypothesized suppressing RhoA/ROCK signaling following induction with TGFß would enhance chondrogenesis in hMSCs. HMSCs were treated with 10µM concentrated Y27632 to inhibit ROCK under TGFß1 induction and pellet culture. Construct size and number of cells within each pellet were analyzed ROCK signaling is also involved in myosin-II light chain phosphorylation. The authors hypothesized chondrogenesis needs proper actin cytoskeleton contraction. Traction-force microscopy experimentation measured the force produced by hCMSCs under growth maintenance (control), chondrogenic induction and ROCK signaling inhibition. Results show traction force increased by 1.7 times during chondrogenic induction and ROCK inhibition increased by 1.2 compared to the control. The authors also hypothesized inhibiting RhoA/ROCK would increase transport properties within pellets. Dextran was added to the control and drug pellets and the amount of fluorescence from the dextran was analyzed. Results show DAPI number average for each pellet increased by 1.2 in the Y27632 treated pellets compared to the

control. These findings show chondrogenesis and transport properties can be improved when cytoskeleton tension that regulates cell rounding and contraction is reduced.

Poster Board No. 020 INHIBITION OF CARTILAGE DEGRADATION AND SUPPRESSION OF PGE_2 AND MMPs EXPRESSION BY POMEGRANATE FRUIT EXTRACT. Omer S. Ashruf[1] (oashruf17@us.edu), Tariq Haqqi[2], Ph.D. (thaqqi@neomed.edu), Nazir Khan[2] (nkhan2@neomed.edu). [1]University School, 2785 SOM Center Rd., Hunting Valley, OH, 44022, [2]Department of Anatomy and Neurobiology at the Northeast Ohio Medical University, Rootstown, OH.

Osteoarthritis (OA) is a joint disease characterized by the deterioration of cartilage and bone. Pomegranate fruit extract (PFE) restricts the degradation of cartilage *in vitro.* Our experiment determined whether the oral consumption of PFE inhibited the progression of OA in rabbits. Osteoarthritis was surgically induced in the tibiofemoral joints of adult rabbits. One group of rabbits was fed PFE for 8 weeks after surgery. A second group was fed PFE for 2 weeks prior to surgery and 8 weeks after. Fluorometric assays were used to determine MMPs activity. The Elisa technique quantified IL-1ß, MMP-13, PGE_2 and COL2A1 levels in synovial fluid/plasma. The effect of PFE on enzymes and proteins MMP-13, MAPK and NF-κB was studied in IL-1ß-stimulated rabbit articular chondrocytes. Our results show that chondrocyte cluster formation was significantly reduced in rabbits fed PFE. Rabbits fed PFE showed less breakdown of extracellular matrix/cells (IL-6, MMP-13 and PGE_2 expression) in the synovial fluid and showed an increase in proteins and human genes, respectively, which provide support to connective tissues (ACAN and COL2A1 mRNA), compared to their water-fed counterparts. PFE pretreatment significantly reduced IL-1ß-induced IL-6 and MMPs expression and MMP-13 activity. As MAPK and NF-κB inhibitors, PFE was equally effective in inhibiting IL-1ß-induced PGE_2 production in chondrocytes. An increase in COL2A1 mRNA and protein was also observed after PFE treatment in IL-1ß-stimulated chondrocytes. Our data emphasized that oral consumption of PFE in a model of OA has chondroprotective effects, delaying progressive joint space narrowing effects and aiding in the management of OA.

Poster Board No. 021 THE ROLE OF HAIR BUNDLE PROTEIN 7(HBP7) IN THE AUDITORY HAIR CELL OF ZEBRAFISH IN MEDIATING HEARING FUNCTION. Ashwin Veeramani[1,5] (ashwinveeramani@yahoo.com), Haimeng Bai[1,2] (hxb217@case.edu), Shengxuan Wang[1,2], Bona Ko[1,2], Lana Pollack[1,2], Joseph Kao[1,2], Brian M. McDermott[1,2,3,4] (bmm30@case.edu). [1]University School, 2788 SOM Center Road, Hunting Valley, OH 44022, [2]Department of Otolaryngology-Head and Neck Surgery, Case Western Reserve University School of Medicine, Cleveland, OH, [3]Department of Biology, Case Western Reserve University, Cleveland, OH, [4]Department of Genetics and Genome Sciences, Case Western Reserve University School of Medicine, Cleveland, OH, [5]Department of Neurosciences, Case Western Reserve University School of Medicine, Cleveland, OH.

Hair cells in the inner ear detect sounds through deflection of their stereocilia, which activate transduction channels in vertebrates, including zebrafish. It is hypothesized, from protein sequence similarity and expression profiling using RNA *in situ* hybridization, that *Hbp7* (hair bundle protein 7) is necessary for hair bundle function of inner ear hair cells. To test *Hbp7* role in hearing using mutagenesis, CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) mediated gene editing was used to generate a loss-of-function mutation. First, an enzyme, Cas9, cuts the two strands of target DNA at a specific gene location guided by a pre-designed RNA: single guide RNA (SgRNA). Cas9 was injected into zebrafish embryos for sgRNA to activate the Cas9 endonuclease for *Hbp7* mutation. Then, it was confirmed if *Hbp7* was mutated. Genomic DNA was extracted from the embryos and amplified using PCR. PCR products were sequenced to confirm the mutation. Specifically, the PCR products were transferred onto host bacteria through vectors and the hosts incubated. The *Hbp7* gene amplicons were then extracted and sequenced. The first step of confirming the hypothesis was completed when it was established that the CRISPR method successfully mutated *Hbp7* by comparing the sequence of the wild-type *Hbp7* gene to the gene fragment in the vector. Next, hearing will be examined in the mutated fish using microphonic potential recordings that determine the value of *Hbp7* to sound perception. Recordings detect electrical responses to mechanical stimuli. If *Hbp7* is important in hair cell function, then *Hbp7* mutant zebrafish would have a different response to stimuli than a wild-type fish.

Poster Board No. 022 PHOSPHORYLATION OF TRPV2 BY PROLINE-RICH KINASE 2 IN NEURONAL OUTGROWTH. Fatema Uddin[1] (fuddin17@hb.edu), Xu Han[2] (xxh112@case.edu), Vera Y. Moiseenkova-Bell[2] (vxm102@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122. [2]Department of Pharmacology, Case Western Reserve University School of Medicine, Cleveland, OH.

Chronic pain is a life-long unpleasant sensory and emotional experience with limited treatment options. Nerve growth factor (NGF) is essential for the development of nociceptive neurons; and following injuries, NGF signaling is associated with chronic pain. The increase in NGF after injury leads to the formation of new nociceptive inputs and pain signal amplification. Little is known about molecular targets that contribute to this phenomenon and an understanding of this process may help to develop improved treatments for chronic pain. Previously, transient receptor potential vanilloid 2 (TRPV2), a non-selective Ca^{2+}-permeable cation channel, was shown to promote NGF-induced outgrowth of nociceptive neurons. Additionally, TRPV2 phosphorylation has been shown to be involved in neuronal outgrowth, and previously in the laboratory, it was found that proline-rich kinase 2 (Pyk2) directly interacts with TRPV2 and could phosphorylate TRPV2 at Y343 and Y525 sites. This study investigates the role of Pyk2 phosphorylation of TRPV2 on neurite outgrowth. By site-directed mutagenesis, Y343F-TRPV2 and Y525F-TRPV2 mutants were generated by mutating the tyrosine sites to phenylalanine, and were transfected into PC12 cells along with wild-type TRPV2 as a control. Western blot analysis did not detect expression of wild-type or mutant constructs. A new TRPV2 plasmid was extracted from the YepM vector. In the future, the new TRPV2 plasmid can be used to generate mutants and perform a western blot analysis to test for expression. Additionally, immunocytochemistry can be performed to determine whether the Y343F mutant and Y525F mutant affect the channel localization after NGF treatment.

Poster Board No. 023 THE ROLE OF GALU, UTP-GLUCOSE-1-PHOSPHATE URIDYLYLTRANSFERASE, IN THE PROTECTION OF *PSEUDOMONAS AERUGINOSA* FROM ACIDIFIED NITRITE TOXICITY. Wesley R. Wolf[1] (wesleyrwolf@gmail.com), Warunya Panmanee[2], Daniel J. Hassett[2]. [1]Walnut Hills High School, 3250 Victory Parkway, Cincinnati, OH 45207, [2]University of Cincinnati College of Medicine, Cincinnati, OH.

Pulmonary infections involving *Pseudomonas aeruginosa (PA)* are a complication faced by cystic fibrosis (CF) patients. The bacteria can turn into a mucoid called *mucA22* by mutation of the *muc*A gene, which decreases the effectiveness of antibiotics. Acidified nitrite ($NaNO_2$) was shown to be an antibacterial agent against *mucA22.* Previously, it was shown that the *mucA22 galU* double mutant had increased susceptibility to acidified nitrite treatment. The complements of this mutant bacteria were investigated to assure that there were no downstream

effects after the genetic modification of the bacteria. This experiment used *PA01, mucA22, mucA22 galU*, and their complements in conditions mimicking those of CF patients. The hypothesis was that the genetic modification *galU* of *PA* and *mucA22* should be the only mutation that affects the level of protection against acidified nitrite toxicity and not any other genes downstream of these bacteria. Bacterial cultures, incubated for 24 hours, were used to perform ten-fold serial dilutions. They were spotted onto lysogeny broth agar pH 6.5 containing nitrate as a control or nitrate plus nitrite as an experimental plate. Plates were incubated in either anaerobic (15 mM nitrite) or aerobic (30 mM nitrite) conditions. Results were recorded and then reported in CFUs/mL. The results through p-value were statistically significant and demonstrated that the *galU* complements were complementable. Therefore, *galU* is one of the genes that is involved in the protection of *PA* from nitrite treatment. This could lead to a potential therapeutic in the future to help ease the problems of CF patients.

Poster Board No. 024 DETERMINING PROPER CONTROLS FOR INVESTIGATION INTO THE SITE-SPECIFIC IMPORTANCE OF MACROPHAGES IN NERVE INJURY. Katherine Wang[1] (kwang19@hb.edu), Jon P. Niemi[2] (jpn34@case.edu), Richard E. Zigmond[2] (rez@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Department of Neurosciences, Case Western Reserve University, Cleveland, OH.

A defining factor of peripheral nerve regeneration is the accumulation of macrophages at the site of injury and around injured neuronal cell bodies. Macrophages accumulate in these areas due to CCL2 release from Schwann cells and sensory neurons after injury. Determining the importance of macrophages at each site has been difficult; however, previous studies inhibiting macrophages at both sites resulted in a restriction of regeneration. To test each site individually, the cre-lox system was used to knockout CCL2 in the dorsal root ganglia (DRG) or sciatic nerve (SN) by mating CCL2-floxed mice (CCL2 fl/fl) with sensory neuron-expressing cre mice (Advillin-cre) or Schwann cell-expressing cre mice (P0-cre), respectively. First, however, the most appropriate genotype to use as a control must be determined. It is hypothesized that CCL2 fl/fl mice will be better to use as controls for the upcoming experiments. Mice underwent sciatic nerve transection and seven days later, DRG and SN was harvested and sectioned. The tissue was then stained for the macrophage marker CD68. Macrophage accumulation in DRG and SN after injury was measured in wild type, CCL2 fl/fl, P0-cre, and Advillin-cre mice (n=5/group). Using a two-way ANOVA, no significant difference in CD68 staining was found between wild type and CCL2 fl/fl mice in DRG ($p=0.754$) and SN ($p=0.53$). The DRG was also stained for activating transcription factor 3, a normal injury/regeneration-associated protein, and no difference was found between CCL2 fl/fl and wild type mice ($p=0.632$). Thus, CCL2 fl/fl mice will be used as controls.

Poster Board No. 025 COMPARING THE YIELD AND CYTOTOXICITY OF NK CELLS EXPANDED WITH DIFFERENT FEEDER CELLS. Michael F. Castellanos[1] (mcastellanos19@us.edu), Folashade Otegbeye[2] (folashade.otegbeye@uhhospitals.org), Evelyn Ojo[2] (exo54@case.edu), David Wald[2] (dnw@case.edu). [1]University School, 2785 SOM Center Rd., Hunting Valley, Ohio, 44122, [2]Comprehensive Cancer Center, Case Western Reserve University, Cleveland, OH.

Natural killer (NK) cells are ideal candidates for new cancer treatment methods. Roughly 1 million NK cells can be recovered from 10 mL of blood from a healthy donor. Treating one cancer patient would require at least 10 million NK cells per kg body weight collected from many liters of donor blood. Therefore, we need a way to grow NK cells so there are enough for human treatment. We compared NK cell expansion platforms for proliferation yield and cell activation. Blood collected from an arm vein in a healthy volunteer was centrifuged on a ficoll density gradient to isolate peripheral blood mononuclear cells (PBMCs). Magnetic bead depletion of $CD14^+$, $CD3^+$, and $CD19^+$ from PBMCs yielded $CD3^-/CD56^+$ NK cells. These were split between feeder cell platforms P1 and P2 (both being cell lines derived from human leukemia patients). After 3 weeks, NK cells co-cultured with P1 and P2 were stained with Trypan Blue and counted using a hemocytometer determining that they yielded 510-fold and 1000-fold proliferation respectively. Using flow cytometry, we determined NK cell surface expression of activating receptors, maturation markers, and trafficking molecules. P1 NK cells exhibited more expression of CD57 (37% vs. 1.5%) indicating high cytotoxic activity and terminal differentiation. P2 cells expressed more of some activating receptors (CD16, NKG2D, and NKp46). Despite these differences, P1 and P2 NK cells displayed similar killing capability against Jurkat T-cell leukemia cells (76.7% and 73.7% killing respectively). Our results suggest that P1 and P2 are both viable NK cell expansion methods.

Poster Board No. 026 A STUDY OF THE SYNERGISTIC ACTIVITY OF CDK5 AND TGF-β INHIBITORS IN PEDIATRIC SOLID TUMORS. Anish Ganesh[1] (aganesh19@us.edu), Dr. John Letterio[2] (John.Letterio@UHhospitals.org). [1]University School, 2785 SOM Center Rd, Chagrin Falls, OH 44022, [2]Case Western Reserve University, University Hospitals, Rainbow Babies & Children's Hospital, Cleveland, OH.

On average, 15,780 cases of pediatric cancer are diagnosed within the United States annually. Furthermore, pediatric solid tumors account for about 30 percent of all cases of pediatric cancer. Previous studies on pediatric cancer have shown high expression of the two proteins Cyclin-dependent kinase 5 (Cdk5) and Transforming Growth Factor beta (TGF-β). Cdk5 is an enzyme that was first shown to play a key role in the development of neuronal cells via phosphorylation of substrate proteins. TGF-β is a cytokine that signals and regulates cancer cell growth and tumor development by influencing cell function in the tumor microenvironment. Cdk5 inhibition suppresses cancer cell growth, but these effects are complicated by the emergence of resistance to inhibition. The hypothesis is that simultaneous exposure to inhibitors of Cdk5 and of the TGF-β receptor kinase TbRI will synergistically suppress the growth of pediatric solid tumors. Combinations of Cdk5 and TGF-β inhibitors were analyzed independently to establish dose response curves, and were analyzed together. Suppression was measured by the percentage of cell confluency using the Incucyte ZOOM®. There was a 35.62 percent decrease in confluency in the presence of both inhibitors relative to the control, while exposure to Cdk5 and TGF-β inhibitors alone was associate with only a 22.65 and 4.16 percent decrease, respectively. Thus, TGF-β and Cdk5 inhibitors acted synergistically to decrease proliferation in pediatric solid tumors in vitro. Future studies will focus on time and dose-dependent responses in to inhibitors of TGF-β and Cdk5 in a broader subset of pediatric cancers.

Poster Board No. 027 CHEMICAL SCREENING FOR INFLAMMASOME INHIBITORS. Alexandra K. von Zedlitz[1] (lvonzedlitz18@hb.edu), Chuanping Wang[2] (cxw77@case.edu), Dr. Tsan S. Xiao[2] (tsx@case.edu). [1]Hathaway Brown School, 19600 North park Blvd., Shaker Heights, OH 44122, [2]Department of Pathology, Case Western Reserve University, Cleveland, OH 44106.

Inflammasomes are multi-protein oligomeric complexes that play important roles in innate immune defense against infections as well as autoimmune/autoinflammatory disorders including, DM-type 1 diabetes, multiple sclerosis, potentially Alzheimer's disease, and other cardiovascular disorders. Despite the important physiological and pathological functions of inflammasomes, the critical need for inflammasome-specific chemical probes has not been

met. This not only impedes the progress of mechanistic studies in the inflammasome field, but also hampers the development of small molecule therapeutics. Inflammasome sensor molecules, such as NLRP3, detect infections or danger signals and induce rapid polymerization of the adapter molecule ASC, forming speck like structures that activate caspase-1 and induce pyroptotic cell death. To screen for small molecule compounds that inhibit inflammasome activation, a mouse macrophage cell line expressing cerulean-tagged ASC was activated with LPS/signal 1 and ATP/signal 2 leading to the formation of ASC specks. In the presence of "hit" compounds that inhibit the NLRP3 inflammasome, ASC speck formation is reduced. Findings concluded that a 100μM concentration of the B8 well drug disulfiram effectively inhibited signal 1 and 2 inflammasome activation. A second method used to screen for inflammasome inhibitors was the Sandwich Elisa Protocol. By determining the optical intensity of the colored solutions in each well, it was possible to measure the amount of secreted IL-1ß using an IL-1ß standard. The drug ebselen in well B10 of the cell plate NCP003902, in addition to the drug disulfiram in well B8 of the cell plate NCP00592, worked effectively in reducing IL-1ß secretion, thus successfully inhibiting the inflammasome activation.

Poster Board No. 028 PROSTATIC ACID PHOSPHATASE IS A NON-SELECTIVE ECTONUCLEOTIDASE IN RIP 1 DEFICIENT HUMAN JURKAT T CELL LEUKEMIA AND EG7 MURNINE THYMOMA TUMOR CELLS. Graham S. Lane[1] (glane17@us.edu), Andrea Boyd Tressler[2] (amb212@case.edu), George Dubyak[2] (gxd3@case.edu). [1]University School, 2785 SOM Center Rd, Hunting Valley, Ohio 44022, [2]Department of Pharmacology, Case Western Reserve University, School of Medicine, Cleveland, OH.

Chemotherapies are used to induce apoptosis on a select number of tumor cells and initiate an anti-tumor immune response. Signaling for this response is characterized by pannexin 1 mediated release of apoptotic adenosine triphosphate (ATP). ATP acts as a "find me" signal for macrophages. Macrophages then phagocytize the dying tumor cell and present tumor antigen to cytotoxic T-cells. In RIP1 -/- Jurkat Human T-cell leukemia and EG7 murine thymoma cells, apoptotic extracellular ATP accumulation is degraded by plasma membrane ectonucleotidases. Prostatic acid phosphatase (PAP) is a known plasma membrane protein in prostate cancer. I hypothesized that PAP is a non-selective ectonucleotidase in Jurkat RIP1 -/- and EG7 cells because PAP was recently shown to be a nonselective phosphatase and to hydrolyze the nucleotide thymine monophospate (TMP) into thymine. Through etheno adenosine monophosphate (e-AMP) and etheno adenosine triphosphate (e-ATP) hydrolysis assays, AMPase and ATPase activity of PAP in Jurkat control, Jurkat RIP1 -/- and EG7 cells was measured with and without the presence of the selective PAP inhibitor, l-tartrate. $2x10^6$ cells/mL were re-suspended in basal salt solution (BSS) media + 10mM glucose + .1%BSA. 10mM l-tartrate was added to certain wells, followed by 10μM e-AMP and 10μM e-ATP. Cells were incubated for one hour and supernatants were collected and evaluated using ion exchange high performance liquid chromatography. The presence of l-tartrate inhibited e-AMP hydrolysis and partially inhibited e-ATP hydrolysis in Jurkat RIP1 -/- and EG7 cells. PAP was also identified through western blot analysis. These results suggest that PAP is a non-selective ectonucleotidase present in not only prostate cancer, but also certain strands of leukemia and lymphoma.

