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2017 April 7 The University of Cincinnati, Cincinnati, Ohio

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The **Ohio Academy** *of* **Science**

Theme: ***Environment, Health, and Sustainability***

Hosted by
Ohio University
April 16, 2016

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Cover photo of Ohio University Cutler Hall - Provided by Ohio University

The Ohio Academy of Science 125th Annual Meeting

Hosted by
Ohio University
Athens, OH 45701
April 16, 2016

Theme: **Environment, Health, and Sustainability**

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!

Ohio University welcomes you to the 125th 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: ***https://oas.memberclicks.net/index.php?option=com_mc&view=mc&mcid=form_203212*.**
On-site registration will be available at a higher rate. The Ohio Academy of Science must receive registration by **March 27, 2016**.

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Registration by credit card or purchase order only will be accepted by FAX at 614. 488.7629. Your registration materials, receipt, and name tag will be ready at the meeting registration desk upon your arrival. For further information, please call 614.488.2228.

Saturday, April 16: Registration in the lobby of The Grover Center.
7:30 AM-12:00 PM. On-site registration at a higher rate by check, VISA, or MasterCard. Cash is discouraged

PARKING ON CAMPUS: Parking will be available in the football stadium lot at the corner of South Green Dr. and Richland Ave. See map on page 36, or https://www.ohio.edu/athens/ioumap.html.

SMOKING POLICY: Smoking is not permitted in any building.

HOTELS: See options: ***http://www.tripadvisor.com/Hotels-g29942-Athens_Ohio-Hotels.html***

MEALS: Saturday, April 16 - Box lunches may be pre-ordered with registration for $10.00 and will be available for pick-up on the third floor of the Baker Center prior to the State of the Academy address at 11:15 am. The box lunches will be the only opportunity for food.

GENERAL SCHEDULE

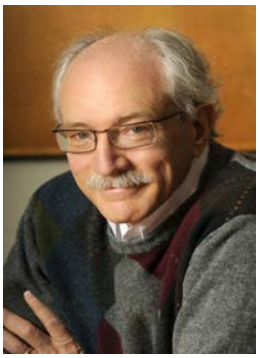
Friday, April 15, 2016

5:30 PM - 7:30 PM	Welcome Reception Grover Center

Saturday, April 16, 2016

7:30 AM - 12:00 PM	Meeting Registration and Breakfast Grover Center
8:15 - 8 :45 AM	Welcome from Ohio University Grover Center
9:00 -11:00 AM	Podium Sessions Grover Center
11:15 AM	Box lunch pick up outside of the Ballroom in the Baker Center
11:30 AM - 12:00 PM	State of the Academy The Baker University Center
12:00 PM	**All-Academy Lecture** The Baker University Center

Richard Woychik, PhD
Deputy Director, NIEHS and
Principal Investigator



As Deputy Director of NIEHS, Richard Woychik, Ph.D., assists the NIEHS and the National Toxicology Program Director, Linda Birnbaum, Ph.D., in the formulation and implementation of plans and policies necessary to carry out the NIEHS missions. Woychik works with Birnbaum in the administrative management of the NIEHS, and speaks on behalf of the institute as appropriate.

As a mammalian geneticist with a distinguished career in molecular genetics and science administration, Woychik currently heads the Mammalian Genome Group within the NIEHS Epigenetics and Stem Cell Biology Laboratory. His research program is focused on better understanding the molecular mechanisms associated with how environmental agents influence the epigenetic control of gene expression. Most recently and since 2002, he served as president and CEO of Jackson Laboratory in Bar Harbor, Maine, and also functioned as the director of the laboratory's NCI designated Cancer Center. Prior to leading The Jackson Laboratory, Woychik's professional history also included positions in both academia and industry: chief scientific officer for Lynx Therapeutics, Hayward, CA; head of the Parke-Davis Laboratory of Molecular Genetics, Alameda, CA; professor within the Departments of Pediatrics, Genetics and Pharmacology at the Case Western Reserve University, Cleveland, Ohio; and senior research scientist at the Oak Ridge National Laboratory, Oak Ridge, Tenn.

Dr. Woychik completed his B.S. and M.S. at the University of Wisconsin, Madison, and earned his Ph.D. in molecular biology at Case Western Reserve University in 1984. He received his postdoctoral training in the Laboratory of Philip Leder at Harvard Medical School with fellowship support from the Jane Coffin Childs Memorial Fund and from the Howard Hughes Medical Institute.

1:15-3:15 PM Poster Session in the Baker University Center

Our Institutional Host

OHIO UNIVERSITY STRIVES TO BE the best student-centered, transformative learning community in America, there more than 39,000 students realize their promise, faculty advance knowledge, staff achieve excellence, and alumni become global leaders. OHIO is committed to fostering, embracing, and celebrating diversity in all its forms. Our Athens Campus offers students a residential learning experience in one of the nation's most picturesque academic settings. Regional campuses and centers serve additional students across the state, and online programs further advance the University's commitment to providing educational access and opportunity.

Ohio University Mission
Ohio University holds as its central purpose the intellectual and personal development of its students. Distinguished by its rich history, diverse campus, international community, and beautiful Appalachian setting, Ohio University is known as well for its outstanding faculty of accomplished teachers whose research and creative activity advance knowledge across many disciplines.

Ohio University Vision
Ohio University will be the nation's best transformative learning community where students realize their promise, faculty advance knowledge, staff achieve excellence, and alumni become global leader. Regardless of a student's major, we want them to study what they love and love what they study. We want them to make a difference. As Capital students, they fulfill their passion and make an impact on the greater good – each tiny ripple of influence becoming a wave of positive change that all started right here, with their decision to attend Capital.

Faculty Host and Local Arrangements Chair

Dr. Michele Morrone, Professor of Environmental Health Science, Department of Social and Public Health in the College of Health Sciences and Professions, will host the meeting.

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Entomology and Macroinvertebrates

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9:00 – 11:00 AM
Podium Session
Session 01
Entomology and Macroinvertebrates
Room 113

09:00 - SENSITIVE AND COLD-WATER MACROINVERTEBRATE TAXA REFLECTING HABITAT AND GROUNDWATER INPUT IN HEADWATER STREAMS IN NORTHEAST OHIO THAT SUPPORT THREATENED BROOK TROUT (*SALVELINUS FONTINALIS*). Katherine S. Amey[1] (kamey@kent.edu), Paul Anderson[2] (panderson@enviroscienceinc.com). [1]Kent State University, 3300 Lake Road West, Ashtabula, Ohio 44004, [2]Enviroscience.

The purpose of this study was to evaluate how macroinvertebrate populations in eight cold-water streams reflect a stream's capacity to sustain populations of the threatened Ohio Brook Trout (*Salvelinus fontinalis*). It was hypothesized that by sampling and calculating repeat Headwater Macroinvertebrate Field Evaluation Index (HMFEI) scores in the same location as a 2004-2006 study, it would highlight declining brook trout habitats. Additional locations within the same streams were also predicted to yield variable scores depending on local lithologic conditions and utilization of macroinvertebrates as a food supply. Objectives were to identify sensitive taxa, which indicate high water quality, and cold-water taxa, which emphasize areas of groundwater input needed for permanent flow and ultimately support brook trout populations. Methods included calculating and correlating HMFEI scores, the Ohio Environmental Protection Agency's method for assessing the biology of primary headwater habitats in northeast Ohio, in addition to seining for a brook trout count. Analysis of samples to the lowest practicable taxonomic level allowed for evaluation of both the number of present sensitive and cold-water taxa, which indicate groundwater input is maintaining perennial stream temperatures and sustaining the biological populations. Repeat low HMFEI scores revealed areas of perturbation, stream degradation, and habitat alteration in need of attention. The HMFEI scores are location dependent, and scores widely differed within the same stream. For example, high scores evident upstream of a large brook trout population compared to lower scores downstream, indicated additional factors such as local consumption of the macroinvertebrate population.

09:15 - CG12054, A *DROSOPHILA MELANOGASTER* ZINC-FINGER HOMOLOG TO HUMAN JAZF1, AN ENDOMETRIAL AND PROSTATE CANCER GENE, DISPLAYS PROTEIN EXPRESSION PATTERNS SIMILAR TO MAMMALIAN SYSTEMS. Vladimir Bokun (vbokun12@students.ndc.edu), Brittany N. Stawicki (bstawicki11@students.ndc.edu), Matthew L. Johnson (mjohnson@ndc.edu). Notre Dame College, 4545 College Road, South Euclid, OH 44121.

Complex yet tight regulation of gene expression in multicellular organisms is essential for development and maintenance of cellular processes that enable proper development and reproduction of an organism. C2H2 zinc-finger proteins represent the largest family of transcription regulators that act to regulate gene expression by binding to specific DNA sequences to regulate expression patterns of various genes. CG12054 is a *Drosophila melanogaster* C2H2 zinc-finger-protein-encoding gene, whose human homolog JAZF1 has been associated with both endometrial stromal sarcomas (ESSs) and prostate cancers in humans. This study compares JAZF1 and CG12054 and reveals conservation between *Homo sapiens* and N-termini region of *D. melanogaster* homolog with an identity of 51% and similarity of 64%. Furthermore, immunostaining using an antibody specific to the vertebrate JAZF1 detected CG12054 in multiple tissues. Throughout all these tissues, CG12054 protein localizes to the nuclei and appears to have a higher expression within the reproductive system in *D. melanogaster*. The expression pattern corresponds to the tissues where JAZF1 has been associated with ESSs and prostate cancers in *H. sapiens*. In addition, immunostaining of *Caenorhabditis elegans* reveals a protein that also localizes to the nucleus, giving evidence of a structural homolog to JAZF1 in nematodes. Collectively, immunostaining and Western-blot approaches allow the elucidation of specific developmental, and isoform expression of CG12054. By using a comparative approach, the *D. melanogaster* and *C. elegans* homologs of JAZF1 may give insight to how this gene functions throughout the animal lineage and its role in human cancers.

09:30 - SHIFTS IN THE SPIDER (ORDER: ARANEAE) COMMUNITY AFTER AN EF-2 TORNADO IMPACTED A NORTH-CENTRAL OHIO FOREST. Sarah J. Rose (rose.891@osu.edu) and P. Charles Goebel (goebel.11@osu.edu). School of Environment and Natural Resources, The Ohio State University, 210 Kottman Hall, 2021 Coffey Rd. Columbus, OH 43210.

Catastrophic winds associated with thunderstorms and tornadoes are important natural disturbances that affect ecosystem structure and function in the Central Hardwood Forest region. Few studies, however, have evaluated the natural succession of a forest impacted by catastrophic winds. In 2010, an EF-2 tornado impacted the forests of the Secrest Arboretum at the Wooster campus of The Ohio State University, providing an opportunity to quantify the recovery of a relatively undisturbed natural forest ecosystem. In 2013, spider sampling utilizing pitfall traps, visual sampling, vegetation beating, and leaf litter extraction, was completed in order to describe the spider (Order: Araneae) community of the tornado-impacted area and an adjacent unimpacted reference area. A total of 3,316 spiders from 24 families were collected; with 21 families present in the reference stand, and all 24 present in the tornado stand. These data showed a shift in the spider community composition related to the catastrophic canopy disturbance associated with the tornado (e.g. higher densities of wolf spiders (Family: Lycosidae) in the tornado stand when compared to the reference stand). Both Shannon Diversity Index and overall spider abundance were greater in the tornado impacted stand when compared to the reference stand (t-test: $p = 0.02$ and 0.03, respectively). As we continue to study these communities, we increase our understanding of the role that natural disturbances, and their legacies, play in regulating the structure and composition of spider communities. Such information is important as we develop restoration strategies that emulate natural models of ecosystem development.

09:45 - MACROINVERTEBRATE COMMUNITY INDEX AT NINE MILE CREEK/LANGERDALE URBAN MARSH (SOUTH EUCLID, OH). Robin C. Sallade (rsallade11@students.ndc.edu), Jeffrey M. Wallace (jwallace13@students.ndc.edu), Ron Maichle (maichle@neord.org), and Tracey T. Meilander (tmeilander@ndc.edu). Notre Dame College, 4545 College Rd., South Euclid, OH 44121.