Poster Board No. 029 EFFECTS OF BEXAROTENE ON NEUROINFLAMMATION IN AN AD MOUSE MODEL. Lekha Medarametla[1] (lmedarametla18@hb.edu), Brad T. Casali[2] (btc8@case.edu), Gary E. Landreth[2] (gel@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Department of Neuroscience, Case Western Reserve University, Cleveland, OH, 44106.

Alzheimer's disease (AD) is the most common form of dementia, characterized by neuronal death and neuroinflammation, which may result in cognitive impairment and memory loss. Neuroinflammation, or inflammation-like responses from microglia and astrocytes due to enhanced amyloid-beta production, contributes to AD pathogenesis. Greater microglia and astrocyte reactivity cause greater amounts of neurotoxic intermediates to be released, leading to neuronal death. Neuroinflammation is regulated by nuclear receptor Retinoid X Receptor (RXR) in the brain, and the drug bexarotene activates RXR among several other nuclear receptors, making it an ideal candidate for combating neuroinflammation in AD. Recently, treatment of AD mouse models with bexarotene resulted in amyloid-beta clearance and improved cognition. Here, whether bexarotene can decrease the microglia and astrocyte reactivity by inhibiting inflammation was examined. In AD mice treated with bexarotene, protein immunohistochemistry was performed on brain sections to examine the effect of bexarotene on neuroinflammation in microglia and astrocytes. Importantly, bexarotene reduced astrocyte, but not microglia, neuroinflammation in AD mice by approximately 50% four months into AD pathology. Collectively, these results demonstrate that bexarotene treatment is effective early in pathology in combating neuroinflammation. Future experimentation will examine whether astrocytes are the main mediators of reduction in inflammation.

Poster Board No. 030 IDENTIFYING TRANSCRIPTION FACTORS THAT REGULATE THE EXPRESSION OF *CEMIP*. Keyvon Rashidi[1,2] (krashidi.2017@gmail.com), Stephen Fink[2] (sxf14@case.edu). [1]University School, 2785 SOM Center Road, Hunting Valley, OH 44124, [2]Case Western Reserve University School of Medicine, Cleveland, OH.

Colorectal cancer is among the leading causes of cancer-related deaths in the United States. Recent studies indicate CEMIP, a protein not expressed in normal colon epithelium, is upregulated in colon cancer; higher CEMIP tumor expression levels are associated with poorer patient survival. Thus, identifying transcription factors that turn on CEMIP expression in colon cancer will not only help determine how CEMIP expression is regulated, but may also lead to novel therapies for treating colon cancer. The goal of the present project is to identify transcription factors that regulate CEMIP expression. Human genome coordinates of Histone 3 Lysine 27 acetylation regions for CEMIP were identified: Region 1- chr15: 81068000-81075000 and Region 2- chr15: 81121000-81159000. A program written in R was used to identify transcription factor binding sites in the two regions with 95% confidence. Microarray expression data for the transcription factors (n = 79) were obtained from previously acquired data. Spearman correlations were conducted between expression levels of CEMIP and each transcription factor. Five candidate transcription factors associated with high Spearman correlation coefficients ($\rho > 0.4$) were chosen to be pursued through further testing. These five transcription factors are SOX 9 ($\rho = 0.6144$, $p < 0.00001$), RUNX1 ($\rho = 0.5081$, $p < 0.00001$), TEAD1 ($\rho = 0.5053$, $p < 0.00001$), MZF1 ($\rho = 0.4971$, $p < 0.00001$), and BRCA1 ($\rho = 0.4760$, $p < 0.00001$). SiRNA knockout will be used to determine if the knock down of a candidate transcription factor(s) results in a knock down of CEMIP expression.

Poster Board No. 031 OPTIMIZING ADVANCED STIMULATION PARADIGMS TO IMPROVE PERFORMANCE OF FUNCTIONAL NEUROMUSCULAR STIMULATION. Greta N. Cywinska[1] (gcywinska19@hb.edu), Brian M. Sanner[2] (brian.sanner@case.edu), Dustin J. Tyler[2,3] (dxt23@case.edu). [1] Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Dept of Biomedical Engineering, Case Western Reserve University, Cleveland, OH, [3]Cleveland Louis-Stokes Dept of Veteran's Affairs Medical Center, Cleveland, OH.

Functional neuromuscular stimulation (FNS) is used to improve the lives of people living with spinal cord injuries. In motor system neuroprostheses, FNS consists of multiple channels of electrical stimulation on peripheral nerves to produce controlled muscle contractions and generate useful movements of paralyzed limbs. Current FNS systems that enable standing require high levels of constant stimulation. In human studies, high levels of constant stimulation cause early onset fatigue. To accommodate the needs of prolonged standing, more sophisticated advanced stimulation paradigms (ASPs) activate altering combinations of several muscles that have the same desired function. Each muscle is activated at less than full strength and the intensity of muscle activation varies over time. The objective of an ASP is to balance the shifting activation of muscle combinations such that the resulting total output is constant. Examples of ASPs include carousel, interleaved, and sum-of phase-shifted sinusoids (SOPS). Preliminary data from two human subjects shows the SOPS paradigm provides an increase in time to fatigue compared to constant stimulation (13.8 vs. 2.3 minutes and 9.5 vs. 4.2 minutes for subjects 1 and 2, respectively). Proper balance of the ASP parameters currently requires time-consuming manual tuning. We are developing an automated tuning method in felines. Three cats were implanted bilaterally with 16-channel C-FINE electrodes on the sciatic nerve. A JR3 moment transducer measures the ankle moment produced from stimulation of individual and multiple channels. Automated computational algorithms developed in this study should optimize performance of ASPs to delay the onset of fatigue in human subjects.

Poster Board No. 032 AUDITORY VS. VISUAL SUBLIMINAL MESSAGES: WHICH IS MORE EFFECTIVE? Andrew D. Fornadel (mfornadel@att.net). St. Rita School, 33200 Baldwin Rd., Solon, OH 44139.

Background: Subliminal messages are signals transmitted through visual or auditory means and pass below one's normal level of perception. In the 1950s, visual subliminal messages used in advertising were effective in increasing concession sales during movies. Auditory subliminal messages have been blamed for causing suicides (Judas Priest, 1990). Hypothesis: Visual subliminal messages will have a stronger influence than auditory subliminal messages. Seventy-two subjects were randomly placed into three groups. Methods: Each group watched a video showing eight different colored crayons. Group A: (the control group) watched the unedited video. Group B's video had three, 1-frame blue color visual subliminal message imbedded. Group C's video included four brief, auditory subliminal messages stating "purple." Results: At the end of the videos, the subjects were asked to choose a color that stood out and record on their test paper. The color most chosen per group follows: Control: red (n=6), Group B: blue (n=11), Group C: Green (n=7). Blue was the expected outcome in group B, and purple was the expected outcome in group C. These results support the hypothesis in that visual subliminal messages were stronger than auditory subliminal messages. Discussion/Conclusions: Some factors that may have influenced color choice include that the subject may have been distracted and may have not heard or seen the stimulus, or they may have chosen their favorite color. These results may have future impact on marketing or advertising.

Poster Board No. 033 EFFECTS OF MEDITATION ON EMOTIONAL INTELLIGENCE AND HEART RATE VARIABILITY. Sara G. Yacoub (saragyacoub@yahoo.com). Archbishop Alter High School, 940 East David Road, Kettering, OH 45429.

Meditation has been shown to be an effective way of relaxing the body, but could it affect physiology and vital organ function? It was hypothesized that meditation would increase emotional intelligence (EI) and heart rate variability (HRV). Meditation's effects on EI and HRV were tested. HRV is the beat-to-beat changes in heart rate, and a higher HRV correlates with better heart function. Pre-meditation EI scores and HRV were compared with post-meditation EI scores and HRV. Fifty-two subjects' HRV was recorded while watching an emotionally stimulating video. The subjects took the Maetrix Emotional Intelligence Test. After three weeks of daily meditation exercise, per instructions, HRV was recorded, while the subjects watched a similar emotionally stimulating video, and took the Maetrix Emotional Intelligence Test again. For high EI scorers on the original test, the percent change was -1.65% and 5.63% for EI scores and HRV respectively. For medium EI scorers, the percent change was -4.09% and 3.73% for EI scores and HRV respectively. For low EI scorers, the percent change was 20.59% and 22.20% for EI scores and HRV respectively. The Pearson correlation between the change in EI scores and the change in HRV was 0.999993, showing a strong direct relationship. In conclusion, meditation has the largest effect on EI and HRV in the subgroup of individuals who are low original EI scorers. Meditation may be used to not only affect, but improve heart health, and more research in this field can allow for further understanding about meditation's role in physiological functions.

Poster Board No. 034 ANATOMIC AXIS OF THE DISTAL HUMERUS ARTICULAR SURFACE. Harry A. Hoyen[1] (hhoyen17@us.edu), Eric Rodriguez[2] (rodrige3@ccf.org), Todd B. Bafus[3] (bbafus@metrohealth.org). [1]University School, 2785 SOM Center Road, Hunting Valley, OH 44124, [2]Cleveland Clinic, Cleveland, OH, [3]The MetroHealth System, Cleveland, OH.

The articular surface of the distal humerus is comprised of the trochlea and capitellum, which form the elbow with the ulna and radial head respectively. The axis of this articular surface is clinically relevant in trauma and arthritic conditions. The goal is to utilize humerus CT data in a novel 3D modeling method to define the flexion/extension axis and reference it to intraoperative osseous landmarks. Humeral CT DICOM images were obtained from 8 human cadaver specimens and then converted into a Mesh file for Solidworks® software analysis. Three trochlea spheres and one capitellum sphere were independently placed. The center of these spheres defined the articular axis. A coordinate system based on the humerus intramedullary canal was used to describe the axis in reference to three planes. The best fit line for the sphere centers (articular axis) was highly conserved with r^2 of 0.99. The average articular axis of the XY axis (rotational plane) was 10.86 degrees (6.14 to 16.78). The average XZ articular axis (varus/valgus) was 5.70 degrees (1.07 to 12.73.) The YZ axis (anterior/posterior) was 60.3 degrees (42.44 to 80.14 degrees). The native distal humerus articular axis was defined with a 3D modeling system by placing different spheres into the articular segment. The axis values in reference to a coordinate system were variable as evidenced by the wide range of measurement angles. The values are patient specific and this method provides surgeons with a new and reliable tool to accurately measure the axis for each patient.

Poster Board No. 035 THE RELATIONSHIP BETWEEN BODY MASS INDEX AND BARRETT'S ESOPHAGUS. Ying Ying Yang[1] (yyang18@hb.edu), Paul M. Bakaki[2] (pmb18@case.edu). [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122, [2]Deparment of Epidemiology, Case Western Reserve University, Cleveland, OH.

Barrett's esophagus is damage to the lower tissues of esophagus so that esophageal tissues resemble stomach tissues. Barrett's esophagus is a risk factor for esophageal cancer. The cause of Barrett's esophagus is not clear. The aim of this cross-sectional study is to investigate whether body mass index (BMI) is associated with Barrett's

esophagus. It was hypothesized that obesity is associated with Barrett's esophagus. In this study, R Language is used for data analysis. The sample size is 381, in which 376 have complete data. Obesity is the exposure, and Barrett's esophagus is the outcome. Potential confounders are examined individually in relation to the exposure and outcome. Confounders in this study are defined by a p-value less than 0.2. The exposure, outcome, and predictors are put into a logistic regression model to estimate the adjusted association between obesity and Barrett's esophagus. It is found that an obese individual is 3.8 times more likely to have Barrett's esophagus than one who is not obese. This result is significant (p-value: <0.0001). This result suggests a significant relationship between obesity and Barrett's esophagus. In the future, this information can be distributed among the public to increase awareness of obesity and associated risks.

Poster Board No. 036 MESENCHYMAL STEM CELL SEEDED 3D PRINTED POLYMER SCAFFOLDS FOR BONE TISSUE REPAIR. Nipun U. Jayatissa[1] (19njay@mvcds.org), Janitha Unagolla[2], Bipin Gaihre[2], Jiayong Liu[3], Sarit Bhaduri[4]. [1]Maumee Valley Country Day School, 1715 South Reynolds Road, Toledo, OH 43614, [2]Department of Bioengineering, The University of Toledo, Toledo, Ohio, [3]Department of Orthopaedic Surgery, The University of Toledo, Toledo, Ohio, [4]Departments of Mechanical Engineering and Surgery, The University of Toledo, Toledo, Ohio.

Repair of bone defects due to trauma, fracture or diseases is a clinical challenge for civilian and warrior patients. The ideal scaffolds for bone tissue repair should provide mechanical support, biocompatibility, porosity and interconnectivity. Conventional scaffolds are still unable to make ideal scaffolds for bone tissue repair. Relatively new, three-dimensional (3D) printing technology is capable of printing polymer structures. Polycaprolactone (PCL) is a polyester that melts around 60°C, and was selected for this study. The hypothesis of the present study is that 3D printed PCL scaffolds can be used to support bone tissue repair. PCL scaffolds were 3D printed using a 3D BioBot printer with a pre-created computer program into a 3D scaffold structure. The dimensions of the PCL scaffolds (n=5) were measured by the Vernier caliper: length and width = 10 mm; thickness = 5 mm. The pore size of these scaffolds (n=5) was 180μm determined by optical microscopy. The compressive modulus of the PCL scaffolds (n=5) was 31 MPa measured by a mechanical testing machine. Human mesenchymal stem cells (hMSCs) with cell density ($2x10^5$ cells/ml) were seeded onto a PCL scaffold and cultured at 37°C for 5 days to determine cell cytotoxicity. hMSCs were attached to the PCL scaffolds and no cytotoxicity was observed after 5 days confirmed by LIVE/DEAD cell assay. These results indicate that the 3D printed scaffolds have biocompatibility and similar mechanical properties and porosity to human bone tissue. Therefore, hMSC seeded 3D printed PCL scaffolds have a potential for future use in bone tissue repair.

Poster Board No. 037 DACT*YLIS GLOMERATA* THATCH REMOVAL AND ITS EFFECT ON THE REESTABLISHMENT OF INVASIVE SOUTHERN CANADIAN SPECIES AT PELEE ISLAND, ONTARIO. Maddelana K. Chesler (lchesler17@hb.edu). Hathaway Brown School, 19600 North Park Blvd., Shaker Heights, OH 44122.

Invasive species are species transported across a major geographical barrier, which produce reproductive offspring in areas distant from sites of introduction. One such species that is among the top ten most common non-native species in Southern Ontario is Orchardgrass (*Dactylis glomerata*), whose detrimental effects have led to a decline in the native plant population of Southeastern Ontario. In order to eradicate *D. glomerata* while preserving native flora, 0.29 ha were treated with sprayed 1.5% glyphosate and the *D. glomerata* biomass was left to decompose into thatch. Twelve plots were then established and separated into control plots left unaltered after glyphosate treatment, and those that underwent thatch removal. Over a three month period, the plots were observed and plant percent coverage was measured monthly by species. The two most prevalent naturalized species were both identified and categorized in this experiment as invasive, D. glomerata and Hedge Bindweed (*Calystegia sepium*), and the remaining species were measured as native, in order to determine the effect of the removal of *D. glomerata* thatch on the reestablishment of invasive species. The statistical analysis of *D. glomerata* wes F=0.2342, p=0.6432, df=7, and the analysis for *C. sepium* was F=0.0218, p=0.88626, df=8 (calculated through R version 3.1.2 (R Core Team, 2014) with the LME4 (Version 1.1-7) package), indicating that there was no statistically significant difference in the presence of invasive species between the treatments after three months. Therefore, according to this short-term study, the presence of *D. glomerata* thatch does not affect the reestablishment of invasive species.

Poster Board No. 038 COURTSHIP BEHAVIOR OF TRIPLOID ZEBRAFISH. Christopher T. Codogni[1] (ChrisCodogni@gmail.com), Kevin J. Fisher[2] (fisher.645@osu.edu), Thomas A. Delomas[2] (delomas.1@osu.edu), Konrad Dabrowski[2] (dabrowski.1@osu.edu). [1]Hilliard Davidson High School, 5100 Davidson Road, Hilliard, OH 43026, [2]The Ohio State University, School of Environment and Natural Resources, 210 Kottman Hall, 2021 Coffey Road, Columbus, OH.

Although zebrafish reproduction has been previously studied, the courtship behaviors of triploid male zebrafish remain largely unstudied. The purpose of this study was to identify if differences existed in the courtship behavior between diploid and triploid zebrafish (*Danio rerio*) males. Fish were maintained at a temperature of 28±1°C. Triploidy was induced by heat shock treatment of fertilized oocytes (2 mins at 41°C beginning 2 min post-fertilization) to cause retention of the second polar body. The resulting progenies were raised to maturity and ploidy was confirmed by flow cytometry. Diploid female zebrafish were individually crossed with diploid and triploid males. The evening before spawning, a male and female were placed in a breeding chamber and separated by a mesh barrier (chemical contact was maintained). Approximately 25 minutes after turning the lights on, the barriers were lifted and the fish were allowed to interact. Initial times at which courtship behaviors (7 sequential interactions according to Darrow and Harris 2004) and oviposition were performed by the fish was recorded. Boxplots and Student's t-tests were used to compare the initial times at which courtship behaviors were performed between breeding pairs involving diploid or triploid males. Times at which initial courtship behaviors and oviposition were performed in pairs containing triploid males were later and had a larger spread in comparison to diploid males. Males of both ploidy were able to consistently induce oviposition. These results demonstrate that triploid male zebrafish exhibit functional reproductive behavior, although differences in timing from diploid males were observed.

Poster Board No. 039 THE EFFECT OF WINDOW GRIDS ON WINDOW ENERGY EFFICIENCY. Edward D. Dan (edw656@gmail.com). Solon High School, 33600 Inwood Road, Solon, OH 44139.

Window manufacturers have studied many ways to improve a window's energy efficiency. However, no research has been conducted to understand energy loss with a window grid. It's hypothesized that the window with grid between has the lowest efficiency and the window without grids has the best efficiency. In this experiment, three windows' interior/exterior surface temperatures were measured under environmental temperatures of 2°C-33°C from summer-fall using an infrared thermometer. Win-

dows are argon filled, low emission, 59"X33", double pane with three different configurations, an aluminum grid between, a window without grid and a wood grid on the interior side. Each window was measured with 10 points on both the grid (exclude window w/o grids) and the non-grid area with 5 measured from the inside and 5 from the outside for both grids and non-grid areas. Boxplot shows the temperature range of window without grid being smallest and a 5°C difference mean than the window with grid. Regression model with Pearson correlation analysis concluded that the higher the outside temperature, the larger the difference between the window with grid between and the window without grid. Heat loss due to window grid is calculated to be about 8.91W for each average sized window based on calculated U-factor resulting in estimated $128 utility cost and 987 pounds of CO_2 released annually for a home with 10 windows. This experiment advises window manufactures to avoid making windows with grid between or to study different materials with good insulation and durability as alternative window grid.