Nine Mile Creek/Langerdale Urban Marsh is a bioengineered wetland ecosystem that drains 46.62 square kilometers of South Euclid, Cleveland Heights, University Heights, and Bratenahl in Cuyahoga County, Ohio. This 17.7km long stream and associated wetlands function as filter and flooding overflow for the area along Green Rd. across from Notre Dame College of Ohio. The wetland system includes 13 stepwise pools separated by rock weirs designed to filter pollutants and nutrients. Since its construction in 2008, few water quality and biodiversity studies within this ecosystem have been conducted. The objective of this study is to investigation is to describe the

macroinvertebrate diversity and water quality within the Nine Mile Creek wetland system. Quantitative sampling of macroinvertebrates using Hester-Dendy samplers was conducted in fall 2015 and will be analyzed to order using the invertebrate community index (ICI). The types of macroinvertebrates present will be used as bioindicators to describe the water quality. The ICI results are compared to water quality measurements (including temperature, dissolved oxygen concentration, pH, conductivity, phosphate, nitrate, and ammonia concentration) made in the wetland ecosystem. The results of this study will be shared with community leaders to determine if further study and/or ecosystem management will be required. This study is being conducted in collaboration with Northeast Ohio Regional Sewer District and the City of South Euclid.

10:00 - A REVIEW OF THE REALIZED AND POTENTIAL IMPACTS OF TWO EXOTIC INVASIVE BEETLES IN OHIO. Curtis E. Young (young.2@osu.edu), Amy K. Stone (stone.91@osu.edu), Joseph Boggs (boggs.47@osu.edu). Ohio State University Extension, Van Wert County, 1055 South Washington Street, Van Wert OH 45891.

Emerald ash borer (EAB), *Agrilus planipennis* and Asian longhorned beetle (ALB), *Anoplophora glabripennis*, wood borers native to Asia were accidently introduced into the United States and Canada in the 1990s and 2000s. EAB has proven itself to be highly invasive, having already spread into 25 states and parts of Canada. EAB was discovered in Toledo, Ohio in 2003. EAB infestations have been positively identified in 85 of 88 Ohio counties. An ALB infestation was discovered in Bethel, Ohio in 2011. Economic and environmental impacts have resulted and will likely continue, in loss of trees, costs of removal, disposal, replacement, treatments, long-term surveillance, and management efforts, and alteration of habitats. In Ohio, the estimated cost of losing all urban ash trees will be $1.8-7.6 billion. Dollar value of landscape trees were estimated using USDA i-Tree Streets software. ALB's spread has been limited to 61 square miles in southwest Ohio. Eradication is the method used to deal with ALB. Removal of 58,612 host trees have occurred since removals started in 2011. Though a large number of trees, it is only a small fraction of the potential number that could be infested and killed by ALB. Tree species in 13 genera can support ALB development with maples (*Acer* spp.) being the primary host. The timber value of 7 billion board feet of standing maples in Ohio is $2.5 billion. If ALB were to become as widespread in Ohio as EAB, the economic and environmental impacts would be immense. It will take a combined effort of education, vigilance, collaboration, and for some, sacrifice to limit ALB's potential impact in Ohio.

9:00 - 11:00 AM
Session 02
Microbiology, Human Biology, and Behavioral Science
Room 119

09:00 - EMPLOYING A FLP-FRT STRATEGY TO UNVEIL THE PHENOTYPE OF FOUR ZINC FINGER CONTAINING GENE KNOCKOUTS. Brian J. Burleson (bburleson12@students.ndc.edu), Matthew L. Johnson (mjohnson@ndc.edu). Notre Dame College, 4545 College Road, South Euclid, OH 44121.

The C2H2 zinc finger protein is a subclass of the zinc finger family that represents the largest class of transcription factors in eukaryotic organisms. Although C2H2 zinc fingers are characterized as performing a variety of functions in the cell, the most common of these is through a direct interaction with DNA. To better understand their in vivo relevance four different genes containing C2H2 zinc finger motifs were chosen based on the ability to generate single gene knockouts using available reagents via a FLP-FRT recombination strategy in *Drosophila melanogaster*. With the employed strategy, flies carrying a white mini gene, conveying red eyes, which will be removed due to induced recombination that can also result in the removal of the selected C2H2 genes. Results from this study have obtained putative lines carrying a chromosome that has a specific genes of interest removed. Specifically, 12, 3, 11, and 56 recombinant lines have been generated based on changes in eye color in the genes CG4496, CG5316, CG12054, and CG12744 respectively. Currently, PCR is being conducted to verify the CG12054 knockout. Initial results indicate that two lines containing a knockout of CG12054 have been obtained. When properly balanced, these lines should provide better insight into the in vivo phenotype that result from an absence of CG12054, the homologue to the *Homo sapiens* gene JAZF1.

09:15 - EFFECT OF MUSIC ON HEART RATE RECOVERY POST-EXCERCISE. Tyler J. Calton (t-calton@onu.edu), Austin E. Bracy (a-bracy@onu.edu), Curtis O. Warren (cwarren.2@onu.edu). 402 W. College Ave Unit 1724 Ada, OH 45810 Ohio Northern University [Advisor Vicki A. Motz (v-motz@onu.edu)].

Many studies suggest that music generates a physiological response by acting as a distraction factor rather than as an independent stimulus of physiological reaction. This study postulated a music genre specific difference in both change in heart rate and post exercise heart rate recovery time (increasing with excitatory music and decreasing with sedative). Participating university students (n= 80) were randomly assigned to one of five random mixed gender groups (n=16) of university students who exercised on an elliptical, maintaining a heartbeat range of 65-75% of their calculated maximum heart rate for five minutes. During exercise and recovery each group listened to either: no music, sedative music throughout, excitatory music throughout, excitatory music while exercising and sedative during recovery, or vice versa. Each participant had a no music control test on a separate day. A significant difference in duration of heart rate recovery between the five groups was observed (ANOVA $p = 1.91 \times 10^{-6}$). Post hoc student's unpaired t-tests showed that participants who listened to excitatory music throughout as well as only during recovery had a significant delay in their resting heart rate recovery ($p=0.0213$ and $p=0.0198$) respectively beyond their control rates. Contrary to this, those listening to sedative music throughout and during recovery had a significant acceleration in their resting heart rate recovery ($p=5.9 \times 10^{-6}$ and $p=0.0069$) respectively as compared to their control tests. T-tests also showed that music need only be played during recovery for these significant results to be obtained. Therefore, people may experience the relaxing effects of sedative music by listening after a stressful event. These findings support the hypothesis that music alters heart rate recovery time following stressful situations.

09:30 - ANALYSIS OF THE MATB HUMAN-MACHINE INTERACTION AND MULTITASKING: THROUGHPUT PERFORMANCE AND THROUGHPUT STRATEGY BY RANKING HUMAN OPERATOR PRIORITIES. Lanie A. Monforton (monforton.2@wright.edu), Aerial N. Camden (aerial.camden@wright.edu), Chandler A. Phillips (chandler.phillips@wright.edu). Department of Biomedical, Industrial and Human Factors Engineering, Wright State University, Dayton, OH 45435, USA.

Multitasking has become prevalent in everyday life, leading to research by psychologists and human factor engineers analyzing human performance in these environments. However, various subjective metrics are often used to

describe human performance. To address this, the Human Operator Informatic Model (HOIM) was developed to quantitatively measure human multitasking performance. An advantage of the HOIM is that a performance analysis method can be applied to quantitatively define human operator (HO) strategy. A group of 34 subjects was evaluated using the Multiple-Attribute Task Battery (MATB). This is a computer-based multitasking simulation software that includes four different task components: Monitoring, Communications, Tracking, and Resources. The subjects were informed that all tasks were equally weighted. A performance analysis method was applied to identify how strategy changes with different difficulty levels and task combinations when the tasks are equally weighted. The task combinations were ordered by average performance, then the HO's attention to each task component was ranked within each task combination. Comparisons were made between task components of different combinations to define the throughput strategy. Results indicate that the subjects were unable to equally divide their attention, but rather prioritized Communications (an auditory task) at the expense of the other three visual tasks. In the future, the HOIM and performance analysis method can be applied to other multitasking environments to identify factors that exceed the HO's abilities to accurately and promptly respond to demands. Future research will aid our understanding of how human attention is divided across multiple fields by utilizing information metrics.

09:45 - SYNERGISTIC ANTIBIOSIS BY CONSTITUENTS OF THYME (THYMUS VULGARIS). Michael Murray (m-murray.7@onu.edu) and Natalie Samijlenko (n-samijlenko@onu.edu). [Advisors: Christopher P. Bowers (c-bowers@onu.edu), Vicki A. Motz (v-motz@onu.edu), Linda M. Young (l-young@onu.edu), and Amy L. Stockert (a-stockert@onu.edu)]. 402 W. College Ave. Ada, OH 45810.

Antibiosis by thyme constituents individually and in combinations have been evaluated for synergistic activity. Thymol, the major constituent of thyme extract exhibits antibiosis against Gram positive bacterial species; with decrease in thymol effectiveness in the presence of other phenols pointing to interference. Variable antibiosis was observed against Gram negative species. This research in progress focuses on analysis of extract constituents for antibiotic activity individually and synergistically with thymol. Thyme was harvested, dried, extracted in ethanol and reconstituted to 1 g plant matter/ml ethanol. Thymol, carvacrol and limonene concentration, measured by gas chromatography, were 9.96×10^{-5} g/ml, 1.59×10^{-5} g/ml and 1.12×10^{-5} g/ml respectively; quercetin, ursolic and caffeic acid concentrations will be measured by high pressure liquid chromatography. Solutions of constituents will be prepared at extract concentrations and pipetted onto discs (100 ug/disc) to perform Kirby Bauer assays on the following bacterial lawns: Staphylococcus epidermidis, Staphylococcus aureus, Streptococcus pneumoniae, *Bacillus subtilis*, *Escherichia coli*, and *Klebsiella pneumoniae* which will be prepared at a 0.5 McFarland standard and incubated (24 hours, 37°C, 5% CO_2). Zones of inhibition will be read and synergy determined by diameter with respect to whole extract and thymol alone. Additionally, binding studies of constituents will be conducted individually at varying concentrations in order to determine relative affinity of the constituent for its target. Constituents will be combined at concentrations based on these affinities in order determine if they behave competitively for the target. The constituent exhibiting the greatest affinity will be combined with each of the other constituents at varying concentrations and correlated to diameters of zones of inhibition.

10:00 - DEVELOPMENT OF A FLUORESCENCE ASSAY FOR MONITORING LIGAND BINDING TO REGULATORY RNA THERMOMETERS. Jacob Sieg[1] (js438911@ohio.edu), Chunxi Zeng (cz313109@ohio.edu)[1,2], Erin R. Murphy[1,2,3] (murphye@ohio.edu), Jennifer V. Hines[1,2] (hinesj@ohio.edu). [1]Department of Chemistry & Biochemistry, [2]Molecular & Cellular Biology Program, [3]Department of Biomedical Sciences, Ohio University, Athens, OH.

This study utilized fluorescent RNA models to develop drug discovery assays that identify potential inhibitors of the *ompA* thermometer, a novel RNA drug target. The *ompA* RNA thermometer regulates translation of ompA proteins in *Shigella Dysenteriae*, which causes a severe form of dysentery. A molecular beacon style approach was used to develop a moderate throughput assay that identifies ligands that bind the functional unit of the ompA thermometer. Eight aminoglycoside antibiotics known to bind other RNAs were screened using this assay to test its sensitivity. Then aminoglycoside binding was characterized by follow-up EC_{50} determinations and thermodenaturation experiments. In the primary screening assay, the aminoglycosides reduced the fluorescence intensity of the molecular beacon model in comparison to an untreated control, indicating stabilization of thermometer secondary structure. The EC_{50} of aminoglycosides binding the *ompA* thermometer ranged from 0.25 to 5.3 μM. The hill slope for certain aminoglycoside binding curves was much smaller than negative one (-3.1 for Neomycin, -4.2 for Gentamycin, and -3.2 for Paromomycin) indicating cooperative binding. Furthermore, aminoglycoside increased the thermodenaturation point (Tm) of the molecular beacon model. For example, 50 μM Neomycin with 6 protonatable amine functional groups increased the Tm by 12ºC. The aminoglycoside effect on Tm was primarily related to aminoglycoside charge, indicating that binding is driven by electrostatics. This information can be used to inform future drug discovery studies of RNA thermometers.