Poster Board No. 040 ARCTIC OIL SPILL CLEAN-UP: LIGHT VS. HEAVY OIL. Abigail L. Myers (myersa13@embarqmail.com). Big Walnut High School, 4251 N. County Line Rd., Sunbury, OH 43074.

The environment is in a constant state of alteration due to climate change and its harmful effects. These effects are noticeable in the Arctic Circle where glaciers are receding. Countries have begun oil/gas exploration in this region, and are mapping future shipping routes. This newly exposed region will provide natural resources, but will create higher risk for oil spills. This experiment examined the ability of polypropylene, polyurethane, and cotton sorbents to remove light and heavy oil from Arctic water conditions through absorption and adsorption. It also examined how heavier oil affected sorbent ability to either absorb or adsorb oil. Hypotheses: (1) Cotton will most effectively remove heavy oil, followed by polypropylene, and polyurethane; and (2) polyurethane effectiveness will increase for removal of heavy oil, while polypropylene and cotton will decrease. 1.5 grams of sorbent was placed in a tank containing 26L of 5°C water, 0.46 kg of ice, and 20ml of -18°C oil. Sorbent was retrieved after 5 minutes in the tank, and mean oil mass ratios (mass of used sorbent containing recovered oil: mass dry sorbent) were determined for each of the 60 trials conducted. Polypropylene was most effective with a mean oil mass ratio of 12.9 (σ=0.3) and increased effectiveness by 25.2% as compared to light oil, followed by cotton (8.5, σ=0.2) which decreased by 10.4%, and polyurethane (6.3, σ=0.3) which increased effectiveness by 61.5 %. The hypotheses were not completely supported as the effectiveness of polypropylene was greater than cotton, and unexpectedly increased in removing heavy oil.

College Student and Professional Poster Sessions

9:00 – 10:15 PM and 1:30 – 3:00 PM

Tangeman University Center Great Hall (4th Floor, Room 465)

Note: All posters will be displayed in both morning and afternoon sessions.

Poster Board No. 001 MOVERS, SHAKERS & EVERYONE IN BETWEEN: FACULTY ATTITUDES ON ACTIVE LEARNING AT THE UNIVERSITY OF CINCINNATI. Batsheva R. Guy (serotabr@mail.uc.edu). University of Cincinnati, 3730 Herbert Avenue, Cincinnati, Ohio 45211.

This exploratory, qualitative study investigates the attitudes STEM (Science, Technology, Engineering, and Mathematics) faculty have about active learning (AL), the barriers that STEM faculty face when implementing AL, and what would encourage STEM faculty to use AL. Data was gathered using a modified Group Level Assessment (GLA), a participatory method meant for large groups, in an online format. Faculty expressed a need for smaller class sizes, more administrative support, and less content to cover. Thematic data analysis led to the development of four distinct faculty personas—"The Mover," "The Shaker," "The Planner," and "The Feeler." Each persona has individualized needs that will help them implement AL in the classroom. Future implications involve developing programs to help each type of faculty persona implement AL. Administration and faculty members need to work together to develop ways to increase faculty use of AL.

Poster Board No. 002 CAN THEY USE IT? STUDYING THE USABILITY OF THE CANVAS LMS AT BOWLING GREEN STATE UNIVERSITY. James Faisant (faisanj@bgsu.edu), Robert Green (greenr@bgsu.edu). Department of Computer Science, Bowling Green State University, Bowling Green, OH 43403.

Students' use of the Canvas learning management system (LMS) as implemented by Bowling Green State University (BGSU) is a substantial part of their learning experience. A well designed and easy to use LMS not only allows students to be more efficient, it allows students to engage effectively with their coursework. Students' ability to effectively use Canvas is examined to understand whether the system is usable, and if not, what changes should be made. Research included two distinct elements. First, 13 students completed nine tasks identified as common tasks within Canvas, while being timed. Additionally, students responded to the System Usability Scale (SUS) questionnaire to provide a usability score. Then, students' results were analyzed to see if they could be explained by training, class standing, or number of semesters at BGSU. Second, the processes to complete these nine tasks were diagrammed using Business Process Model Notation (BPMN). These diagrams were analyzed to look for ways these processes could be improved. Student's performance could not be explained on the basis of training received, class standing, or number of semesters at BGSU. Further, students scored the system well, an average of 75.96, using the SUS, completed tasks at a rate of 92.24%, and felt the tasks were easy. Lastly, analysis of the BPMN diagrams reveals that the processes are not overly complex. Overall, these findings suggest that BGSU's Canvas is highly usable, but does have some room for improvement. Minor issues should be corrected and training opportunities

should be provided that would benefit the students at BGSU.

Poster Board No. 003 EFFECTS OF CLASS TYPE AND PARTICIPANT CHARACTERISTICS ON COLLEGE STUDENTS' STUDYING TIME. Dave D. Hochstein (dave.hochstein@wright.edu). Department of Psychology, Wright State University – Lake Campus, Celina, OH 45822.

While the number of hours college students spend studying has been extensively used as a variable in past psychological research, little work has been done to examine how anxiety, student personal characteristics, and type of class affect this factor. In this initial examination, students (n = 156) at a small rural university campus completed a survey two to three weeks before final exams. Personal characteristics and answers to the following questions for each of the courses they were currently enrolled in were collected: course type (e.g. engineering), test anxiety, and hours studying per week (during weeks with and without tests). Time spent studying was significantly positively correlated with anxiety in both test weeks and non-test weeks. A significant F test revealed third-year and above students reported significantly more time studying per week (M = 1.88 hours) than did first year students (M = 1.19 hours). A significant three-way interaction (repeated measures ANOVA) clarified the relationship between test presence, gender, and academic status on hours reported studying per week. Additionally, significant gender group differences (t-tests) in reported hours of studying within particular class types were only found for the Life Science classes, with females consistently reporting more time studying than males. Personal characteristics were differentially associated with the number of hours of studying reported per week, with further clarification based on presence or absence of an exam and class type. More detailed examinations focused on class characteristics (e.g. major vs elective) are recommended.

Poster Board No. 004 SCALING CENTRAL FORCE OPTIMIZATION FOR MODERN PARALLEL ARCHITECTURES. Harrison Renny (rennyh@bgsu.edu), Robert Green (greenr@bgsu.edu). Department of Computer Science, Bowling Green State University, Bowling Green, OH 43403.

Central Force Optimization (CFO) is a deterministic-population based metaheuristic algorithm that competes with other metaheuristic algorithms. CFO has demonstrated superior results in terms of fitness quality as well as the number of functional evaluations, but at the cost of having higher runtimes. To reduce the required computation time, this study evaluates the scalability of the CFO algorithm on the Intel Xeon Phi coprocessor, which contains 56 compute cores each capable of supporting four or more threads. Algorithms that run on the Intel Xeon Phi focus on parallelization to run efficiently. It is expected that the use of the Xeon Phi coprocessor leads to decreased computation times while continuing to produce superior solutions. Further evaluation will also compare the performance issues related to Native Execution, the process will only use resources from the Intel Xeon Phi vs. Offloading, the process will run from the main processor and send some parts of the process to run on the Intel Xeon Phi.

Poster Board No. 005 TOWARDS CYCLOMETALATED PLATINUM(IV) COMPLEXES WITH VERY LONG EXCITED STATE LIFETIMES. Dr. Dustin M. Jenkins (djenkins@walsh.edu), Batool Murtahda (batoolmurtadha@walsh.edu). Walsh University, 2020 East Maple Street, North Canton, Ohio 44720.

Due to their strong luminescent properties, transition metal polypyridine complexes have garnered a great deal of attention, and are finding numerous applications in materials science, biomedicine, and catalysis. Strong spin-orbit coupling in these complexes leads to long triplet excited state lifetimes which are central to the development of materials and methods important to biomedicine such as optical blood gas sensors. The recent discovery of bis- and tris-cyclometalated platinum(IV) complexes has opened up new potential in this area as some of these complexes exhibit extreme sensitivity to molecular oxygen and lifetimes hundreds of microseconds long. Therefore, the synthesis of materials with very long lifetimes and a high sensitivity to triplet oxygen has been undertaken. New platinum(IV) complexes are being investigated using judicious modification of metal-ligand architectures to yield very long lifetimes. Efforts are focusing upon modifying the nature of the excited state to promote greater charge transfer through π system extension and constraint of ring rotation. Ligands are being synthesized using a combination of the Krohnke pyridine synthesis and Suzuki cross-coupling reactions. To synthesize bis- and tris-cylcometalated platinum(IV) complexes, cyclometalated platinum(II) pendant complexes will be oxidized using hypervalent iodine reagents followed by ligand substitution.

Poster Board No. 006 COLLAPSE OF AXION STARS. Madelyn J. Leembruggen (leembrmn@mail.uc.edu), Joshua Eby (joshaeby@gmail.com), Peter Suranyi (peter.suranyi@gmail.com), L.C.R. Wijewardhana (rohana.wijewardhana@gmail.com). Department of Physics, University of Cincinnati, 400 Geology/Physics Building, PO Box 210011, Cincinnati, OH 45221-0011.

Axions are theoretical elementary particles, which have zero spin and obey Bose statistics. Axions have been postulated to solve the strong CP problem in quantum chromodynamics, which is an unexpected symmetry in the theory of strong interactions. At low temperatures bosons condense in the ground state of their quantum mechanical system, forming Bose-Einstein Condensates, and can become gravitationally bound. It has been proposed that these gravitationally bound condensates of axion particles, called "axion stars", could be contributing to dark matter. Previous studies have found axion stars have a critical mass of ~10^{19} kg and a metastable radius of ~200 km. However, configurations of supercritical mass will collapse from their dilute state. We improve previous approximations of the axion star's energy functional by including higher-order terms to describe the axion self-interactions. Utilizing the variational method to find minima of the energy functional, we determine a stable radius can exist at ~7 m. We conclude that in the case of collapse, a repulsive self-interaction will stabilize the axion star before it becomes a black hole. Further, we are led to believe that as it contracts, the star will decay and rapidly emit highly relativistic axions through a $A_N \rightarrow A_{N-3} + a$ process, where A_N is an axion star of N particles, and a is a free axion.

Poster Board No. 007 DERIVATIZATION AND FLUORESCENCE DETECTION OF NITROSYLCOBALAMIN FOR HPLC ANALYSIS. Courtney Kilway (ckilway1@walsh.edu), Michael J. Dunphy, Ph.D. (mdunphy@walsh.edu). Walsh University, 2020 East Maple Street, North Canton, Ohio 44720.

Nitrosylcobalamin (NO-Cbl) is a vitamin B12 derivative with verified anti-tumor properties in canine and feline subjects, with no side effects in test trials. However, FDA clinical trials requires a very sensitive quantitative method for NO-Cbl in body fluids. Our research group previously published a validated reversed phase gradient HPLC method for NO-Cbl analysis on an RP-Amide column at 450nm with a detection limit of 100 ng/mL. To increase sensitivity, this project explores the use of carbazole-9-carbonyl chloride (C9C) to form a fluorescent ester derivative of NO-Cbl for HPLC analysis with the same HPLC conditions. The high quantum yield for C9C should

enable a detection limit for NO-Cbl in the desired mid to low pg/mL range for pharmacokinetic studies. Proton NMR, UV-Vis spectra and HPLC all provide evidence that a C9C adduct has been formed, though initial results suggest multiple ester structures may be involved. C9C-NO-Cbl linearity (measured as peak area versus concentration, r^2 = 0.9970, 50 – 500 pg/mL), detection limit (approximately 50 pg/mL) and repeatability (CV 3-5%) look promising, and the synthesis conditions may be causing a leveling effect which either displaces the diatomic ligand (NO, CN or HO) or causes the derivatives to co-elute under the HPLC conditions thereby complicating interpretation of results. Current research is focused on optimizing synthetic conditions, purification of the derivative and ultimately validating the HPLC method.

Poster Board No. 008 QUANTITATIVE ANALYSIS OF HYDROXYTOSYLOXYIODOBENZENE (HTIB) BY HIGH PRESSURE LIQUID CHROMATOGRAPHY (HPLC). Brylie N. Schafer (bschafer2@walsh.edu), Michael J. Dunphy, Ph.D. (mdunphy@walsh.edu). Walsh University, 2020 East Maple Street, North Canton, Ohio 44720.

Hydroxytosyloxyiodobenzene (HTIB) is a hypervalent organo-iodine compound used extensively as a synthetic reagent for chemical transformations. While the significance of the use and applications of HTIB has been well established for decades, a standard method for quantitative analysis is not generally available. The purpose of this study was to develop a suitable HPLC procedure for the quantitative analysis of HTIB for potential monitoring HTIB synthesis and reaction kinetics. 4-ethyl HTIB was synthesized by ligand exchange and used as an internal standard. Reversed phase isocratic HPLC with a C-18 column, a water/tetrahydrofuran mobile phase and UV detection (254 nm) was used. Initial results have demonstrated linearity (20-200 ug/mL HTIB, r^2 =0.9978) with peak area ratio (HTIB/4-ethylHTIB) versus HTIB concentration. The detection limit under the conditions used is 10 ug/mL and within-day and between-day variation with manual injection was under 3% each. The HPLC method will be used to monitor the reaction kinetics of the α-oxidation of acetone by HTIB and calculate rate constants and determine reactant order. If successful, the method may be extended to measure HTIB in biological samples if HTIB produces positive results with the Sulforhodamine B test on cancer cell viability.

Poster Board No. 009 ANALYSIS OF TOTAL ASCORBIC ACID IN FRUITS AND VEGETABLES USING UV-VIS SPECTROSCOPY. Ernesto J. Solorzano (esolorza1@walsh.edu), Nisreen Nusair (nnusair@walsh.edu). Department of Mathematics and Sciences, Walsh University, 2020 East Maple Street, North Canton, Ohio 44720.

Ascorbic Acid (Vitamin-C) is a key antioxidant in our daily diet that removes potentially damaging oxidizing agents in our body. Ascorbic Acid is needed to maintain the proper health of certain structural tissues such as the skin, bones, and blood vessels. Multiple food storing strategies have been developed throughout the years, and most of these methods involve some type of sealing of the product. Can, bags, and plastic containers have all become popular among the supermarkets yet by far the most popular still remains to be frozen goods. Frozen meals are now making an even bigger presence in the fast food industry and the household than ever before so an accurate method for analyzing the concentrations of Ascorbic Acid is quintessential to assure the biological needs of every individual are being met adequately. The primary objective is to compare the absolute change in Ascorbic Acid concentrations when comparing certain fruits and vegetables in their fresh state to their frozen and microwaved counterparts. The secondary objective is to prove the reliability of the labels portrayed in each container. The hypothesis is that all products tested will have the most Ascorbic Acid in their fresh state, followed by their freezing, and the least when microwaved after frozen. The Ascorbic Acid extracted from the samples will be oxidized with Bromine water and reacted into Dehydroascorbic Acid. This reagent will be dyed with a DNPH into an orange colored sample that can be analyzed with an UV-Spectrophotometer. Results will then be compared with a baseline made with stock samples of Ascorbic Acid prepared beforehand.

Poster Board No. 010 CORTICAL COMPETITION MODELS FOR COUPLED REALISTIC SPIKING NEURONS WITH HODGKIN-HUXLEY DYNAMICS: APPLICATIONS TO HUE OPPONENCY. Vincent A. Billock (billock.3@osu.edu). College of Optometry, Ohio State University, 338 W. 10th Ave., Columbus, OH 43210.

Winner-Take-All (WTA) models of neural competition are employed throughout cognitive neurosciences, but there are no good WTA models for realistic simulations of spiking neurons. Theoretical Methods: A modification (to fit human/primate cortical neurons) of the famous Hodgkin-Huxley model for generating neural action potentials was employed. Two neurons and their reciprocal inhibitory synapses were modeled using eight coupled differential equations, which were numerically integrated (using the fourth order Runge-Kutta method) to yield two neural spike trains. Results: If synaptic coupling is strong, WTA behavior results; the generated behavior depends on the speed of the simulated synapses. For slow synapses (circa 200 msec), an unstable rivalry occurs, with each neuron's spikes slowing the other neuron's response, until one neuron is suppressed and the winning neuron recovers to its original firing rate – true WTA behavior. However, for fast synapses (circa 2 msec) a pseudo-WTA response is produced: the stronger neuron wins quickly, but instead of being completely suppressed, the losing neuron produces a low voltage membrane potential, synchronized to the winner's spikes. These WTA models were used to simulate cortical red-green and blue/yellow hue opponency, by driving the simulated cortical neurons with firing rate data from real primate thalamic wavelength-dependent neurons. Conclusions: Although both WTA models result in the same steady-state winning firing rate, they have different temporal dynamics (e.g., only the true-WTA model produces hysteresis) that may suit modeling different sets of neural and behavioral data (that display commensurate time courses). Supported by NSF #145560.

Poster Board No. 011 EFFECT OF HYPOXIC CONDITIONS ON SKELETAL MYOBLASTS. Abdo M. Boumitri[1] (a.boumitri@vikes.csuohio.edu), Shuai Zhao[2] (shuaizh117@gmail.com), Crystal M. Weyman[2] (c.weyman@csuohio.edu). [1] Cleveland State University, 2216 Green Acres Dr., Parma, Ohio 44134, [2]Cleveland State University.

Ischemic injury in skeletal muscle caused by hypoxic (low oxygen) conditions occurs in response to vascular and musculoskeletal traumas, diseases and following reconstructive surgeries. Thus, a thorough understanding of the effect of hypoxia on skeletal myoblasts is warranted to identify potential therapeutic targets. Treatment with 300-μM cobalt chloride (to mimic hypoxic conditions) decreased the number of viable (attached) 23A2 skeletal myoblasts over time and increased the percentage of detached myoblasts. To determine the contribution of apoptosis (cell death) to this increase in detached myoblasts, we performed Western analysis to assess PARP cleavage, a standard marker for apoptosis. Consistent with cell death via the apoptotic process, PARP cleavage was detected following cobalt chloride treatment. The effect of cobalt chloride on the expression of the pro-apoptotic Bcl2 family member PUMA was characterized by RT-PCR and Western Analysis after three hours. Cobalt chloride treated myoblasts possessed PUMA mRNA levels six times greater than untreated myoblasts. Further, this increase

in PUMA mRNA resulted in a three-fold increase in PUMA protein. Results reported are from at least 3 independent experiments. Future experiments will focus on elucidating the mechanism by which cobalt chloride treatment results in increased PUMA levels.

Poster Board No. 012 ESTABLISHING A NORTH AMERICAN MODEL IN PLANARIAN REGENERATION. Eugene Matthew P. Almazan (almazan.2@wright.edu), Labib Rouhana (labib.rouhana@wright.edu). Wright State University, Department of Biology, Dayton, OH 45435.

The study of regenerative biology is essential to understanding the potential use of stem cells for treating human conditions in the clinic. Planarian flatworms can regenerate their entire anatomy through contributions of a continuous population of pluripotent stem cells called neoblasts. The recent ability to culture pluripotent mammalian stem cells has increased the interest of using planarians as a model for regenerative medicine, thus increasing the interest in the planarian species *Schmidtea mediterranea* as the model organism. This study seeks to facilitate the use of an alternate planarian species, the North American flatworm *Girardia dorotocephala*. A reference transcriptome was obtained by de novo assembly of Next Generation RNA-seq data generated from a clonal line of *G. dorotocephala*. Members of the PIWI family of proteins represented in the *G. dorotocephala* transcriptome were identified by TBLASTN and cloned into a commercial vector for in vitro transcription of riboprobes and double-stranded RNA. Whole-mount in situ hybridization experiments demonstrate that PIWI 1 and 2 orthologs in *G. dorotocephala* are indeed expressed in the stem cells, whereas only PIWI 2 is required for regeneration and homeostasis. These results validate the functional conservation of PIWI homologs in stem cell function previously reported in foreign planarian species, and also demonstrate the suitability of *G. dorotocephala* for studies of gene expression and function.