10:15 - CYTOTOXIC EFFECTS OF TURMERIC ON GASTRIC CANCER CELLS. Luis Felipe F. Sousa[1] (luisfsa30@hotmail.com), Helen L. Del Puerto[1] (helendelpuerto@hotmail.com), Camila S. Ferreira[1] (camilasteph.f@gmail.com), Gabriella S. Cardoso[1] (gabriella.cienciasbiologicas@gmail.com), Júlio C. S. Lopes[1] (julliosantiagoo@gmail.com), Lucimara F. da Silva[1] (lucimaraf@una.edu.br), Raíssa C. Arruda[1] (raissacorreaa@gmail.com), Wagner Rezende[1] (wagner-rezende@hotmail.com), Sabrina S. Campolina[1] (camp@yahoo.com.br), Paula H. C. Ciscotto[1] (paula.ciscotto@prof.una.br), Érica F. Borsali[1] (erica.borsali@prof.una.br), Fabrício Freire de Melo[1] (fabriciof@fasa.edu.br), Elizangela M. dos Santos[1] (elizangela.santos@prof.una.br), Amy Milsted[2] (milsted@uakron.edu). [1]Centro Universitário UNA, Rua dos Guajajaras, 175, Instituto de Ciências Biológicas e Saúde, Belo Horizonte MG, 30180-100, Brazil. [2]University of Akron.

Gastric cancer is the third most common cause of cancer-related death in the world. Turmeric (*Curcuma longa L.* [Linnaeus]), a perennial herb cultivated in tropical and subtropical regions, provides a flavorful powder used in cosmetics, textiles, and foods such as curry. Tumeric also appears to have antioxidant and anti-inflammatory properties. Our hypothesis was that turmeric extract is toxic to the human gastric adenocarcinoma cell line, AGS, and could be of value in treating gastric cancer. AGS cells were seeded into 6-well plates, allowed to attach for 24 hours, treated with turmeric extract for 48 hours and counted to determine viability. Each well received 3 mL of growth medium plus 1 mL of medium (negative control), 1 mL of 70% ethanol (positive control for cytotoxicity), 1 mL of turmeric extract or 0.5 mL of extract plus 0.5 mL medium. Cells treated with undiluted extract showed 27% viability, while cells treated with the diluted extract showed 45% viability. These results suggest that turmeric extract may have a dose-dependent effect on cell viability. Additional studies will be required to optimize conditions for further testing of the extract and to determine which components in the turmeric extracts are cytotoxic to gastric cancer cells.

10:30 - A COMPARATIVE GENOMIC APPROACH REVEALS TWO CONSERVED TANDEM GENES CHARACTERIZED BY SPECIFIC EXPRESSION IN THE ADULT MALE ACCESSORY GLAND. Kara Vitalone (kvitalone13@students.ndc.edu) and Matthew Logan Johnson (mjohnson@ndc.edu). Notre Dame College, College Road, South Euclid, OH 44121.

The mechanisms that control transcription establish much of what orchestrates cell specific gene expression. Some of the mechanisms of transcription control are known and have resulted in generalized rules such as; euchromatic DNA is transcriptionally active, whereas heterochromatic DNA tends to be transcriptionally inactive. To better understand the DNA characteristics that control transcription, the Genomics Education Partnership (GEP) has focused on a comparative genomics approach to address those transcripts that do not fit the common rules. This approach requires successful genomic annotation to locate protein coding genes. This project focuses on the annotation of 80,000 base pairs from contig 34 of the L arm of chromosome 3 of *Drosophila elegans*. This was accomplished by using common annotation tools available through the GEP and NCBI to compare and align homologues. The results of this analysis revealed two tandem genes within contig 34 that are expressed in a gender and tissue specific manner in *D. melanogaster*, msopa and Sfp79B. Msopa (male specific opa containing gene) is characterized as being expressed only in the abdominal region of *D. melanogaster* adult males and most abundantly in the accessory glands. Sfp79B (Seminal fluid protein 79) also appears to encode a gene expressed exclusively in adult males and most abundantly in the accessory glands. Comparison between *D. melanogaster* and *D. elegans* reveal that msopa has 48% similarity and Sfp79B shows 78% similarity. Future studies may further disclose characteristics that better define the differences between heterochromatin and euchromatin as well as tissue and sex specific expression.

9:00 – 11:00 AM
Podium Session
Session 03
Environmental Science
Room 125

09:00 - EFFECTIVENESS OF DATA BUOYS FOR SAMPLING CYANOBACTERIAL HARMFUL ALGAL BLOOMS IN LAKE ERIE. Douglas D. Kane[1,2] (dkane@defiance.edu), Kayla M. Moore[2,3], (kaylamoore736@gmail.com), Justin D. Chaffin[1] (chaffin.46@osu.edu). [1]Defiance College, 701 N. Clinton St., Defiance, OH 43512, [2]Franz Theodore Stone Laboratory, [3]Cleveland State University.

Of the Great Lakes, Lake Erie is the shallowest, warmest, and drains the greatest amount of agricultural land, causing it to be most susceptible to cyanobacterial harmful algal blooms (HABs). If HABs continue to be problematic for lake managers, the need for continuous, real-time data that can be used to monitor and warn against HABs will become more important. The objective of this project was to determine how accurate data buoys are at sampling for cyanobacteria in Lake Erie, which is important in determining if they are a good early warning system for HABs. Surface water samples were collected near data buoys at two locations (the Sandusky subbasin near the City of Sandusky's water intake and to the north of Gibraltar Island) over a month long period (late June-late July) and were analyzed using a FluoroProbe which uses the fluorescence of chlorophyll in algae to assign algae to classes and can be used to determine the amount of cyanobacteria present. FluoroProbe data were compared to the cyanobacteria data (also fluorescence-based) that the buoys collected. There were some inconsistencies between the buoy data and FluoroProbe data that could potentially lead to inaccurate warnings; however, t-tests showed that there were no statistically significant differences between the two data sets ($P>0.05$). Even with some inconsistencies, buoy data can still be useful for showing the overall changes in cyanobacteria abundance occurring in the lake. Data buoys have the potential to be effective early warning systems for HABs.