Poster Board No. 013 GENERATION OF A RAT SCL39A9 LUECIFERASE REPORTER TO EXPLORE SRY TRANSCRIPTIONAL REGULATION OF THE ZIP9 PROTEIN. Madison Lyberger (mlyberge1@walsh.edu), Gabrielle Mey (GabrielleMey@walsh.edu), Amy Milsted (amilsted@walsh.edu), Adam Underwood (aunderwood@walsh.edu). Walsh University, 2020 East Maple Street NE, North Canton, OH 44720.

The solute carrier family 39 a 9 (slc39a9) gene encodes the transmembrane transport protein, ZIP-9 (zinc ion transporter isotype 9) which is associated with coordinating zinc ion mediated apoptosis in target cells. In addition to functioning as a zinc ion transporter, ZIP-9 also has been shown to function as a membrane bound receptor for testosterone, referred to as the membrane androgen receptor (mAR). This protein can stimulate a G protein mediated nongenomic response to testosterone. SRY (sex-determining region of the Y chromosome) is male specific transcription factor that has been shown to directly modulate expression and intracellular activity of cytoplasmic androgen receptor. The objective of this project was to generate a luciferase reporter construct encoding -665 base pairs of rat slc39a9 promoter sequence (pGL3/rat39a9). This reporter will then be used in future studies to determine if SRY also regulates the expression of slc39a9. This project began by extracting genomic DNA from rat hepatic tissue followed by PCR amplification of -665 base pairs of slc39a9 promoter. Forward and reverse primers were designed to contain restriction sites for the endonucleases BAM H1 and HINDIII respectively. The pGL3 Luciferase Reporter (Promega) and the sls39a9 amplicons were then cleaved and the amplicons were ligated with T4 DNA ligase into the opened pGL3 vector. After the ligation, pGL3/rat39a9 constructs were sequenced and transformed into Zymo Research Mix and Go Zymo 5α competent cells. pGL3/rat39a9 plasmid DNA preparations have been completed and DNA is now ready for cotransfection studies to determine if Sry can modulate slc39a9 expression.

Poster Board No. 014 CONSERVED FUNCTION OF THE MET-2 GENE IN CAENORHABDITIS BRIGGSAE. Aaron L. Berenson (berenson.4@wright.edu), Scott E. Baird, Ph.D. (scott.baird@wright.edu). Wright State University, Department of Biological Sciences, 3640 Colonel Glenn Hwy., Dayton, OH 45431.

In the hermaphroditic nematode *Caenorhabditis elegans*, the *met-2* gene encodes a histone methyltransferase responsible for the dimethylation of lysine 9 of histone H3 (H3K9me2). Mutations in *met-2* result in germline mortality, imperfect fertilization and defective vulval development. The goal of this study is to determine if these functions are conserved in *Caenorhabditis briggsae*. A CRISPR-induced frame-shift mutation in *cbr-met-2* was made for this purpose. Germline mortality (sterility) is observed in *C. elegans* mutant animals within 28 generations of homozygosity. However, *cbr-met-2* homozygous mutant populations have been maintained for 50+ generations with no evidence of germline mortality. *Cbr-met-2* mutants have a reduced brood size and low penetrance defects in fertilization. To confirm fertilization defects, young adult hermaphrodites will be fixed, DAPI stained and scored for endomitotic oocytes within the uterus. The reduction in brood size cannot be fully accounted for by defects in fertilization. Rather, it likely is due to a premature transition from spermatogenesis to oogenesis. To test this, gonads in L4s and young adults were scored for the presence of sperm and oocytes. Based on initial observations, this transition occurs during late L4 in *cbr-met-2* mutants while wildtype animals remain spermatogenic until 4 hours into adulthood. Finally, in *C. elegans met-2* is a class B synMuv gene. Vulval defects result from simultaneous disruption of class A and class B synMuv genes. To test for this, *cbr-met-2* mutant animals will be treated with RNAi to disrupt class A synMuv genes and scored for defects in vulval development.

Poster Board No. 015 MYD88-DEPENDENT TLR ACTIVATION NEGATIVELY REGULATES TLR3 SIGNALING IN MACROPHAGES. Hannah M. Schwab (hshwab13@students.ndc.edu), Rachelle L. Miller (rmiller12@students.nde.edu), Angela C. Johnson (acjohnson@ndc.edu). Notre Dame College, 4545 College Road, South Euclid, OH 44121.

Toll-like receptors (TLRs), a subset of pattern recognition receptors, are critically involved in innate cellular immune responses to pathogenic insults. These receptors, which are expressed by macrophages, dendritic cells, and epithelial cells, are responsible for recognition of pathogen-associated molecular patterns (PAMPs), thereby triggering signaling transduction pathways and leading to induction of pro-inflammatory gene expression. Recent studies have suggested that MyD88, a common adaptor molecule utilized by most TLRs, plays a negative regulatory role in TLR3 activation, as a genetic knock-out of MyD88 results in increased TLR3 signaling. Therefore, MyD88 may play a negative regulatory role for TLR3 signaling. To further elucidate these findings, studies with the macrophage cell line J774 have begun. Briefly macrophages will be treated with Pam_3CysK_4 (TLR2 agonist) alone, flagellin (TLR5 agonist) alone, Poly(I:C) (TLR3 agonist) alone, Pam_3CysK_4 with Poly(I:C), or flagellin with Poly(I:C). Preliminary data suggests that utilization of TLR2 and TLR5, which are both dependent upon MyD88 signaling, prior to TLR3 activation results in enhanced production of CCL5/RANTES. In agreement with previous studies, it is expected that both NF-κB nuclear translocation and MAP kinase signaling as measured by phosphorylation of JNK will be similarly increased. In conclusion, as MyD88 is utilized for signaling via TLR2 or TLR5, its negative

impact on TLR3 signaling will be relieved; and, therefore, TLR3 activity may be enhanced. It is expected that these studies will reveal the impact that bacterial infections, as mimicked by TLR2 and TLR5 activity, may have upon viral infections (TLR3).

Poster Board No. 016 NUCLEAR LOCALIZATION OF TRUNCATED HUMAN SRY PROTEINS TRANSIENTLY TRANSFECTED INTO CHINESE HAMSTER OVARY CELLS. Celeste E. Kunkel (celestekunkel@walsh.edu), Adam C. Underwood (aunderwood@walsh.edu). Walsh University, 2020 East Maple Street NE, North Canton, OH 44720.

SRY (sex-determining region of the Y chromosome) is a transcription factor that transforms an undifferentiated embryonic gonad into testes. Human SRY (hSRY) is comprised of a single exon, and encodes a 204 amino acid protein containing a centrally located High Mobility Group (HMG) box DNA binding domain. The HMG box is flanked by two nuclear localization sequences and most mammalian SRY proteins encode an amino terminal flanking region that enhances transcriptional activity. However, rodent Sry lacks this 65 amino acid region, thus function has been elusive. The purpose of this project was to identify functional attributes of this amino terminal region encoded by hSRY, specifically focusing on nuclear localization. The hypothesis tested was; the amino terminal flanking region (residues 1-65) of hSry is required for nuclear translocation. To complete this project a mutated hSRY expression construct excluding the flanking region (pEF1/hSRY-flank) was generated. To determine functional contribution of the flank region, pEF1/hSRY-flank was transfected into Chinese Hamster Ovary cells grown to 70% confluence in Nunc® Lab-Tek® 16 well Chamber Slides™. On each slide (N=3) six chambers were transfected with positive control vectors encoding native hSRY, native rat Sry1 and rat Sry2 constructs. Additionally, two chambers were transfected as negative controls with empty pEF1/cMyc-His. Following a 24 hour incubation at 37°C and 5% CO_2, immunocytochemistry (ICC) was used to determine protein localization. ICC showed that in all positive controls, Sry localized as predicted and trunked hSRY protein showed cytoplasmic and nuclear accumulation, indicating the flanking region is reacquired for nuclear localization.

Poster Board No. 017 EVALUATION OF POTENTIAL FOMITES IN SENIOR NURSING FACILITY AND REHABILITATION UNIT. Morgan Rouch (m-rouch.2@onu.edu), Genevieve Marchese (g-marchese@onu.edu). Ohio Northern University. [Advisors: Linda Young (l-young@onu.edu), Vicki Motz (v-motz@onu.edu). Ohio Northern University, 505 N. Gilbert St., Ada, OH 45810].

In healthcare settings, numerous items have the potential to become fomites (depositories for pathogenic microbiota) if proper hygiene protocols are not followed. Geriatric and immunocompromised populations can be particularly vulnerable to nosocomial infections due to weakened immune systems, and medical devices such as indwelling catheters. The housekeeping staff is responsible for general disinfection of nursing home facilities. Health care professionals (ie. nurses, state tested nursing assistants) are responsible for following proper cleaning methods for equipment and for themselves. This research team has followed a new nursing home facility to determine whether effective cleaning methods have been employed on items primarily in contact with patients (a call button in a patient room, a wheelchair arm rest and a side table top) and those used by the health care workers (a control panel for a Hoyer lift, the handles of the wheel chair and a hall charting computer mouse); and whether these methods remain effective as patient population rises. Items were swabbed weekly for 7 weeks using culturettes with Stuart's media and bacteria eluted from swab via thermoagitation in 2 ml MH broth at 37°C for 5 minutes at 1000 rpm. Ten microliter aliquots were plated on trypticase soy agar with 5% SRBC and incubated 24 hours at 37°C with 5% CO_2. Colonies were subcultured onto differential/selective media for identification. Colony counts were low averaging 190.4 +/- 265.3 CFUs on areas handled by staff compared with 322.8 +/- 473.6 CFUs on patient contact areas. Colony identification is in progress. Although patient population increased throughout the duration of the study, no correlation was seen between bacterial count and number of residents.

Poster Board No. 018 ANTIBIOTIC-RESISTANT BACTERIA DISCOVERED IN INTESTINAL TRACT OF *AMBYSTOMA MEXICANUM*. Erica N. Eskins (eskinse@bgsu.edu), Raymond A. Larsen (larsera@bgsu.edu). Bowling Green State University, 431 Life Science Building, Bowling Green, OH 43403.

Bacterial isolates from the intestinal microbiota of the salamander species *Ambystoma mexicanum* (a common laboratory model organism and increasingly common household pet) were surveyed for resistance to a set of antibiotics, with particular emphasis on the beta lactam antibiotic ampicillin. Fresh fecal deposits taken from the tanks of three separately-housed animals (two female, one male) were sampled on two occasions, eight days apart. Samples were plated onto general (Luria Bertani (LB)) and selective/differential (Hektoen Enteric (HE) & MacConkey (MAC)) agar and incubated at 30°C for 24 hrs. A total of 95 isolates were characterized based on growth/phenotype on the HE & MAC plates. Antibiotic sensitivities of these isolates were tested by patching onto LB plates containing one of four different antibiotics at concentrations that inhibit the growth of laboratory *Escherichia coli* strains. Of the 95 isolates, 90% were resistant to ampicillin, 67% were resistant to chloramphenicol, 29% were resistant to kanamycin, and 2% were resistant to tetracycline. Six strains were resistant to at least three of the four antibiotics. The pattern of resistance, combined with colonial phenotypes, suggests that there are at least 79 different isolates that were collected. Ongoing studies using 16S rRNA gene sequencing will confirm the identity of the isolates. The variety of phenotypes and responses to antibiotics in this pilot study suggest the intestinal microbiota of *Ambystoma mexicanum* is sufficiently diverse to justify a broader, metagenomics survey to further evaluate species composition and variation of genes encoding resistance to beta lactam antibiotics in this habitat.

Poster Board No. 019 ANTIBIOTIC RESISTANCE MECHANISMS IN *RAHNELLA* BACTERIA. Katherine D'Angelo (katherd@bgsu.edu), Raymond A. Larsen (larsera@bgsu.edu). Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403-0208.

Antibiotic resistance is a growing problem in the field of healthcare. Antibiotics are becoming less effective as species of bacteria adapt and share resistance mechanisms. If transmission of mechanisms can be better understood at the molecular level, inhibitors could be developed to lessen the likelihood of antibiotic resistance. In this study, *Rahnella* spp were isolated from environmental sources on MacConkey plates containing 100 μg ml^{-1} ampicillin, and confirmed by 16S rRNA gene sequencing. Whole genomic DNA was extracted from isolates and initial amplifications were performed by the polymerase chain reaction (PCR) using primers specific for TEM, SHV and CTX ß-lactamase genes. Products were generated only with CTX primers, and these were weak. New primers were designed based on the sequence of a ß-lactamase identified in a *Rahnella* genome. These primers provided strong amplification. The products of these amplifications were sequenced, with the predicted protein products showing high sequence similarities to the previously identified *Rahnella* ß-lactamase and less homology to CTX ß-lactamases. Individual sequences were compared and found to cluster into two distinct

groups, with each being distinct from the known *Rahnella* ß-lactamase. Additional *Rahnella* isolates have been collected and further analysis is ongoing.

Poster Board No. 020 A PSEUDOGENE PROVIDES EVIDENCE OF EVOLUTION OF NEW GENETIC INFORMATION BY GENE DUPLICATION FOLLOWED BY FRAMESHIFT MUTATION. Daniel Rasicci (drasicci1@walsh.edu), Matthew Huntsman, Thomas Freeland (tfreeland@walsh.edu). Walsh University, 2020 East Maple St., North Canton, OH 44720.

A pseudogene is a genomic DNA sequence that has sequence similarity to a functional gene but it is non-functioning. Being subject only to neutral mutation rates rather than the faster rates of directional selection, a pseudogene may be able to reveal distant evolutionary relationships. It is known that new genetic information arises from gene duplications followed by point mutations, resulting in recognizable protein families, but new information resulting from frameshift mutations is more difficult to detect because there is no amino acid sequence similarity. The gene Arch_1773 in the Bacterial pathogen *Arcanobacterium haemolyticum* was analyzed using standard bioinformatics tools during a gene annotation project. Arch_1773 was identified as a pseudogene because its ORF was interrupted by multiple termination codons. The gene sequence was found (by nucleotide BLAST search) to be similar to the nucleotide sequence of several genes from related Bacteria (*Segniliparus rotundus*, *Corynebacterium falsenii*, and *Corynebacterium argentoratense*). However, due to frameshifts, these related genes coded for several different unrelated amino acid sequences. Within the A. *haemolyticum* genome, the Arch_1773 was most similar to the Arch_1635 gene. Arch_1635 codes for a cell-surface protein containing a TQXA domain. Arch_1773, with stop codons removed, also includes a signal peptide coding sequence. It is suspected that the pseudogene Arch_1773 is a duplicate of the Arch_1635 gene, but with mutations that created stop codons inactivating the functional ORFs. Meanwhile, the lack of any selection on the pseudogene has allowed it to retain some nucleotide sequence similarity that reveals its relationship to genes coding for very dissimilar proteins. This may be evidence of new gene evolution by gene duplication followed by frameshift mutation. The duplicates acquired new functions by frameshift mutations, but Arch_1773 became a pseudogene (by point mutation) that was not subject to selection pressure and therefore preserves some of the original nucleotide sequence similarity that was detected by BLAST search.

Poster Board No. 021 COMPARATIVE ANALYSIS OF THE THIRD CHROMOSOME OF *DROSOPHILA FISCUSPHILA* REVEALS THE HOMOLOUES OF TWO *DROSOPHILA MELANOGASTER* GENES. Alyssa Estep (aestep14@students.ndc.edu), Matthew L. Johnson (mjohnson@ndc.edu). Notre Dame College, 4545 College Road, South Euclid, OH 44121.

Traditionally, euchromatin is considered an area of the genome that is transcriptionally active, while heterochromatin is transcriptionally silent. However, in certain circumstances genes that are in heterochromatic areas are transcriptionally active. In particular, the F-element, a heterochromtic chromosome in certain *Drosophila* species remains transcriptionally active. Based on conservation of genomic elements between related organisms, a comparison between the F-element and euchromatic DNA can aid in uncovering certain motifs that allow for expression in heterochromatic versus euchromatic DNA. In order to compare genomic regions, fully annotated sections of various *Drosophila* species are required. Through a collaborative effort with the Genomic Education Partnership (GEP), high quality annotation can be achieved. As part of this collaboration, this study examines Contig 3, a 40,000 base pair section, of the 3L chromosome from *D. ficusphila*. Standard resources for annotation were used such as the reference *D. melanogaster* genome, FlyBase, BLAST, UCSC Genome Browser, and the GEP's Gene Record Finder. This analysis successfully annotated two genes in the contig3, *D. ficusphila*, Mes2, with two isoforms Mes2-PB, Mes2-PC, and CG32461. Furthermore, analysis of putative transcription start sites through BLASTn alignment of the initial exon from *D. melanogaster*, RNA-Seq coverage, TopHat splice junctions, core promotor motifs, and sequence conservation with other *Drosophila* species helps to aid in the uncovering the differences in between euchromatic and heterochromatic DNA transcription.

Poster Board No. 022 HOMOLOGY MODELING OF HIGH MOBILITY GROUP BOX (HMG BOX) PROTEINS SOX9 AND HMGB1; WORK TOWARDS TRANSLATIONAL GENOMICS. Maya Seif[1] (mseif1@walsh.edu), William Cvammen[1] (wcvammen1@walsh.edu), Thomas Freeland[1] (tfreeland@walsh.edu), Adam Underwood[1] (aunderwood@walsh.edu), Jeremy Prokop[2] (jprokop54@gmail.com). [1]Walsh University, 2020 East Maple St. NE, North Canton, OH 44720, [2]HudsonAlpha Institute for Biotechnology.

In silico research focusing on the architectural and functional attributes of proteins has the potential to revolutionize future understanding of and therapies for a variety of disorders. The entire genome sequences of many species have been completed in the last five years, therefore evolutionary biology can be used as a means to define the signaling molecules and intracellular pathways that regulate homeostasis or contribute to disease states. Our research team, in collaboration with HudsonAlpha Institute for Biotechnology, is working to establish a work flow that uses programs such as YASARA to make *in silico* three-dimensional models of transcription factors such as SOX9 (Transcription factor SOX-9) and HMGB1 (High mobility group protein B). The program builds models by using PsiBLAST to build position-specific scoring matrices, and the resulting sequence profiles are compared to sequences in the Protein Data Bank, where homologous proteins can be found whose structures were previously determined. Regions of evolutionary conservation will be mapped onto the models, as a way to begin predicting functionally conserved structural motifs. The current work is for student researchers to establish structural models of various human HMG box proteins all of which are transcription factors. So far, several protein structure models have been completed, and validated by energy minimization analysis. Investigation of possible post-translational modification will be done next. These structures will be included in a database of "deep-sequence-to-structure-to-function" analysis. This represents a step in the translation of genomic data to relevant functional information.

Poster Board No. 023 HOMOLOGY MODELING OF HIGH MOBILITY GROUP BOX (HMG BOX) PROTEINS LEF-1 AND SP100; WORK TOWARDS TRANSLATIONAL GENOMICS. Michelle Seif[1] (mseif2@walsh.edu), Daniel Rasicci[1] (drasicci1@walsh.edu), Thomas Freeland[1] (tfreeland@walsh.edu), Adam Underwood[1] (aunderwood@walsh.edu), Jeremy Prokop[2] (jprokop54@gmail.com). [1]Walsh University, 2020 East Maple St. NE, North Canton, OH 44720, [2]HudsonAlpha Institute for Biotechnology.