09:15 - AIR QUALITY ANALYSIS IN ALLEGHENY COUNTY, PENNSYLVANIA AS A NONATTAIMENT AREA OF THE 2012 ANNUAL FINE PARTICULATE (PM2.5) STANDARD. Muhammad M. Mereb (mmereb@cscc.edu). Columbus State Community College, Physical and Biological Department, Room NH 432, 550 E Spring St, Columbus, OH 43215.

The purpose of this study was to understand the reasons for the elevated fine particulate (PM2.5) in Allegheny County, Pennsylvania and evaluate the contribution of the neighboring states. Allegheny County is one of the nine nonattainment areas of the 2012 annual PM2.5 national ambient air quality standard (three-year average of 12.0 µg/m3). Annual PM2.5 three-year average in Allegheny County changed from 20.8 µg/m^3 in 2005 to 13.0 µg/m^3 2014, a 37.5% reduction but not enough to meet the standard. The Comprehensive Air Quality Model with Extensions (CAMx) modeling system was used by the Cross-State Air Pollution Rule (CSAPR) to evaluate the PM2.5 contribution by other states. The modeling results of the CSAPR were used by this study. The effect of the reduction in SO2 and NOx as a result of CSAPR implementation was evaluated. The 2011 National Emission Inventory (NEI) was used to establish and quantify air pollution emissions within 25, 50, 75, 100, and 125 miles from the Allegheny County nonattainment designation monitor. The study also evaluated the effect of the meteorological conditions, transportation patterns, and geography/topography on the designation monitor's elevated PM 2.5 concentrations in Allegheny County. It was determined that neighboring states are not contributing significantly to the nonattainment in Allegheny County.

09:30 - SHOCK METAMORPHISM AT THE WELLS CREEK IMPACT STRUCTURE, TENNESSEE: PEAK BROADENING IN XRD SPECTRA FROM SHATTER-CONED DOLOSTONE OF THE KNOX GROUP. Keith A. Milam[1] (milamk@ohio.edu), Timothy Henderson[2] (hende103@purdue.edu). [1]Ohio University, Department of Geological Sciences, 316 Clippinger Laboratories, Athens OH 45701, [2]Purdue University, Earth, Atmospheric, and Planetary Sciences Department, 550 Stadium Mall Drive, West Lafayette, Indiana 47907- 2051.

This study involved analysis of X-ray diffraction (XRD) patterns and petrographic thin sections of carbonate sedimentary rocks from the Wells Creek impact structure (north-central Tennessee) in an effort to assess the magnitude of shock metamorphism experienced during this post-Mississippian impact event. Wells Creek represents a ~12 km diameter complex impact crater (collapsed rim, uplifted center) in primarily carbonate target rocks (dolostone and limestone). Eighteen shatter cones were collected from the Cambrian-Ordovician dolostones of the Knox Group exposed in the central uplift of the heavily-eroded complex impact crater of north-central Tennessee. Powder (<25 µm) XRD patterns were compared to well-known unshocked dolomite standards and diffraction peaks were refined using the Rietveld peak refinement. Full-width half-max (FWHM) values were calculated as a means of determining the level of peak broadening between standard diffraction patterns and those in this study. Results indicate that peak broadening does occur in Wells Creek shatter cones compared to unshocked dolomite. This peak broadening is of a magnitude (<17 GPa) expected for shatter cone formation during shock wave passage, as determined through a comparison of Wells Creek samples to experimentally shocked dolostone/dolomite. Overall

FWHM values were comparable to those of shatter-coned dolostone from the ~13 km Kentland impact structure (Indiana) and higher than those from the ~ 4 km diameter Flynn Creek impact structure, as would be expected from a larger event. This suggests that shatter cones collected from different-sized complex impact craters experience peak shock pressures reflective of the amount of energy release during impact.

09:45 - A COMPARATIVE ANALYSIS OF FISH AND MUSSELS IN LOWER BIG WALNUT CREEK, FRANKLIN AND PICKAWAY COUNTIES, OHIO. Trevor S. Smoot (trevor.smoot@otterbein.edu) and Michael A. Hoggarth (mhoggarth@otterbein.edu). Otterbein University, Department of Biology and Earth Science, 1 South Grove Street, Westerville, Ohio 43021.

Freshwater mussels (family Unionidae) depend on fish as hosts for their larval (glochidia) stage. Where fish communities are diverse and numbers of fish are abundant, mussel communities also may thrive. Mussel diversity in Big Walnut Creek downstream of Hoover Dam can be divided into three reaches: an upper reach where historic and extant mussel diversity are relatively similar (85% similarity), a middle reach where extant mussel diversity is lower than historical diversity (58% similarity), and a lower reach that is somewhat intermediate in regard to diversity of historical and extant mussel species (70% similarity). Because of the relationship mussels have with fish, the hypothesis is that fish community parameters mirror mussel community parameters. Fish were collected by using an electrofisher employing Ohio EPA methodology at sites where mussels also had been collected. The fish data were used to calculate fish-IBI and Shannon-Weiner Diversity Index values. These data were compared to mussel-IBI, Shannon-Weiner Diversity Index, and Jaccard Coefficient of Similarity values for the mussel communities previously determined. Linear regression was used to compare fish and mussel parameters. Fish-IBI and Fish-Shannon-Weiner Diversity Index values remained relatively high (ranged 42-56 and 2.28-2.88 respectively) throughout the reach from the dam to near the mouth while mussel parameters did not (IBI ranged 16-36; SWDI ranged 0-1.03; Jaccard ranged 57%-100%). Fish community structure does not explain the loss of mussels in the mid-section of lower Big Walnut Creek.