In silico research focusing on the architectural and functional attributes of proteins has the potential to revolutionize future understanding of and therapies for a variety of disorders. The entire genome sequences of many species have been completed in the last five years, therefore evolutionary biology can be used as a means to define the signal molecules and intracellular pathways that regulate homeostasis or contribute to disease states. Our research team, in collaboration with HudsonAlpha Institute for Biotechnology is working to establish a work flow that uses programs such as YASARA to make *in silico* three-

dimensional models of transcription factors such as LEF1 (Lymphoid enhancer-binding factor 1) and SP100 (Nuclear autoantigen Sp-100). The program builds homology models by using PsiBLAST to build position-specific scoring matrices, and the resulting sequence profiles are compared to sequences in the Protein Data Bank, where homologous proteins can be found whose structures were previously determined. Regions of evolutionary conservation will be mapped onto the models, as a way to begin predicting functionally conserved structural motifs. The current work is for student researchers to establish structural models of various human HMG box proteins, all of which are transcription factors. So far, several protein structure models have been completed, and validated by energy minimization analysis. Investigation of possible post-translational modification will be done next. These structures will be included in a database of "deep-sequence-to-structure-to-function" analysis. This represents a step in the translation of genomic data to relevant functional information.

Poster Board No. 024 LIPIDOMIC ADAPTATIONS IN WHITE AND BROWN ADIPOSE TISSUE IN RESPONSE TO EXERCISE DEMONSTRATES MOLECULAR SPECIES-SPECIFIC REMODELING. **Adam C. Lehnig[1] (adam.lehnig@osumc.edu), Francis J. May[1], Lisa A. Baer[1], Kawai So[2], Matthew D. Lynes[2], Emily Y. Chen[3], Fei Gao[3], Niven R. Narain[3], Michael A. Kiebish[3], Laurie J. Goodyear[2], Kristin I. Stanford[1] (kristin.stanford@osumc.edu). [1]Dorothy M. Davis Heart and Lung Research Institute, Department of Physiology and Cell Biology, The Ohio State University Wexner Medical Center, Columbus, OH 43210, [2]Section on Integrative Physiology and Metabolism, Joslin Diabetes Center, [3]Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA 02215, [3]BERG Health, Framingham, MA 01701.**

Exercise improves whole-body metabolic health through adaptations to various tissues including skeletal muscle, the cardiovascular system, and adipose tissue. Chronic exercise alters the lipid content of skeletal muscle resulting in improved insulin sensitivity, but the role of exercise on the lipid profile of white adipose tissue (WAT) and brown adipose tissue (BAT) is unknown. Here, we utilized an MS/MS^{ALL} shotgun lipidomics approach to comprehensively characterize differential molecular signatures of exercise-induced adaptations to both subcutaneous WAT (scWAT) and BAT in mice. We identified that 3 weeks of voluntary exercise (wheel-cage running) leads to antagonistic regulation of phospholipids in scWAT and BAT, with exercise decreasing specific molecular species of phosphatidic acid (PA), phosphatidylcholines (PC), phosphatidylethanolamines (PE), and phosphatidylserines (PS) in scWAT and increasing molecular species of PC and PE in BAT (n=6/group, two-tailed t-tests with significance $p<0.05$). Exercise also decreases triacylglycerols (TAGs) in both scWAT and BAT, with the exception of longer chain molecular species of TAGs, which are significantly increased in both scWAT and BAT after exercise. In summary, these data indicate that exercise results in surprising adaptations to both scWAT and BAT that are associated with significant and molecular species-specific remodeling of both phospholipids and glycerol lipids.

Poster Board No. 025 THE ROLE FOR VEGF-R2 IN THE ALTERED VASCULAR BEHAVIOR OF SECONDARY ORDER MESENTERIC ARTERIES IN THE RUPP MODEL OF PREECLAMPSIA. **Kyle G. Denihan[1] (Kdenihan1@walsh.edu), Brittany Balser[2] (Bab159@zips.uakron.edu), Rolando J. Ramirez[2] (Rjr@uakron.edu), Jacqueline Novak[3] (Jnovak@walsh.edu). [1]Walsh University, 2020 East Maple St., PO Box 383, North Canton, OH 44720, [2]University of Akron, Akron, OH, [3]Walsh University, North Canton, OH.**

Preeclampsia is a potentially fatal condition characterized by hypertension and impacts both maternal and fetal health. Preeclampsia is a result of an improper balance of angiogenic factors and their receptors; specifically, a decreased amount of free vascular endothelial growth factor (VEGF) available to bind to membrane bound VEGF receptor (VEGF-R2). We hypothesize increasing VEGF-R2 through treatment with L-Tyrosine Polyphosphate nanoparticles will improve maternal vascular responses in the reduced uterine perfusion pressure (RUPP) model of preeclampsia. The RUPP model is produced by partially occluding the descending abdominal aorta and uterine-ovarian arteries. The control group (Sham) undergoes the same surgery as RUPP but uterine perfusion is not reduced. Additionally, at the time of surgery the treated groups are injected with nanoparticles, which results in four groups: Rupp, Rupp-Treated, Sham, and Sham-Treated. The rats are euthanized at day 20 of pregnancy, and the second order mesenteric arteries are removed. The vessels are studied in an isobaric arteriograph. Arterial diameter measurements are made over a range of pressures (20-120mmHg) to assess the vessels' myogenic reactivity responses (n=6 per group). Preliminary results show improved myogenic reactivity in RUPP animals treated with the nanoparticles and no effect on SHAM animals. Percent change in diameter will be calculated and results will be analyzed by repeated measures ANOVA. Western Blotting will be performed to determine if the VEGF-R2 found in the rats was endogenous or exogenous (from nanoparticles) since VEGFR2 from the nanoparticles carries a molecular (myc) tag. Increasing VEGFR2 through nanoparticle treatment will improve maternal vascular responses.

Poster Board No. 026 EXPLORING THE LINK BETWEEN POLYCHLORINATED BIPHENYLS, IMMUNE MARKERS AND EXERCISE. **Mahesh R. Pillai[1] (mpillai@bgsu.edu), K. Todd Keylock[2] (tkeyloc@bgsu.edu), Lee Meserve[1] (lmeserv@bgsu.edu). [1]Dept. of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403 [2]Dept. of Exercise Science, Bowling Green State University, Bowling Green, OH 43403.**

Polychlorinated biphenyls (PCBs) are environmental pollutants and endocrine disruptors, harmfully affecting reproductive, endocrine, neurological and immunological systems. This has implications for processes such as wound healing, which is modulated by the immunological response of the body. Conversely, while PCBs can be linked to diminished wound healing, outside of PCB pollution systems, exercise has been shown to accelerate wound healing. However, the potential for moderate intensity exercise to modulate or offset the harmful effects of a toxin like PCB are yet unknown. Exploration of this possible moderation was achieved by analyzing the concentrations of proinflammatory cytokines, interleukin-1ß(IL-1ß) and tumor necrosis factor-α (TNF-α) in wounds (inflicted by punch biopsy) in mice that were not exercised as compared with those previously exercised at moderate intensity by running on a treadmill for 30min/day and then injected intraperitoneally with Aroclor 1254 (industrial mixture of PCB congeners) in doses of either 0, 100, 500 and 1000 ppm (wt/wt of mice). Mice were euthanized at Day 3 or Day 5 (n = 3-6) and skin excised from the wound area was homogenized and analyzed for cytokine content. Results showed that IL-1ß concentrations in Day 5 mice with no PCB administered were 33% less in exercised mice than mice not exercised. However, IL-1ß concentrations in Day 3 mice administered 100 ppm were 130% greater in exercised mice than not exercised mice. Exercise did not alter TNF-α concentrations. However, in not exercised mice at Day 3, administration of 100 ppm PCB caused 25% depression of TNF-α concentrations than mice not administered PCB. The results observed will also be correlated to wound size measurement to obtain a better understanding of how these immune markers are affecting wound healing.

Poster Board No. 027 FRONTAL GLUTAMATE HOMEOSTASIS IS MODIFIED BY DIETARY OMEGA-3 FATTY ACID INTAKE DURING PERI-ADOLESCENT DEVELOPMENT: AN *IN VIVO*

^{1}H MRS STUDY. Ruth Asch[1] (aschrh@mail.uc.edu), Richard Komoroski[1], Diana Lindquist[2], Robert McNamara[1]. [1]Department of Psychiatry and Behavioral Neuroscience, Division of Bipolar Disorders Research, University of Cincinnati, Cincinnati, OH 45219, [2]Department of Radiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH 45267.

Omega-3 fatty acid (*n*-3) biostatus and glutamate homeostasis in the medial prefrontal cortex (mPFC) are often both perturbed in individuals with psychopathology. This study investigated the effects of dietary-induced alterations in cortical docosahexaenoic acid (DHA, 22:6*n*-3) accrual during peri-adolescent development on glutamate homeostasis in the adult rat brain using ^{1}H-MRS. From postnatal day P21-P90, male rats received a diet deficient of *n*-3 (DEF, n=20), a diet fortified with preformed DHA (fish oil, FO, n=20), or a control diet containing alpha-linolenic acid (18:3*n*-3, CON, n=20). On P90, ^{1}H MRS data were acquired from voxels in the mPFC and thalamus as a sub-cortical control using a 7T Bruker Biospec system. Spectra were imported into LCModel for quantitation and absolute concentration of glutamate, glutamine and the glutamine/glutamate ratio, an index of glutamine synthetase activity. In the mPFC, there was a significant effect of diet on glutamate levels (p=0.006): DEF rats had significantly higher glutamate levels when compared to FO (+12%, p=0.003) and CON (+7%, p=0.05). There were no significant effects of diet for glutamine in the mPFC (p=0.69), and the glutamine/glutamate ratio was lower in DEF rats compared with CON (-10%, p=0.05) and FO (-10%, p=0.04). In the thalamus, there were no significant differences in glutamate (p=0.54), glutamine (p=0.78), or the glutamine/glutamate ratio (p=0.72). These data indicate that dietary *n*-3 intake and cortical DHA accrual during peri-adolescent development is an important determinant of prefrontal glutamatergic homeostasis in adult rats. Ongoing studies are investigating a possible role of astrocyte glutamate transporters and/or glutamine synthetase.

Poster Board No. 028 USE OF HUMAN UMBILICAL CORD MESENCHYMAL STEM CELLS TO TREAT CORNEAL OPACITY ACQUIRED THROUGH INJURY AND INFECTION. Mohamed H. Elzarka (elzarkmd@mail.uc.edu), Mindy Call (callmk@ucmail.uc.edu). University of Cincinnati, 3230 Eden Avenue, Suite 5860, Cincinnati, OH 45267.

The corneal stroma is composed of a matrix of interwoven collagen fibrils, proteoglycans, and sparsely distributed keratocytes that allows for transparency and thus permits light to refract through the cornea correctly. Disruption of stromal architecture through conditions such as corneal injury or bacterial infection can lead to increased corneal opacity and a loss in vision acuity. The purpose of this study is to determine whether human umbilical cord mesenchymal stem cells (hUMSCs) can mitigate the effects of corneal opacity, and it was hypothesized that hUMSCs would improve corneal opacity brought about by corneal injury and bacterial keratitis infection. To conduct the study, wildtype C57BL/6 mice were used to create two study groups. The first group (n=14) was used to model corneal injury and received bilateral 2mm keratectomies of anterior corneal stroma. The second group (n=26) modeled corneal infection and was bilaterally infected with *Pseudomonas aeruginosa* (strain PA01). Mice in each group were subsequently treated on one eye with hUMSCs applied as a stem-cell-rich fibrin gel directly to the corneal surface. Corneal opacity was assessed in these eyes and in contralateral controls using Heidelberg Retinal Tomography. Among eyes that underwent keratectomy, hUMSC-treated eyes had significantly (p=.031) reduced corneal opacity as compared to their contralateral controls. Similarly, infected eyes treated with stem cells showed a reduction in opacification as compared to non-treated, infected eyes. These results indicate the efficacy of using hUMSCs in treating acquired corneal disease and have led to ongoing experimentation in assessing the hUMSC immunomodulatory response in bacterial infection.

Poster Board No. 029 INVESTIGATION OF NITRIC OXIDE RELEASE CHARACTERISTICS AND CELL TOXICITY POTENTIAL OF VARIOUS MODIFIED COBALT AND IRON COMPLEXES FOR USE IN CANCER THERAPY. Kaitlin Kruger (kkruger2@walsh.edu), Michael J. Dunphy, PhD (mdunphy@walsh.edu), Joseph A. Lupica, PhD (jlupica@walsh.edu). Walsh University, 2020 East Maple Street, North Canton, OH 44720.

Nitric Oxide (NO), when released in sufficient quantity into human cells, is toxic, triggering apoptosis and leading to cell death. NO can be added as a ligand to non-toxic compounds to be taken up by cancer cells, and the NO can then be released, leading to cancer-cell death. When treated appropriately, hydroxocobalamin, a form of Vitamin B12, can form a hexadentate complex, including one molecule of NO, and is able to successfully deliver NO to cancer cells following TCP-II receptor binding, endocytosis, and lysosome-mediated NO release. The purpose of this study is to evaluate the effect of NO-loaded cobalt (III) and NO-loaded iron (III) complexes on cancer-cell growth in vitro. We hypothesize that cell growth will decrease in the presence of such complexes as a direct result of the NO release from the complexes which would trigger apoptosis. The cell toxicity study was performed with tissue-cultures using the well accepted sulforhodamine B (SRB) assay and cell line A375 (ATCC), a malignant melanoma, commonly used by the National Cancer Institute to screen promising anti-cancer compounds. A nitrogen oxide analyzer was used to determine the amount of NO being released by the derivatives in solution. Initial results are promising with specific cobalt and iron-NO complexes showing stability, NO-release capability and positive SRB assays. Current studies are being done to increase purity, titrate NO-release profiles and determine final structures of NO-complexes.

Poster Board No. 030 ANTI-CANCER EFFECTS OF A NOVEL TAMOXIFEN ANALOG (SP-1) ON U87 GLIOBLASTOMA CELL LINE. Samson M. Frendo[1] (s-frendo@onu.edu), Amy L. Aulthouse[2] (a-aulthouse@onu.edu), David H. Kinder[2] (d-kinder@onu.edu). [1]Ohio Northern University, Unit #1585, 402 W. College Ave., Ada, OH 45810, [2]Ohio Northern University.

Glioblastoma is the most common and deadliest form of malignant primary brain tumors. The Sigma-2 receptor is known to be present in glioblastoma cells, and agonists of sigma-2 receptors are known to have cytotoxic and antiproliferative effects on cancer cells. A unique compound designed to bind sigma-2 receptors, SP-1, with structural similarities to the drug Tamoxifen, was synthesized with the removal of the estrogen receptor binding portions. U87 glioblastoma cells were grown in monolayer or a single-cell suspension in low temperature agarose. They were then fed DMEM containing 10% FCS and incubated at 37°C. Cells in agarose were treated with Tamoxifen (5μM, 10μM) and SP-1 (18μM, 35μM) with triplicate cultures per treatment. Cell morphology, mitotic activity, and cytotoxicity were noted at half-week intervals for a period of 1.5 weeks. All agarose cultures were stained with trypan blue to assess viability; living and nonliving single cells and colonies with dead were counted. Statistical comparisons were made using a t-test and reported as significant at or below the 95% CI. As noted in monolayer, cellular processes occurred in single cells and colonies in agarose under vehicle and normal controls. Process extension significantly decreased over time as treatment concentrations increased. Continuous exposure to vehicle control (0.1% DMSO) did not have a significant effect on mitosis or cell viability when compared to untreated controls. The Tamoxifen and SP-1 treatments at all concentrations showed significant cytotoxic and antimitotic effects after 1.5 weeks. Future

studies will elucidate the mechanism by which cytotoxicity and antimitotic activity occur.

Poster Board No. 031 SEROTONIN SENSITIVITY OF GLIOMA CELLS AND THE NEURAL-TUMOR SYNAPSE. Katarina M. Coulson (kcoulso@bgsu.edu), Arpan De (ade@bgsu.edu), Julie L. Emmert (jemmert@bgsu.edu), Michael E. Geusz (mgeusz@bgsu.edu). Dept. of Biological Sciences, 217 Life Sciences Bldg., Bowling Green State University, Bowling Green, OH 43403.

The "neural-tumor synapse" refers to interactions between tumors and the nervous system mediated through neurotransmitters or other molecules. Many potential chemical modulators act on gliomas as they invade brain tissue. Furthermore, the glioma microenvironment changes during the day because of rhythms in neural activity driven by circadian clocks in specific brain areas. The circadian timing system controls secretion of the neurotransmitter serotonin throughout the brain. To test whether rhythmic serotonin exposure alters glioma cell morphology, which occurs during epithelial-to-mesenchymal transition (EMT) and metastasis, C6 rat glioma cells were treated with forskolin to synchronize their circadian clocks, and then 10 μM serotonin was given at four-hour intervals (4 cultures each). Cell shape was analyzed 48 hours after each exposure to determine whether the circadian clock caused increased serotonin responses at a particular phase of the cycle. Cell circularity was lowest at 36 hours after forskolin and highest at 52 hours. Cell cross-sectional area showed an opposite response, highest at 36 and lowest at 52 hours. When circularity and area data of untreated cells were examined over 24-hour intervals there was significant clustering (Rayleigh test, $p<0.01$, 637-1422 cells per interval), indicating possible circadian modulation. The serotonin treatments disrupted this clustering. Significant declines in cell area and width observed in the 36-hour treatment group also indicated rhythm amplitude suppression. Because similar morphological changes occur during EMT, serotonin may promote glioma cell migration by altering cell shape more effectively at one phase of the circadian cycle.

Poster Board No. 032 MATHEMATICAL MODEL FOR COMPUTER ASSISTED MODIFICATION OF MEDICATION DOSING RULES. Michael Z. Grabel[1] (grabelmz@mail.uc.edu), Eric S. Kirkendall MD[2] (Eric.Kirkendall@cchmc.org), Benjamin L. Vaughan, PhD[3] (Benjamin.Vaughn@uc.edu). [1]University of Cincinnati, 7200 W. Aracoma Dr., Cincinnati, OH 45237, [2]Cincinnati Children's Hospital Medical Center, Cincinnati, OH, [3]University of Cincinnati, Cincinnati, OH.

Medication dosing in pediatrics is complex and frequently prone to errors that can lead to patient harm. To improve computer-assisted dosing, a mathematical model and algorithm were developed to optimize electronic clinical decision support (CDS) dosing rules and to reduce spurious alerts shown to clinicians. The objective is to evaluate the feasibility of using this algorithm to adjust dosing rules. Incorporating historical ordering data, a mathematical model and algorithm were developed to automatically determine optimal dosing rules. The algorithm optimizes the dosing rules by balancing the number of alerts generated for a medication with the length of the acceptable dose interval. Five candidate medications with different dosing patterns were chosen for a pilot study of the model and algorithm. For the five medications, the algorithm generated multiple, clinically-relevant rule possibilities and the rules returned were either a current dosing rule or matched historical prescriber behavior. Rules were comparable to or better than the rules currently in the system in reducing the total alert burden. The mathematical model and algorithm are an accurate and scalable solution to adjusting medication dosing rules. They can be implemented to change problematic rules more quickly than current manual methods and can be used to help identify and correct poor quality rules. Future work includes augmenting the model with additional parameters to increase its accuracy. With better dosing rules, the clinical decision support will become more accurate and result in fewer spurious alerts and dosing errors.

Poster Board No. 033 THE CONCEPT OF METASTABILITY FOR ONE-LEGGED STANDING. Lauren Moore[1], Neal Carr[1], Ulrich Zurcher, PhD[1], Paul Sung, PhD[2]. [1]Physics Department, Cleveland State University, Cleveland, OH, [2]Physical Therapy Program, Central Michigan University, Mount Pleasant, MI.

Purpose and Goals: Standing on one foot is a standard test to examine the neurological function of postural control. However, there are few quantitative measures that can be used to distinguish healthy subjects from those with impaired control. We use the center-of-pressure (CoP) to measure the motion of the body and use mathematical methods from the theory of random walks to characterize the irregular behavior of the trajectory. Hypothesis: CoP trajectories exhibit a transition from random to piecewise ballistic motion associated with sways of the center-of-gravity of the body. Methods: We analyze CoP trajectories of 20 subjects (10 healthy control subjects and 10 subjects with low-back pain). The recruitment of subjects was approved by the Institutional Review Board. Trajectories are measured for times longer than 30 s. Results: The trajectories have stochastic character for times $0 < t < 20$ ms and are ballistic for time $t > 20$ ms and is characterized by a constant velocity. The straight-line trajectory is interrupted by sharp turns ("turning points"). Turning points are associated with minima of the short-time fluctuations of the trajectory. Turning points cluster in certain regions, which we associate with basins of metastability. The distance and times between turning points follow an exponential distribution, which suggests that the transition between clusters follows a Poisson process. Preliminary data suggests that the characteristic length- and time-scales derived from the distributions can be used to distinguish healthy subjects from those with impaired postural control.

Poster Board No. 034 A LONGITUDINAL EVALUATION OF DEPRESSIVE SYMPTOMS AMONG SEXUALLY ABUSED ADOLESCENT FEMALES. May C. Hetzer (hetzermc@mail.uc.edu), Andrea R. Meisman (Andrea.Meisman@cchmc.org), Jaclyn E. Barnes (Jaclyn.Barnes@cchmc.org), Colleen Gerding (Colleen.Gerding@cchmc.org), Dr. Jennie G. Noll (Jennie.Noll@cchmc.org). Cincinnati Children's Hospital Medical Center, 2348 Rohs St., Cincinnati, OH 45219.

Major depression is the most prevalent mental health disorder affecting young adults. With females being twice as likely as males to develop depressive symptoms during adolescence, it is important to assess sexually abused, female victims for depressive symptoms. The purpose of this study is to assess depressive symptoms among sexually abused females, using a Center for Epidemiologic Studies Depression Scale (CES-D Scale) to better understand the progression of depressive symptoms. It was hypothesized that over a span of three time points, depressive symptoms will remain consistently high among sexually abused adolescent females with an average CES-D score significantly higher than the average CES-D score of the control group. Researchers recruited participants from the Mayerson Center and Hamilton County Job and Family Services who disclosed their abuse 24 months prior to enrollment. Participants within the control group (n=96) were recruited from the greater Cincinnati area that demographically matched the sexually abused participants (n=91). Participants completed the CES-D assessment to measure their current depressive symptoms at each time point (~12.86 months apart). Participants who scored ≥ 21 on the CES-D scale report exhibiting high levels of depressive symptoms. Results from a t-test support the hypothesis as there was an overall significant difference in depressive symptoms

between the two groups at T1, T2, and T3 (p=.007; p=.006; p=.013); respectively and there was a slight elevation in the depressive symptoms for sexually abused participants at each subsequent time point (M=17.53; M=17.679; M=18.086). These findings show the ongoing depressive symptoms among female, childhood sexual abuse victims.

Poster Board No. 035 AUTHORITATIVE PARENTING AND MARIJUANNA USE AMONG HISPANIC ADOLESCENTS: A SECONDARY ANALYSIS OF THE NATIONAL SURVEY ON DRUG USE AND HEALTH. Kelsi J. Wood (wood2ki@mail.uc.edu), Ashley L. Merianos (ashley.merianos@uc.edu), Keith A. King (keith.king@uc.edu), Rebecca A. Vidourek (rebecca.vidourek@uc.edu). University of Cincinnati, Health Promotion and Education Program, PO Box 210068, Cincinnati, OH 45221-0068.

Marijuana remains the most commonly used illicit drug among Hispanic adolescents. The purpose of this study was to determine the influence authoritative parenting behaviors have on lifetime, past year, and past month marijuana use among Hispanic adolescents by developmental age. The 2013 National Survey on Drug Use and Health was analyzed. Participants were a national sample of 3,457 Hispanic adolescents 12-17 years old. Logistic regression analyses were performed to examine whether lifetime, past year, or past month marijuana use differed based on seven authoritative parenting behaviors (checked homework, helped with homework; assigned chores; limited amount of TV watched; limited amount of time spent out on a school night; told them they did a good job; told them they were proud). Follow-up logistic regression analyses were conducted to examine whether these behaviors influenced marijuana use by age. Results indicated 19.5% of Hispanic participants reported lifetime marijuana use, 14.5% reported past year use, and 7.5% reported past month use. Hispanic adolescents at increased risk of marijuana use were adolescents with parents who never/seldom performed authoritative parenting behaviors (all $p < .03$) compared to those with parents who always/sometimes performed these behaviors. While results indicated that authoritative parenting behaviors had a statistically significant effect on marijuana use, the protective effect of authoritative parenting was highest for 12-13 year olds, f. Ohio professionals should consider these findings when developing substance use prevention programming. Parents of Hispanic adolescents should be included in prevention efforts and be educated on how to perform authoritative parenting behaviors.

Poster Board No. 036 IMPLEMENTING A HEALTHY EATING AND EXERCISE PROGRAM FOR ELEMENTARY SCHOOL-AGE CHILDREN. Robert A. Yockey (yockeyra@mail.uc.edu), Myia C. Lang (langm9@mail.uc.edu), Laura A. Nabors (naborsla@ucmail.uc.edu). University of Cincinnati, School of Human Services, Cincinnati, OH, 45221.

Childhood obesity remains a growing problem in the United States. Despite recent advances in obesity research, knowledge of healthy eating is still lagging, making this a systemic health crisis needed to be immediately addressed. The purpose of this project was to use a "train-the-trainer" model where each child receiving the intervention was provided healthy eating and exercise goals, and then they taught their eating and exercise goals to their parents for the family to follow. It was hypothesized students would gain knowledge about healthy eating and exercise behaviors and parents would report change in their child's healthy eating and exercise behaviors at home. Twenty-five children (N=25; 15 males and 10 females) enrolled in the third through sixth grades and their guardians participated. Using the framework of MyPlate – a framework for implementing healthy eating lifestyle changes – students learned the value of eating more fruits and vegetables, eating healthy lunches and snacks, reducing portion size, and ordering healthy meals at restaurants. Children learned to coach their parents through role play. The importance of 60 minutes of daily physical activity was also discussed, and children and their leaders exercised outside during the last 20 to 25 minutes of each lesson. Group leaders e-mailed parents with updates about their child's healthy eating and exercise goals. Success was assessed by group interviews. Content analysis was used to analyze data provided by children and parents. Themes indicated that children preferred learning through games and being active. They requested lessons about vitamins and minerals in different foods. Findings from parent interviews suggested parents felt that children had difficulty coaching them. The children did not always teach their parents about their weekly health goals. Gains in child knowledge about healthy eating were reported by children. Findings indicated children were interested in learning about healthy lifestyle choices and were willing to adopt to healthy behavioral changes for themselves and their families. In addition, this program shows promise in teaching children about healthy eating and implementation should be considered in elementary programs.

Poster Board No. 037 ENERGETIC CONSEQUENCES OF DEHYDRATION IN THE AMERICAN DOG TICK, *DERMACENTOR VARIABILIS*. Benjamin Davies (daviesbn@mail.uc.edu), Andrew J. Rosendale (rosendaw@ucmail.uc.edu), Alicia M. Fieler (fieleram@mail.uc.edu), Megan E. Dunlevy (dunlevme@mail.uc.edu), David W. Farrow (farrowdw@mail.uc.edu), Joshua B. Benoit (benoitja@ucmail.uc.edu). University of Cincinnati, Rieveschl 711D, 318 College Dr., Cincinnati, OH 45221-0006.

Ticks blood-feed on vertebrate hosts for development and reproduction, but may have to endure several months between feedings. During these extended off-host intervals, ticks must contend with a multitude of environmental stresses including prolonged exposure to desiccating conditions. The objective of this study was to examine the energetic consequences of dehydration in American dog ticks, *Dermacentor variabilis*, to elucidate the interactions between starvation and environmental stress. We hypothesized that dehydration exposure would result in a decrease in energy reserves. Ticks of various energetic states were exposed to a single period at 0% relative humidity (RH) and/or repeated cycles of dehydration (0% RH) and rehydration (100% RH) conditions. Survival, body water content, energy reserves (measured through various biochemical assays), and metabolic rate were monitored during the dehydration process. Metabolic rates of dehydrated ticks were 1.5-fold higher than fully hydrated ticks. Both a single bout and repeated cycles of dehydration caused reductions in their glycogen, protein, and lipid reserves by 15-30%. Ticks could tolerate up to 50% body water loss and showed high survival even after 25 bouts of dehydration. Starved ticks, which had 2- to 3-fold lower protein and lipid levels, succumbed to dehydration more rapidly than recently fed ticks. Both single and repeated dehydration exposures resulted in substantial energy costs, and ticks with limited energy reserves were more susceptible to dehydration-induced mortality, indicating that adequate energy reserves are critical in dehydration survival. This study provides insights into population dynamics of ticks and may lead to a better understanding of the effects of environmental conditions on ticks.

Poster Board No. 038 PREY HYDRATION INFLUENCES WOLF SPIDER (*HOGNA CAROLINENSIS*) PREDATION. Matthew D. Zach (mdlzach.94@gmail.com), Kevin E. McCluney (kevin.e.mccluney@gmail.com), Jamie E. Becker (jebecker42@gmail.com). Bowling Green State University, 4456 West 213th Street, Fairview Park, OH 44126.

Often in scientific studies concerning terrestrial food webs researchers focus upon energy or nutrients as the driving

force of species interactions. Water is rarely considered by ecologists making this vital resource an unexplored topic in terms of pressures regulating terrestrial food webs. The goal of this research is to explore how water influences interactions between species, specifically between predators and their prey. It was hypothesized that predation will be maximized at intermediate prey hydration. First, an experiment was conducted to quantify the rate of evaporative water loss of the specimens *Hogna carolinensis* (Carolina wolf spider) and *Acheta domesticus* (common house cricket) in order to acquire data needed to manipulate their levels of hydration. This was done by desiccating twenty specimens of *Hogna carolinensis* and forty specimens of *Acheta domesticus* within an environmental chamber and measuring their masses until death. Another experiment was conducted to explore how prey hydration influenced predation of *Hogna carolinensis*. Thirty-nine female specimens of *Hogna carolinensis* were housed within the environmental chamber under the same conditions, treated to a four-day period of starvation and desiccation then fed eight specimens of *Acheta domesticus* from one of three hydration treatments. Initial observations concluded that there was little difference between how much mass was consumed by the predators across the three treatments.

Poster Board No. 039 REMOVAL OF PHOSPHORUS FROM AGRICULTURAL STREAMS VIA EMERGENT INVERTEBRATES. Gabrielle K. Metzner (gmetzne@bgsu.edu), Kevin E. McCluney (kmcclun@bgsu.edu). Bowling Green State University, 810 5th Street, Apt. 11, Bowling Green, Ohio 43402.

Floodplain geomorphology and floodplain vegetation are important factors influencing nutrient flow into streams. Floodplains encourage the flow of water through intricate flow-paths allowing more time for phosphorus and nitrogen utilization by microbes. Many fields in northwest Ohio use subsurface tile drain systems that deliver excess water from fields directly into channels, bypassing groundwater flow. These channels tend to have little to no bank and/or vegetation which poses problems with excessive nutrient run-off. Self-forming streams restore channels to mimic natural stream processes and stimulate vegetation growth. Two stage ditches incorporate a floodplain zone into the channel bench, mimicking natural processes of stable streams. This study looked at the effects of restoration practices on fluxes of emergent invertebrates and examined if these fluxes are correlated with variation in hydrogeomorphology and/or vegetation. Twenty sites varying in floodplain geomorphology and vegetation (e.g. conventional channels, natural streams with and without vegetation, two stage ditches, and self-forming streams) from northwest Ohio were sampled from July thru September 2016. At each site, six sticky traps and one emergence trap (ET) collected invertebrates. Sites were visited once every week to exchange sticky traps and ET bottles. Insects recovered from ETs were brought back to the lab, immediately identified to order, and dried at 55 °C. No significant difference in mean abundance was found among site types using an ANOVA test.

Poster Board No. 040 UNDERSTANDING THE DRIVERS OF BLOOM TOXICITY BY QUANTIFYING TOXIC AND NON-TOXIC STRAINS OF *PLANKTOTHRIX* IN SANDUSKY BAY. Taylor A. Tuttle[1] (ttuttle@bgsu.edu), George S. Bullerjahn[1] (bullerj@bgsu.edu), Robert M. L. McKay[1] (rmmckay@bgsu.edu), Timothy W. Davis[2] (timothy.davis@noaa.gov). [1]Bowling Green State University, Department of Biological Sciences, 217 Life Sciences, Bowling Green, OH 43403, [2]NOAA Great Lakes Environmental Research Laboratory.

Sandusky Bay (OH) is a shallow, turbid embayment in Lake Erie (OH) that is often nitrogen limited, yet dominated by the non-nitrogen fixing cyanobacterium *Planktothrix*. Previous studies have shown that *Planktothrix* is adapted to nitrogen limited conditions resulting from active denitrification. N:P ratios were below 16 in 2015 and below 2 in 2016. The toxic (*mcyA*+) versus non-toxic (16S) *Planktothrix* cyanobacterial bloom community was quantified weekly during the summer of both 2015 and 2016. Using qPCR it was found that the ratios of the two genotypeswas highly variable throughout the season despite very different nutrients inputs between the two years. Samples with higher abundances of toxic cells had low concentrations of toxins. Samples with low abundances of toxic cells had higher levels of toxins. This suggests that there may be a rarely occurring *mcyA*+ genotype that is capable of producing large amounts of toxin. Measured environmental variables including SRP, multiple nitrogen species, and temperature were compared with qPCR results to determine drivers of strain dominance. Functional profiling of the nitrogen cycle and toxin production are currently being investigated in metatranscriptomes from the 2015 season.

Poster Board No. 041 ECOSYSTEM HEALTH OBSERVATION OF MUSKINGUM UNIVERSITY STREAMS. Erika Saunders (erikas@muskingum.edu), James L. Dooley, Jr. (jdooley@muskingum.edu). Muskingum University, 163 Stormont St., New Concord, OH 43762.

Eutrophication involves the increase in available nitrogen and phosphorous to a system to high levels, creating an environment where aquatic plants and algae have ample supplies for growth. Aquatic plant biomass can experience population spikes and die offs as a result of excess nutrient availability, the decay of which can cause sudden, sharp drops in the dissolved oxygen levels of the water body. The stream that runs through Muskingum University, a tributary of the Muskingum river, was monitored to establish a baseline of the ecosystem's health and any potential risk of eutrophication events in an ongoing study. Two monitoring sites along the stream, one flowing into Muskingum lake and one flowing out of the lake were measured for temperature, turbidity, pH, phosphate, nitrite, nitrate, dissolved oxygen, and ammonia levels to gauge nutrient availability as well as the nutrient cycling capabilities. Water samples were tested using API brand test kits. The composition of the stream was graded according to Licking County Soil and Water Conservation District guidelines to monitor erosion and water flow. Data collection was monthly from June through October 2016 and will continue into 2017. The stream evaluations revealed that they are good quality habitat structurally, remaining within the optimum ecosystem evaluation range throughout the year. However, the streams are at risk chemically as initial nutrient monitoring indicated algae bloom risk confirmed by observations in September and October. More monitoring over the long term will be needed to establish the system's nutrient level patterns.

Poster Board No. 042 VARIABILITY IN HAWAIIAN CORAL ACROSS A NATURAL RANGE OF TEMPERATURE, pCO_2, AND FLOW GRADIENTS. Alec E. Moore[1] (moore.2578@osu.edu), Rowan H. McLachlan[1] (mclachlan.8@osu.edu), Christopher P. Jury[2] (jurycp@hawaii.edu), Kerri L. Dobson[1] (dobson.77@osu.edu), Robert J. Toonen[2] (toonen@hawaii.edu), Andréa G. Grottoli[1] (grottoli.1@osu.edu). [1]The Ohio State University, 275 Mendenhall Lab, 125 South Oval Mall, Columbus, OH 43210, [2]University of Hawaii at Manoa, Honolulu, HI.

Coral reefs are among the most ecologically diverse and economically important habitats on earth, yet the combined effects of ocean-acidification and warming threaten the integrity of these ecosystems globally. The hypothesis under investigation is that populations of coral can adapt to high temperature and pCO_2 conditions. Biomass and Chlorophyll *a* were measured from three species of coral (n = 9 each) distributed across a naturally occurring range of temperature and pCO_2 conditions around Oahu, HI. Two of the four surveyed sites have higher than average

flow regimes, presenting the opportunity to investigate the interactive effects of temperature, pCO_2, and flow on coral physiology. In the two branching coral species *Montipora capitata* and *Porites compressa*, biomass was lower and Chlorophyll *a* higher at sites with both higher temperature and pCO_2 conditions than at sites with values closer to current average conditions for tropical reefs. No such pattern was observed in the mounding species *Porites lobata*, suggesting that morphology influences resilience. High flow appeared to minimize the negative effects of elevated temperature and pCO_2 on biomass in the branching species *M. capitata*. These preliminary results suggest that adaptive responses to elevated temperature and pCO_2 in Hawaiian coral are species-specific, and that high flow sites may offer refuge to corals in the future. Scheduled endosymbiont density analyses will facilitate a more comprehensive assessment of physiological variation across these gradients.

Poster Board No. 043 THE INFLUENCE OF TIME SINCE RECLAMATION ON THE ABUNDANCE OF GRASSLAND BIRDS ON A SURFACE MINE (THE WILDS). Keri Hunt (kerih@muskingum.edu), Maria Thurston (thurston@muskingum.edu), Johanna Whetstone (johannaw@muskingum.edu). Biology Dept., Muskingum University, 163 Stormont St., New Concord, OH 43762.

The encroachment of woody vegetation on reclaimed surface mines has been shown in several recent studies to have adverse effects on obligate grassland birds during the nesting season. In this study we conducted point counts, during three breeding seasons, to compare numbers of grassland and shrub-land bird species on two regions of a reclaimed mine that reflect time since reclamation (north region reclaimed in 1974-1979; south region in 1981-1984). Our units of observation were the individual point count sites (17 in the north and 21 in the south). Our expectation was that those areas that have had the longest recovery times would have lower numbers of grassland birds and larger numbers of shrub-land birds. However, our investigation indicated that the distribution of birds, as well as the amount of woody vegetation on our site, did not appear to be influenced by the amount of time since reclamation. For example the abundance of Henslow's sparrows (*Ammodramus henslowii*) was similar in areas that were reclaimed longest ago versus areas reclaimed most recently. Conversely, significantly greater numbers of grasshopper sparrows (*A. savannarum*) were found in the north region reclaimed longest ago compared to the more recently reclaimed region during all three years (2013: $F = 5.24$, $p = 0.03$, $df = 33$; 2014: $F = 41.05$, $p = 0.0001$, $df = 33$; 2015: $F = 16.23$, $p = 0.0001$, $df = 33$). Numbers of shrub-land species such as song sparrows (*Melospiza melodia*) and Willow Flycatchers (*Empidonax traillii*) were distributed fairly equally in both regions. Observed bird distributions appear to be as much a reflection of local habitat structure and heterogeneity as they do woody encroachment. We acknowledge though, that our small sample sizes, which precluded us from developing reliable detection probabilities, limit the scope of our findings.