10:00 - RECONSTRUCTING THE GREAT ORDOVICIAN BIODIVERSIFICATION EVENT THROUGH BRACHIOPODS OF OKLAHOMA. Sarah Truboviz (sarbovitz@gmail.com), Alycia L Stigall (stigall@ohio.edu), James A Anderson (ja183911@ohio.edu). 316 Clippinger Laboratories, Ohio University, Athens, Ohio, 45701.

This study was designed to construct the first high-resolution brachiopod species diversity curve for Middle Ordovician strata of Laurentia (North America). Global data aggregates indicate that the number of marine invertebrate families and genera more than tripled during this interval, establishing the highest rate of diversity increase for the Phanerozoic. This pattern is known as the Great Ordovician Biodiversification Event (GOBE). However, the temporal and spatial variability, and triggers of the GOBE remain unknown. Efforts in China and Estonia have used brachiopod species diversity to retrace local timing of the GOBE, but causal hypotheses cannot be evaluated without taxon-specific data from other relevant paleocontinents. New field work was conducted to obtain fossil and sedimentological data from one of the most continuous GOBE-aged exposures in North America: the Simpson Group of central Oklahoma. These strata were surveyed for brachiopod diversity and abundance spanning the Dapingian – Sandbian Stages. Species occurrences and counts were recorded in decimeter-scale stratigraphic context, and samples were collected to ensure consistent species identifications in the lab. Rarefaction methods were used to assess sampling and facies biases in brachiopod diversity patterns and statistical tests confirmed changes. Diversity patterns were correlated to other regions with published conodont biostratigraphy. Preliminary results indicate that diversification on Laurentia was temporally synchronous with diversification on Baltica (Estonia). Both demonstrate a step-wise increase to peak diversity in the *H. holodentata* conodont zone in the early Darriwilian Stage. The signal observed on China, however, is more complex, with two potential peaks in the Floian and Darriwilian. Heterogeneity of these signals suggests that both global and local factors were important for triggering diversity during the GOBE.

9:00 – 11:00 AM
Podium Session
Session 04
Animal Behavior and Habitat Science
Room 126

09:00 - CURRENT COMPOSITION AND STRUCTURE OF A DISJUNCT EASTERN HEMLOCK FOREST ECOSYSTEM IN NORTHWESTERN ALABAMA AND MODELING POTENTIAL HEMLOCK WOOLLY ADELGID INFESTATION. Robert T. Denney (denney.57@osu.edu), [Advisor: Dr. David M. Hix (hix.6@osu.edu)]. The Ohio State University, 2021 Coffey Rd, Columbus, OH 43210.

Eastern hemlock (*Tsuga canadensis*) serves a major role as a foundation species in eastern temperate forest ecosystems. The southernmost populations of hemlock occur in Alabama, and these populations will likely be among the last hemlock-dominated forests in the South to be impacted by the hemlock woolly adelgid (*Adelges tsugae*; HWA), an invasive insect that induces hemlock mortality. This study examines the current composition and structure of a hemlock-dominated forest in Alabama and predicts the impact of potential HWA infestation using the Forest Vegetation Simulator (FVS) model. It is hypothesized that the geographic location of this forest makes it highly susceptible to a HWA infestation that would significantly alter the forest's successional trajectory. This study serves as a baseline to inform future HWA management efforts in the region. To examine the forest, plot sampling was performed in two hemlock-dominated stands on the Bankhead National Forest in northwestern Alabama in May 2015, and quantitative measurements of the woody plants, physiography, and soil were collected. Hemlock makes up 49% of both the overstory and large saplings size classes, though deciduous species (e.g. *Quercus montana* and *Acer rubrum*) dominate other classes. It is predicted that the initial HWA infestation will occur between 2024 and 2027, and the FVS model predicts a decline in hemlock basal area of > 99% by the year 2060. Total basal area of the forest will remain relatively unchanged, suggesting that other woody plant species (e.g. *Quercus montana* and *Acer rubrum*) will replace hemlock in the future.

09:15 - A COMPARISON OF WARM VERSES COOL HABITAT RECLAMATION PREFERENCES FOR OBLIGATE GRASSLAND BIRD SPECIES ON THE WILDS. Jennifer Hastings (hastings@muskingum.edu). Biology and Environmental Science Dept., Muskingum College, 163 Stormont St., New Concord, OH 43762.

It has been well documented that obligate grassland bird species have benefitted from nesting on reclaimed surface mines in the Appalachian region of the United States.

Weekly bird point counts and vegetation surveys were conducted during the 2015 breeding season in order to determine if grassland bird species showed a preference for cool-season (non-native) versus warm-season (native prairie) habitat. Significantly greater numbers of bobolinks (*Dolichonyx oryzivorus*) were observed on cool-season plots ($t = 3.6$, $df = 32$, $p < .001$, May; $t = 2.98$, $df = 32$, $p < .001$ early June). In addition, greater (but not significant) numbers of eastern meadowlarks (*Sturnella magna*), and grasshopper sparrows (*Ammodramus savannarum*) were observed on cool-season plots. Conversely, larger numbers of red-winged blackbirds (*Agelaius phoeniceus*) ($t = -2.32$, $df = 32$, $p < 0.1$, May; $t = -5.39$, $df = 32$, $p < .001$, early June) and common yellowthroats (*Geothlyps trichas*) ($t = -4.8$, $df = 32$, $p < .001$, May; $t = -3.57$, $df = 32$, $p < .01$, early June; $t = -6.75$, $df = 32$, $p < .001$, late June; $t = -6.75$, $df = 32$, $p < .001$, July) were recorded on warm-season plots. Numbers of Henslow's sparrows (*Ammodramus henslowii*) were not significantly different on cool- versus warm-season plots until later in the breeding season ($t = 1.8$, $df = 32$, $p < .05$, late June). Based on the point count and vegetation results, observed bird abundances on warm- versus cool-season plots appear to be largely influenced by local habitat structure and patchiness rather than a preference for native or exotic species of plants.