Poster Board No. 044 ABUNDANCE OF DIPTERA, HYMENOPTERA, AND LEPIDOPTERA IMPACTED ALONG AN URBANIZATION GRADIENT IN TOLEDO, OHIO. Edward Lagucki (elaguck@bgsu.edu), Justin D. Burdine, Kevin McCluney. Bowling Green State University, Department of Biological Sciences, 217 Life Sciences, Bowling Green, OH 43403.

Urbanization transforms natural landscapes into built environments, causing changes in ecological processes and communities. Insects are an important group of organisms that perform a variety of functional roles in ecosystems as pollinators, decomposers, and predators, and can be foundational in structuring food webs. The goal of this study was to identify how urbanization influences the composition of insect communities along an urban-suburban-rural gradient. We predicted that insect diversity and abundance would respond strongly to percent impervious surface, a measurement of urbanization. Insects were sampled from 30 sites along an urbanization gradient in Toledo. Insects were sampled in July and August using pan traps, and a variety of predictor variables were collected at each site. Landcover and impervious surface data were used in this analysis, and all insects were identified to order. Results were analyzed using a non-metric multidimensional scaling approach, and simper analysis. A two-way ANOVA with repeated measures analyzed insect diversity metrics with site location. We sampled and identified a total of 2372 individuals spanning 9 orders. Results indicate that the abundance of Diptera, Hymenoptera, and Lepidoptera were negatively affected by urbanization. The community composition, diversity, and evenness of insects were not significantly different across sites. These results indicate the urbanization impacts the abundance of pollinating insect orders, but not the community composition.

Poster Board No. 045 CONSERVATION OF RARE PLANTS: HOW PRESERVE SIZE AFFECTS WHICH PLANT SPECIES CAN BE PERPETUATED. Jacquelyn M. Yarman (yarmanjm@mail.uc.edu), Yue Ma (may6@mail.uc.edu), Steven H. Rogstad (rogstad@ucmail.uc.edu), Stephan Pelikan (pelikas@ucmail.uc.edu). University of Cincinnati, Departments of Biological Sciences and Mathematical Sciences, 2600 Clifton Ave., Cincinnati, OH 45220.

Populations of rare plant species were modeled using the computer program NEWGARDEN to explore the effects of habitat fragmentation on population dynamics and genetics. NEWGARDEN allows for the realistic modeling of fragmentation processes as a cost effective alternative to actual field studies. A series of realistic input variables were chosen and collectively called a trial. Within comparative trials, the gene dispersal or preserve size were varied to observe the results. 100 replicates for each trial were processed to obtain means and standard deviations of resulting population size, allele number, and inbreeding and subdivision coefficient for each of 20 generations. Plant population dynamics and genetic diversity varied based on gene dispersal and preserve size. Founder plants experienced population growth or extinction, minimal or high allele loss, and severe or low effects of inbreeding. Results show that certain plant species have the potential to thrive while others go extinct when under the pressure of habitat fragmentation. Such modeling can inform preserve design and species management decisions to better promote the perpetuation of endangered species.

Poster Board No. 046 DISTINGUISHING BENEFICIAL POLLINATOR GARDEN LOCATIONS IN URBAN LANDSCAPE USING GEOSPATIAL INFORMATION SYSTEMS. Jordyn T. Stoll (jordyn.t.stoll@gmail.com), Wentworth Clapham (w.clapham@csuohio.edu). Cleveland State University, 2121 Euclid Ave., Cleveland, OH 44115.

Insect pollinators (honey bees) are considered keystone species because they have a large impact on floral communities. However, their reduction or extirpation can have far reaching, negative effects on the whole ecosystem. Based on beekeeping data, the number of western honeybees (*Apis mellifera*) has decreased to half since the 1950s, while the demand for their ecosystem services has continued to increase. Numerous non-profit groups, such as Wild Ones, have set out to establish pollinator gardens and encourage native plant landscaping to support insect communities. Greater plant diversity and reduced pesticide use are thought to increase opportunities for colony survival, even in urban areas. Hedgerows and other fringe type habitats may promote conservation of pollinators, especially when a diverse array of pollinator-friendly plants are present throughout a growing season in contrast to monocultures or strictly exotic flora. One

problem is deciding where garden patches may best benefit pollinators. Research in Cleveland, Ohio utilizes geospatial information systems (ERDAS®) to classify abandoned parcel data by size, density and distribution. Vegetated areas and location data from beekeeping permits are overlaid on six inch resolution imagery of land cover and soil maps, applying distance algorithms, classification selection, and normalized difference and vegetation indices (NVDI) within a multilayer analysis.

Poster Board No. 047 SURVEYING FOR AMPHIBIAN DIVERSITY AND CHYTRID FUNGUS IN A CENTRAL OHIO WETLAND. Sarah E. Taynor (staynor@capital.edu), Christine S. Anderson (canders2@capital.edu). Department of Biological and Environmental Sciences, Capital University, 1 College Ave., Columbus, OH 43209.

Batrachochytrium dendrobatidis (Bd) is a pathogenic fungus responsible for the disease *Chytridiomycosis*. *Bd* disrupts osmoregulation and respiration in the skin of susceptible amphibian species and has been linked with the current decline of populations and extinction of species worldwide. *Bd* has been detected at several sites in central Ohio. The goal of this research project was to determine if *Bd* was present at a similar site, the wetland area behind the eSTEM Early College Academy in Reynoldsburg, OH, and to estimate species diversity and relative abundance of frogs found there. Frogs and tadpoles were live-trapped, processed, and released within 24 hours where replicate swabs and a tissue sample were collected for analysis in the lab. Field surveys were conducted 8 times from August-November 2016 in the multiple wetland ponds and vernal pools behind the school. A total of 27 tadpoles and 7 frogs were caught during this study, including Northern Green Frogs (*Lithobates clamitans melanota*) and American Bullfrogs (*Lithobates catesbeiana*). Future work includes developing a protocol to use conventional PCR to detect *Bd* from swab samples, and using mtDNA sequencing with DNA extracted from tissues samples for species identification of tadpoles. This work will provide information on the occurrence of *Bd* in Ohio to better conserve local amphibian populations to prevent the spread of this disease. In addition, this project was part of an outreach collaboration to provide mentorship for local high school STEM students in research techniques.

Poster Board No. 048 AN ANALYSIS OF SEDIMENT ASSOCIATED WITH MUSSELS (FAMILY UNIONIDAE) IN LOWER BIG WALNUT CREEK. Kierra Lathrop[1], Hayley Quinn[2,3], Nathan Hess[1], Joan Esson[2], Kevin Svitana[1] and Michael Hoggarth[1]. Otterbein University, [1]Department of Biology and Earth Science, [2]Department of Chemistry, [3]Biochemistry and Molecular Biology, Westerville OH 43081.

The presence or absence of organisms provides information on three aspects of the environment: 1) the chemical and physical conditions of the environment, 2) the quality of habitats present, and 3) who else is there. Aquatic animals such as freshwater mussels provide evidence for the quality of the water where they live, the presence or absence of acceptable habitat, and, in this case due to the obligate parasitic relationship these animals have with fish and mudpuppies, the abundance and species richness of the fish community. Lower Big Walnut Creek supports mussels but the number of individuals and number of species are relatively high in the upper portion of the creek downstream of Hoover Reservoir, very low in the middle section of this portion of the creek, and intermediate near the mouth of the creek. These differences in community structure were confirmed during this study (r^2=0.5177, $p<0.05$). In addition, sediment composition changed in a linear manner from upstream to downstream (large sediments declined, r^2=0.6194, $p<0.05$, while finer sediment increased, r^2=0.5535, $p<0.05$) and so was not correlated to mussel community structure. Finally, some chemicals (such as cadmium) had much higher concentrations where mussels were lost (the middle section) suggesting that habitat is impaired and has limited the restoration of the mussel community in this reach.

Poster Board No. 049 SILVER SPOON HYPOTHESIS IN AMERICAN TOADS Samantha M. Bonifas (samantha.bonifas@otterbein.edu), Sarah S. Bouchard (sbouchard@otterebein.edu). Otterbein University, 1 South Grove St., Westerville, OH 43081.

The environmental matching hypothesis predicts that individuals perform best in environments similar to those experienced early in their development. We tested this hypothesis in American Toads *Anaxyrus americanus* by manipulating early environmental conditions of developing tadpoles. Tadpoles were initially reared at high (N = 15) or low density (N = 15) (20 or 5 tadpoles per 12-liter tank). Each tank had equal food levels creating different per capita food resources. Once tadpoles reached a standard mass, we transferred three tadpoles from each tank to a new tank with either high or low food levels. We measured one-week growth rates and toadlet size at metamorphosis. We predicted that tadpoles from the high density would grow more than tadpoles from the low density in the low food treatment. We predicted the opposite response in the high food treatment. However, the low-density tadpoles gained more mass than high-density tadpoles in both high and low food (analysis of variance). The high-density tadpoles gained more length in the low food treatment. Low-density tadpoles metamorphosed into heavier toadlets than the high-density tadpoles in the high food, but there was no significant mass difference for the low food. The results do not support the environmental matching hypothesis. Instead, they suggest the silver spoon effect, which states that individuals raised in high quality environments early in development gain long term advantages, even when later exposed to poor quality environments. We are currently analyzing the food intake and gut morphology to better understand these patterns.

Poster Board No. 050 AFRICAN CLAWED TOADS' RESPONSES TO VISUAL AND LATERAL LINE STIMULI. Marko Milosavljevic[1,2] (akochalko@gmail.com), Kevin Goth[1] (kevingoth@yahoo.com), Jeffrey Dean[1] (jeffreydea@gmail.com). [1]Cleveland State University, Department of Biological, Geological, and Environmental Sciences, 2121 Euclid Ave., Cleveland, OH 44115, [2]8110 Ridge Road, North Royalton, OH, 44133.

African Clawed Toads, *Xenopus laevis*, utilize their visual and lateral line systems to locate prey. We compared responses to surface waves and visual stimuli, individually and combined. Hypothesis: Toads would respond with greatest frequency to a combination of lateral line and visual stimuli. Lateral line stimuli were presented by dipping a Plexiglas rod (3mm diameter) into the water, while visual stimuli were presented by lowering a rod with or without a black band just above the water. Data comprise 685 (N=685) trials with 2 toads. Response frequencies differed: a) lateral line stimuli only (LL): 42% of 137 trials, b) vision only (V): 12% of 225, less than LL, X^2=41.3, p=0.0001; c) vision without black band: 7% of 184, difference from V, NS X^2=2.64, p=0.10; d) vision + lateral line; 54% of 139, greater than LL, X^2=4.97, p=0.026. Visual stimuli eliciting responses were closer (55.6 ± 6.5 mm vs. 73.2 ± 7.8 mm, t=2.2, p=0.03) and more rostral (59.0 ± 8.2° vs. 95.7 ± 3.3°, t=3.8, $p<0.0002$) than those that did not. They did not differ for lateral line stimuli (60.1 ± 4.1 mm vs. 63.4 ± 3.2 mm, t=0.7, p=0.5 and 80.6 ± 6.5° vs. 84.4 ± 5.8°, t=0.42, p=0.67). Neither turn accuracy (turn angle vs. stimulus angle regression slopes: V 0.75 ± 0.6 °/° vs. LL 0.75 +/- 0.4 °/°, t=0.1, p=0.92) nor latencies (V 596 ± 110 ms LL 831± 119 ms; $F_{1,84}$=1.44, p=0.23) differed according to stimulus type. In summary, compared to visual stimuli, lateral line stimuli elicited responses more frequently, at greater distances and at all angles. Combining both stimuli

did increase response frequency.

Poster Board No. 051 FERTILITY AND MORTALITY IN CORN SNAKES WITH THE ODD TRAIT. William P. Gyurgyik (wgyurgy@bgsu.edu), Eileen M. Underwood (eunderw@bgsu.edu). Bowling Green State University, 451 Thurstin Avenue, Apt. 303, Bowling Green, OH 43402.

In 2005, the BGSU Herpetarium discovered a phenotypic variation in corn snakes (*Pantherophis guttatus guttatus*) called *odd*. Studies have found that this trait is autosomal recessive and affects both color and pattern; however, anecdotal evidence indicated that *odd* corn snakes did not reproduce as well and died more frequently than non-*odd* corn snakes. Fertility and mortality rates were measured in *odd* and non-*odd* corn snakes to substantiate these observations, with the expectation that *odd* corn snakes would exhibit lower fertility and higher mortality. Sixty eight non-*odd* male and non-*odd* female, 23 *odd* male and non-*odd* female, 13 non-*odd* male and *odd* female, and eight *odd* male and *odd* female crosses were analyzed. Hatch rates in clutches laid by *odd* females were lower than 10% (19 out of 250 eggs). Crosses with non-*odd* females, even with *odd* males, exhibited greater hatch rates ranging between 50-60% (834 out of 1371 eggs). Mortality data showed that, of 65 snakes that have died since the beginning of the *odd* study in 2005, 31% were odd and 27% were non-*odd*. While more females (N=41) than males died, this trend was consistent between *odd* and non-*odd* females. Evidence fails to support that *odd* snakes exhibit greater mortality, but does support that *odd* females exhibit lower fertility. Future studies are in place to examine the viability of offspring born from *odd* and non-*odd* pairs, and to set up outcrosses to determine if female *odd* fertility is a consequence of inbreeding.

Poster Board No. 052 COMPARISON OF GROWTH RATE, FERTILITY, AND MORTALITY IN CORN SNAKES, *PANTHEROPHIS GUTTATUS*, RELATIVE TO THE *ODD* GENE. Dale Shank (dshank@bgsu.edu), Eileen M. Underwood (eunderw@bgsu.edu). Department of Biological Sciences, Bowling Green State University, Bowling Green, OH, 43403.

In 2005, the BGSU Herpetarium discovered a new pattern morph in their corn snake (*Pantherophis guttatus*) population, dubbed the *odd* morph. It was observed that snakes bearing the *odd* phenotype had reduced fertility and increased mortality, potentially due to the line-breeding involved in proliferating the phenotype. Part of ongoing research, this study was conducted to address whether outcrosses could establish the *odd* morph separate from the fertility and mortality problems, and also to quantify the *odd* trait's impact on growth. A range of breeding crosses (23 total) were established to compare reproductive success relative to the *odd* trait, and overall mortality records were analyzed. Weights were recorded weekly over a period of several months to compare the growth rate of yearling corn snakes relative to their relationship with *odd*. Outcrosses, particularly where the female snake was *odd*, continued to show low reproductive success, producing few viable eggs. Weight gain was significantly different, with unrelated snakes growing more rapidly than *odd* snakes. It is suspected that the continued lack of success with *odd* females is linked to the difficulty in reaching breeding weight. This reduces their ability to impart nutrients to potential offspring, and can lead to higher incidence of dystocia- a typically fatal inability to pass their eggs.

Poster Board No. 053 BIOMASS EFFECTS OF ROUNDUP PRO® ON ANECIC EARTHWORM *LUMBRICUS TERRESTRIS*: REPEATED LOW-DOSE APPLICATION IN A MICROCOSM SETTING. Morgenna R. Zuby (mzuby@muskingum.edu), James L. Dooley (jdooley@muskingum.edu). Muskingum University, 163 Stormont St., New Concord, OH 43762.

Roundup® and other glyphosate herbicides have rapidly dominated the international pesticide market, with current global usage exceeding 1.3 billion pounds applied per year (6.5 billion USD). However, little is known regarding long-term and sub-lethal effects on soil organisms. Anecic earthworms serve as soil engineers in both no-till and conventional tillage agroecosystems and are exposed to Roundup® through ingestion of contaminated organic surface matter in agricultural fields. Current ecotoxicological data for Roundup® is primarily based on acute testing methods utilizing epigeic *Eisenia* species, and cannot be directly extrapolated to chronic toxicity values or to earthworms of different functional niches (epigeic, endogeic, or anecic). This study endeavors to increase knowledge of chronic toxic effects of Roundup PRO® on *Lumbricus terrestris* in a microcosm setting. Sixty replicates of *Lumbricus terrestris* specimen pairs will be housed in microcosms containing field-collected soil with no prior history of herbicide or cultivation use, and divided into one treatment group and one control. The treatment group will be exposed to Roundup PRO® once weekly for eight weeks via surface-spray application of 10 mL of 0.8% Roundup PRO® dilution; immediately following the addition of 10 g dried composted cow manure to soil surface. Total Roundup PRO® exposure per microcosm will equal approximately 6.778 quarts/acre, within U.S. legal application limit of 8.5 quarts/acre per year. Changes in net biomass per microcosm will be analyzed using a one-way repeated measures ANOVA comparing pre- and post-study measurements. It is hypothesized that microcosms treated with Roundup PRO® will exhibit lower net biomasses.

Poster Board No. 054 EFFECTS OF ETHANOL ON THE EMBRYONIC DEVELOPMENT OF THE PEKIN DUCK, *ANAUS PLATYRHYNCHOS*. Kelsey M. Pinkard (kpinkard@capital.edu), Nancy J. Swails (nswails@capital.edu). Capital University, Department of Biological and Environmental Sciences, 1 College and Main, Columbus, OH, 43209.

Research suggests that alcohol has a more pronounced effect on embryos at earlier stages of development than later stages. In this experiment Pekin duck, *Anas platyrhynchos*, eggs were used to test the effects of ethanol on the embryo when introduced at different times during development, with the expectation that embryos exposed earlier in development will have more abnormalities and developmental delays than the embryos exposed later. A preliminary set of 48 eggs were incubated in a single incubator at 38°C and 65% humidity on the day they were laid. The set was divided into three groups: control (no injection), physiological saline, or ethanol injection into the air sac. These groups were further divided into three subsets which were injected at the follow time intervals: subset one at 20 hours of incubation, subset two at 40 hours, and subset three at 60 hours of incubation. All eggs were opened after 5.5 days of incubation and examined to determine if embryonic development occurred. Each embryo was evaluated in the context of developmental stages delineated by Hamburger and Hamilton for chick embryos. Preliminary results suggest that eggs injected with ethanol have a lower survival rate than those injected with saline, while uninjected controls have the highest survival rate. Replications of this experiment are being conducted and the results examined by ANOVA to determine if these differences are significant. The subsets are also being compared in order to assess whether the time of exposure has an impact on the severity of effects.

Poster Board No. 055 THE EFFECTS OF INCUBATION TEMPERATURE ON COLORATION AND GROWTH IN *RHACODACTYLUS* GECKOS. Katherine L. Herzog (herzogk@bgsu.edu), Dr. Eileen M. Underwood (eunderw@bgsu.edu). Department of Biological Sciences, Bowling Green State University, Bowling Green, OH, 43403.

The goal of this research was to observe whether or not the incubation temperature impacted the growth and/or coloration in geckos of the *Rhacodactylus* genus. Three species were used in the research: *R. ciliatus, R. auriculatus, and R. chahoua.* Color change has been observed in leopard geckos (*Eublepharis macularius*) that were incubated at different temperatures and, in some species, incubation temperature plays a role in determining the sex of the hatchlings. Sex of these geckos was not monitored due to immaturity. Our hypothesis was that geckos incubated at a higher temperature would have a lower hatch weight and lighter coloration. To test our hypothesis, eggs laid in clutches of two were split between incubators at 26°C and 30°C. Each incubator had a nighttime drop in temperature which was shown in a previous study to increase survival. Upon hatching, the geckos were photographed, measured, and weighed. Measurements included both the snout-vent length and total length of each animal. The photographs and measurements were taken every other week after the hatch date to track their progress. A small ruler with a color chart was present in each photograph to ensure standardization of color. The research with all three species is still in progress. A larger sample size is needed to form definitive conclusions, but so far, *R. auriculatus* has exhibited a gradual lightening of color among all geckos and those incubated at 30°C hatched darker. Weight did not differ between groups. Thus, the original hypothesis was not supported.

Poster Board No. 056 SWIMMING PERFORMANCE CHAMBER DESIGN: A 'HOW TO GUIDE' ON THE DESIGN, BUILD, AND IMPLEMENTATION OF A NOVEL CHAMBER FOR ECOLOGICAL RESEARCH. Shawn P. Beyke (beyke.13@wright.edu), Benjamin F. Boyd (boyd.115@wright.edu), Clint J. Knapke (knapke.70@wright.edu), Andrew J. Moore (moore.600@wright.edu), Stephen J. Jacquemin (stephen.jacquemin@wright.edu). Wright State University, Lake Campus, Celina, OH 45822.

Quantifying swimming performance of freshwater fishes typically requires sophisticated and expensive laboratory equipment, thus precluding many labs from including this component of behavior in niche analyses. Therefore, the objective of this project was to review existing performance chambers, analyze design facets from a hydrological engineering perspective, and incorporate these features into the design of a novel chamber that is feasible and affordable for any ecology lab to construct. A myriad of racetrack, flow through, and submerged tube designs were reviewed and analyzed for balancing cost and efficiency using a combination of financial budget balancing and computational fluid dynamic analyses (conducted using SC/Tetra CFD and Solidworks software) to generate a research grade product capable of producing laminar flow at a reasonable cost. A final 'how to instructional guide' was produced outlining a basic oval style design capable of producing laminar flow at velocities between 0 and 125cm/s. The proposed closed chamber system has a tank footprint of approximately 150 x 70cm and includes a 20 x 50 x 15cm swimming section for fish. The system is powered by a variable speed DC motor attached to a propeller controlled using gradual and continuous controls. All proposed materials are commercially available at hardware stores and implementation requires a minimal budget (under $4,000). Ultimately, this project should encourage research into this area of ecology and increase access to research equipment for smaller institutions.

Poster Board No. 057 UNDERSTANDING SWIMMING PERFORMANCE VARIATION IN OHIO MINNOWS (CYPRINIDAE). Stephen C. Huelsman (huelsman.26@wright.edu), Cara G. Schemmel (schemmel.7@wright.edu), Austin J. Smith (smith.1893@wright.edu), Stephen J. Jacquemin (stephen.jacquemin@wright.edu). Wright State University, Lake Campus, Celina, OH 45822.

Understanding variability in swimming performance of freshwater fishes has implications for improving descriptions of ecological niches, establishing evolutionary relationships, and providing management and conservation recommendations. Swimming performance is associated with anatomical, physiological, and environmental variation, although the vast majority of swimming performance research to date has focused on larger game species to the exclusion of smaller non-game taxa, which represent the largest portion of North American freshwater fish diversity. Thus, the objective of this study was to assess a previously unstudied area regarding how swimming covaries with body size, sex, watershed, and habitat types of these smaller non-game taxa. A Blazka style swimming performance chamber following a stepwise critical swimming performance (Ucrit) protocol was used to quantify individual variation in four species of common Ohio Minnows (Cyprinidae: Bluntnose Minnow, Spotfin Shiner, Sand Shiner, and Redfin Shiner). Using a series of general linear models at both a global (taxa combined) and local (taxa specific) scale trends were identified across all individuals (N=150 total individuals). First, species differed in swimming performance, even after controlling for cofactors such as body size. Second, slopes depicting relationships between swimming performance and body size were not consistent among taxa and moreover, sex did not appear to play a role in swimming ability. Lastly, species specific models indicated inconsistent differences among taxa related to watershed and habitat variation. Overall, these results provide an important contribution to furthering our understanding of small bodied non-game fishes.

Poster Board No. 058 STRAYING BY STOCKED STEELHEAD TROUT IN LAKE ERIE: WHAT DIFFERENTIATES STRAYERS FROM NON-STRAYERS? Jamie N. Justice (jamjust@bgsu.edu), Jeff G. Miner. Bowling Green State University, 706 Napoleon Rd., APT. 911, Bowling Green, OH 43402.

Steelhead Trout in Lake Erie have little habitat for successful survival in tributaries because most tributaries have unsuitably warm temperatures during summer. Michigan, Ohio, Pennsylvania and New York stock about 2 million age-1 Steelhead Trout into selected tributaries with the expectation that these fish will return as spawning adults to support each state's stream fishery. Using hatchery-specific otolith chemistry signatures, it was previously determined that adults return to different tributaries at a rate of about 10-20%. To determine if there are release-size characteristics of juvenile Steelhead Trout that relates to straying, the length of adults at age one was back-calculated by using the distance from the focus to the first annulus of adult scales and the length of juveniles at stocking. The goal of this experiment is to determine effects of size and otolith composition on straying rates by confirming the back-calculations from scales by developing the same back calculation using otoliths. As well, this experiment will compare percent composition of vaterite and aragonite as vaterite otoliths have been shown to reduce hearing and balance in salmonids which can lead to straying. Composition will be determined by using laser ablation ICPMS and micro-raman spectral study. The hypothesis of this experiment is that straying adults will contain higher amounts of vaterite than non-straying adults and that smaller juveniles are more likely to stray than larger juveniles.

Poster Board No. 059 THE INFLUENCE OF TURBIDITY ON THE DEVELOPMENT OF EYE AND BRAIN MORPHOLOGY IN AN AFRICAN CICHLID. H.J. Tiarks[1] (tiarks.2@osu.edu), Suzanne M. Gray[2] (gray.1030@osu.edu). [1]The Ohio State University, 2965 Brandon Rd., Upper Arlington, OH, 43221, [2]The Ohio State University.

Turbidity, or suspended particles in the water column, is

increasing in freshwaters globally due to human activities. This environmental stressor causes numerous changes to the aquatic environment, which can affect behaviors dependent on visual cues in fish. Previous research suggests that some fishes adapt to increased turbidity by growing larger eyes and visual centers (i.e. optic tecta) in the brain to enhance vision. The aim of this project is to determine if turbidity affects sensory attributes of an African cichlid (*Pseudocrenilabrus multicolor victoriae*) throughout development. The fish for this experiment (n=129) were culled at various time points from a full sibling split-brood rearing experiment that examined behavioral changes in response to turbidity. The two wild-caught parent populations were from a Swamp site (clear water population) and River site (turbid water population). One brood of F1 fish from each family (n=5 families/population) was split and reared in turbid or clear treatment conditions. The age of each fish was determined from birth and cull dates. For each fish, the left eye and whole brain will be excised and photographed using a dissecting microscope and attached camera. Eye and pupil diameter, eye axial length, and the volume of the optic tecta will be measured, which will allow for comparison between populations and treatments across development. This research will provide a better understanding of the effect of turbidity on African cichlid sensory morphology, and contribute to growing knowledge of how animals respond to environmental change.

Poster Board No. 060 RIVERS AS IMPORTANT SOURCES OF ICE NUCLEATING PARTICLES TO THE ATMOSPHERE. Kathryn Knackstedt[1], Elizabeth Glasgo[1], George S. Bullerjahn[1], Robert Michael McKay[1], Thomas Hill[2], Bruce Moffett[3]. [1]Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403, [2]Department of Atmospheric Science, Colorado State University, Fort Collins, CO 80523, [3]Ocean Lab, Fishguard Harbour, Goodwick, Pembrokeshire SA64 0DE, United Kingdom.

Ice nucleating particles (INP) are a neglected, but integral component of the water cycle. Preliminary evidence is presented showing that rivers and lakes possess high numbers of warm temperature (≥-10 °C) biological INP and that these may become airborne, especially in association with features promoting turbulence. Focusing our studies on the Maumee River, situated in a predominantly agricultural watershed and which serves as the largest tributary to Lake Erie, we present a seasonal analysis of surface water INP along with assessment of their propensity to become aerosolized. Abundance of warm temperature INP from the surface microlayer spanned 3-orders of magnitude reaching a maximum of 5×10^4 mL^{-1} during their peak in early spring compared with an average of 1 INP mL^{-1} in surface seawater. In air sampled from below a weir spanning the river, the number of warm temperature INP was around 0.02 L^{-1}. This compares with concentrations between 0.0001 and 0.01 in marine aerosols with the higher abundance coinciding with an algal bloom (DeMott et al., 2015). Preliminary data also indicate that the vast majority of the INP are subcellular and therefore do not attributable to known INP classes. Combined with recent surveys of the Mississippi, Missouri and Platte Rivers in the USA, and river and reservoir water in the UK (Moffett, 2016), there is growing consensus that the presence of abundant warm temperature INP is a common, if not ubiquitous feature of fresh water systems.

DeMott, P.J., Hill, T.C., McCluskey, C.S., Prather, K.A., Collins, D.B., Sullivan, R.C., Ruppel, M.J., et al., (2016) Sea spray aerosol as a unique source of ice nucleating particles. *Proc. Nat. Acad. Sci.* 113: 5797–5803.

Moffett, B.F., (2016) Fresh water ice nuclei. *Fundam. Appl. Limnol.* 188: 19-23.

Poster Board No. 061 VARIATION OF BONE MICRO-ARCHITECTURE WITHIN AND AMONG CONTEMPORANEOUS SPECIES OF FOSSIL HORSES: FEASIBILITY. Emily A. Edwards (e.a.edwards46@vikes.csuohio.edu), Anne Su, PhD (a.su@csuohio.edu). 36514 Butternut Ridge Rd., North Ridgeville, OH 44039, School of Health Sciences, Cleveland State University, Cleveland, OH.

Mesohippus, *Miohippus*, and *Merychippus* are extinct horse species that date fifteen to thirty million years ago, spanning over three time periods in North America. Each of the horses habituated different terrains, from swampy lands to dry savanna lands. Over time, the three species shifted from tridactyl to monodactyl distal limb anatomy, with the third metacarpal becoming prominent. The overall research aim is to determine whether a correlation exists between the third metacarpal bone thickness and terrain where each species lived, which would support Wolff's Law of bone adaptation to habitual applied stresses. First, this method development study was conducted to assess the feasibility of obtaining, measuring, and comparing horse fossil specimens. Seven *Mesohippus*, five *Miohippus*, and two *Merychippus* third metacarpal bones were found to be available from the Yale Peabody Museum. The distal end of each bone was imaged using micro-CT scanning. Five fossils were excluded for being too fragmentary and one was too mineralized to view internal bone structure. With the remaining specimens, anatomical landmarks were defined which allowed for replicable standardized reorientation. Segmentation algorithms were shown to successfully separate bone from non-bone. Volumes of interest (VOIs) were determined based on specimen size to reflect relative areas for comparison. The results of this study show that the third metacarpal bone of fossil horses was able to be isolated into trabecular and subchondral bone for further quantitative analysis and comparison. This study was the first step to enhance understanding of the functional morphology of fossil equine third metacarpal bones.

Poster Board No. 062 SIGNIFICANCE OF PALEOPATHOLOGICAL DEFORMATION OF A CRINOID COLUMN FROM THE UPPER ORDOVICIAN GRANT LAKE FORMATION. James R. Thomka (jthomka@uakron.edu). Department of Geosciences, 114 Crouse Hall, University of Akron, Akron, OH 44325.

Swollen or otherwise malformed crinoid remains are relatively common in the fossil record. However, published descriptions of swellings/deformations are typically associated with a discrete pit, boring, embedment structure, or encruster, and are overwhelmingly from Silurian or younger strata. Here, an occurrence of an amorphously swollen crinoid pluricolumnal is reported from the Upper Ordovician Grant Lake Formation of northern Kentucky. This is likely one of the oldest examples of amorphous swelling in a crinoid columnal and the malformation potentially resulted from interaction with a parasite or epibiont. The pluricolumnal is morphologically generalized, complicating definitive identification, but this specimen most likely represents the diplobathrid camerate *Pycnocrinus*. This genus is characterized by a large calyx, complex arm morphology, and a long column—all traits that are associated with other taxa that are known to serve as preferred hosts for parasites and commensals over crinoids with simpler morphologies. If the paleopathologic deformation in this specimen is in response to an antagonistic biotic interaction, then this occurrence provides further support for the interpretation that certain crinoid morphotypes were more involved in biotic interactions than others during the Paleozoic.

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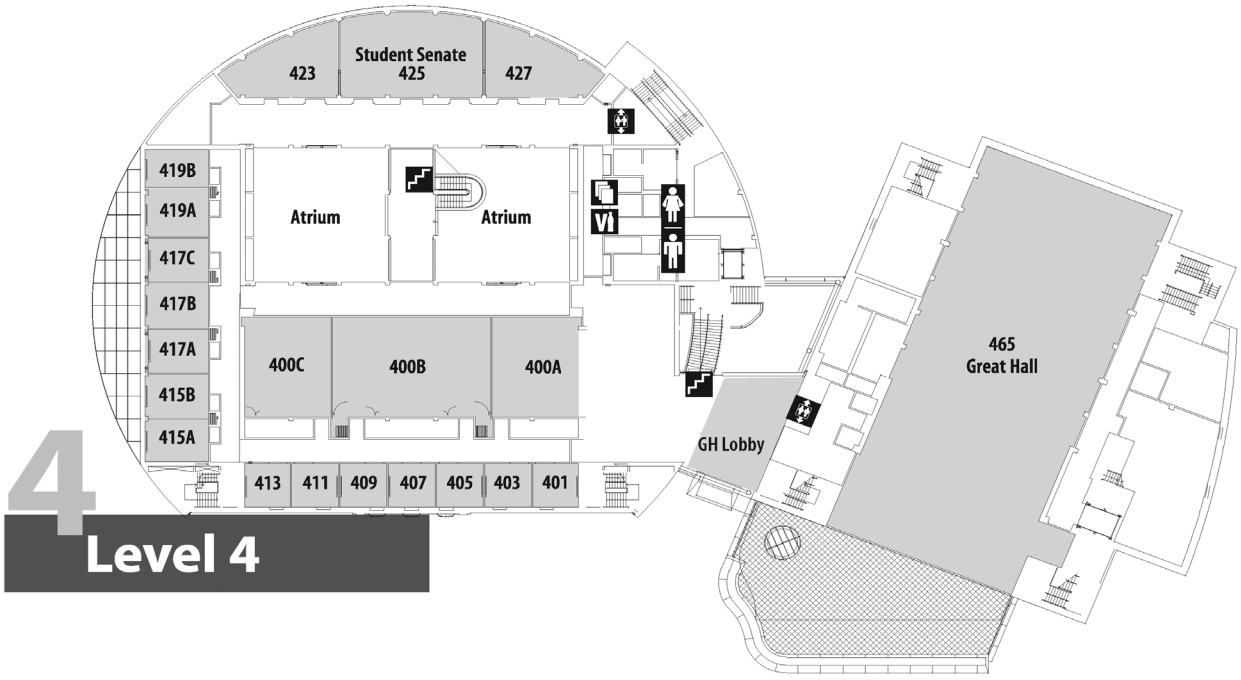

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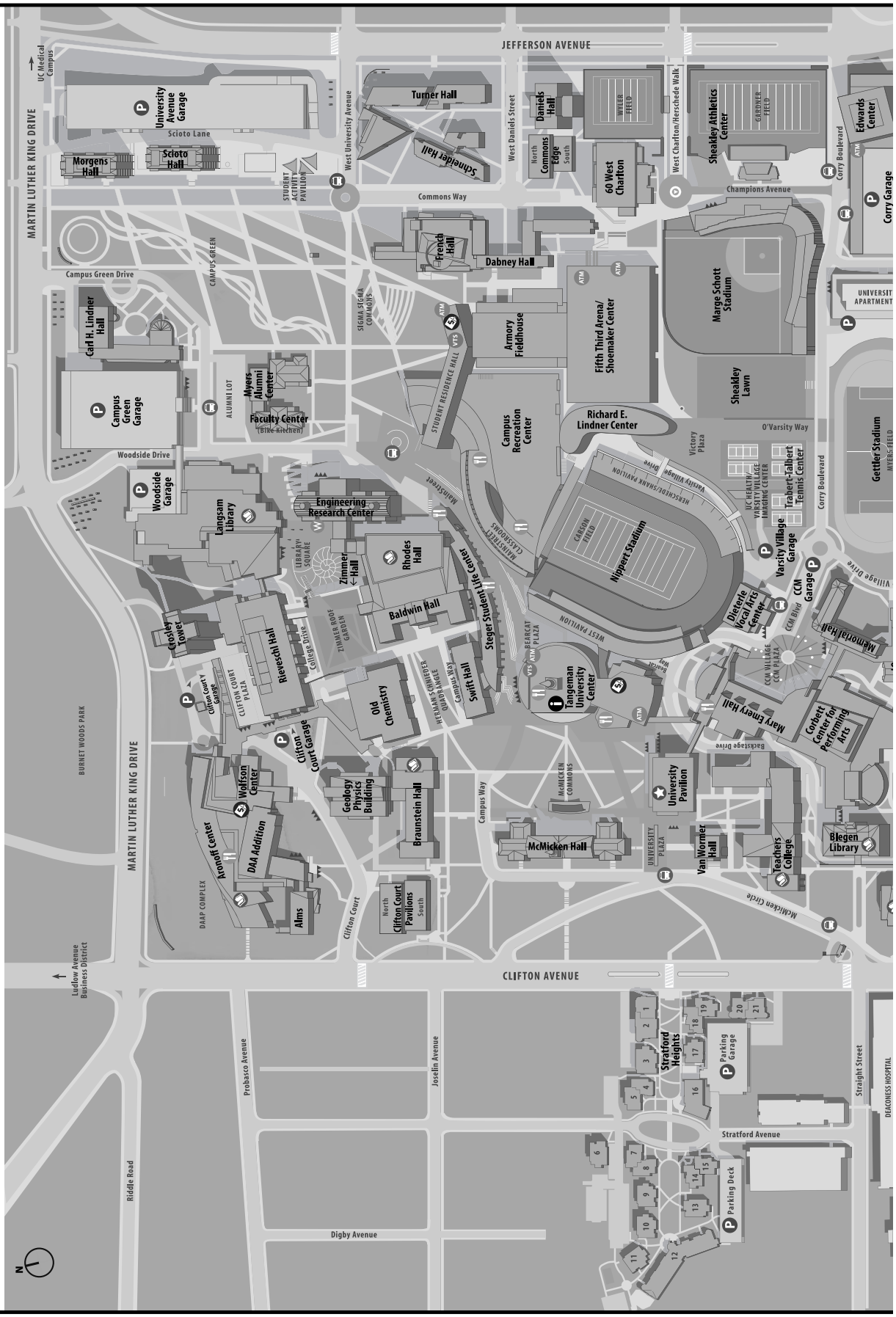

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Registration Fees

Please check appropriate categories. One fee covers the entire meeting. Payment must be received by **March 30, 2017** to avoid higher rates. On-site registration will be accepted at the higher rate by credit card or check ONLY.
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CURRENT MEMBER REGISTRATION RATE		**After March30**
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SATURDAY, APRIL 16, Box Lunch and drink
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Box lunch options: ____ Turkey ____ Beef ____ Veggie

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5-10 from same institution $20 by March 30, 2017; $25 thereafter.
11 or more from same institution $15 by March 30, 2017; $20 thereafter

The All-Academy Lecture is open to the public without cost.

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