09:30 - MAMMALS AND BIRDS ATTRACTED TO PIG (SUS SCROFA) CARRION AT THOREAU WILDLIFE SANCTUARY (DEFIANCE COUNTY, OH). Douglas D. Kane[1] (dkane@defiance.edu), Rikki Gurule[1] (rgurule001@defiance.edu). [1]Defiance College, 701 N. Clinton St., Defiance, OH 43512.

Camera traps allow scientists and managers to collect wildlife presence data without disturbing wildlife and on a continuous basis in a variety of habitats. In order to determine if habitat type and time of day had an effect on type of mammals and birds that would visit the carrion of a fetal pig (*Sus scrofa*) we set up two camera traps at Thoreau Wildlife Sanctuary (TWS) (Defiance County, Ohio) during fall of 2014. Fetal pigs were placed in cages, with one camera trap set up in forest habitat and another was placed in prairie habitat. Camera traps were checked weekly and data (including image, time of image, and temperature at time of image) were uploaded. We used chi-squared tests to determine if carrion-visiting animals showed a preference for habitat and also determined mean time of day of visit for each animal. Deer (*Odocoileus virginianus*), eastern gray squirrel (*Sciurus carolinensis*), turkey (*Meleagris gallopavo*), opossum (*Didelphis virgniana*), cat (*Felis domesticus*), dog (*Canis lupus familiaris*), and turkey vultures (*Cathartes aura*) all visited at least one of the sites during our study. We found that deer were the most frequent visitors at the prairie habitat and their average visit time was in the early morning. Squirrels were the most frequent visitor in the forest habitat and their average visit time was around noon. These results were surprising, as neither of these species is a carnivore. Future studies should be conducted in similar habitats outside of TWS or at different times of year at TWS.

09:45 - ENVIRONMENTAL INFLUENCES ON CANOPY DISTURBANCE HISTORIES IN MATURE OAK-HICKORY FORESTS IN SOUTHEASTERN OHIO. James D. Palus (palus.5@osu.edu), Erin E. Andrew (andrew.36@osu.edu), P. Charles Goebel (goebel.11@osu.edu), David M. Hix (hix.6@osu.edu). The Ohio State University, 2021 Coffey Road, Columbus, OH 43210.

A comprehensive understanding of a forest's disturbance history is critical to understanding how anthropogenic influences have affected its natural disturbance regime. Such information provides insight into the underlying mechanisms driving contemporary forest change. In the unglaciated Allegheny Plateau of southeastern Ohio, forests are currently undergoing a transition from oak–hickory (*Quercus–Carya*) dominance to mesophyte dominance (e.g., *Acer rubrum*). This transition has been attributed in part to the suppression of fires that became common practice post-EuroAmerican settlement. It is unclear, however, whether this transition is occurring at similar rates among different ecosystem types. For example, it is possible that the environmental conditions and canopy disturbances associated with xeric, south-facing slopes result in a faster transition to mesophytic species than on mesic, north-facing slopes. Using tree cores collected from two different ecological land type phases (ELTPs; as described in the ecological classification system for the Wayne National Forest developed by Hix et al. (1997)), we examined the canopy disturbance history of two contrasting south-facing and north-facing ELTPs. Overall, we found a higher frequency of canopy disturbance (as reflected by periods of release and suppression) in the xeric, south-facing ELTPs than mesic, north-facing ELTPs. We surmise that the higher frequencies in canopy disturbance will result in a faster transition to more mesophytic species on xeric, south-facing ELTPs when compared to more mesic, north-facing ELTPs. The inherent differences in the disturbance regimes of these contrasting landscape positions contribute to our understanding of forest stand development and the influences of environmental factors in oak–hickory forests.

10:00 - ABUNDANCE OF GRASSLAND BIRDS ON A SURFACE MINE (THE WILDS) RECLAIMED ACROSS A CHRONOLOGICAL SEQUENCE. Camille V. Walker (cwalker@muskingum.edu), Harrison D. Raub (hraub@muskingum.edu), Anna K Sharier (asharier@muskingum.edu), Madelyn Moss (mmoss@muskingum.edu). Biology Dept., Muskingum University, 163 Stormont St., New Concord, OH 43762.

Reclaimed surface mines provide suitable habitat for obligate grassland bird species throughout much of the Appalachian region of the eastern U.S. However, little to no maintenance of reclaimed surface mines after initial reclamation has resulted in a steady increase in woody encroachment, which has contributed to a reduction in grassland bird numbers. During May through July 2015, point-count surveys of grassland birds were conducted across three sectors of the Wilds (north, central and south) reclaimed 45, 40 and 30 years ago respectively. The objective was to determine whether the amount of time since reclamation influenced bird species composition and abundance in relation to woody encroachment. Numbers of Henslow's sparrows (*Ammodramus henslowii*) were significantly higher in the north versus central sectors in May ($t = 1.80$, $df = 12$, $p < 0.05$) and June ($t = 2.20$, $df = 12$, $p < 0.05$), although no difference was detected in the north versus south sectors. Greater numbers of grasshopper sparrows (*Ammodramus savannarum*) were detected in the central versus south in May-July ($t = 1.83$-4.34, $df = 26$, $p < 0.05$), and the north versus south (although not significant). Greater numbers of common yellowthroats (*Geothlypis trichas*) were detected in the north versus south ($df = 28$, $t = 1.70$, $p < .05$, May; $df = 28$, $t = 1.76$, $p < .05$, early June). The percentage of woody vegetation was about the same in plots from all three sectors (0%, 2% and 3% respectively). The observed bird distributions appeared to be influenced more by overall habitat structure (e.g. height, density, ground cover) and heterogeneity than the amount of time since reclamation in a sector.

9:00 - 11:00 AM
Podium Session
Session 05
Physics and Engineering
Room 131

09:00 - ELECTRONIC STATES AT TRANSITION METAL DICHALCOGENIDE LATERAL HETEROINTERFACES. Oscar R. Avalos-Ovando[1] (oa237913@ohio.edu), Diego Mastrogiuseppe[2] (mastrogi@ohio.edu), Sergio E. Ulloa[1] (ulloa@ohio.edu). [1]Clippinger Labs 251B, Department of Physics & Astronomy, Ohio University. Athens, Ohio 45701, United States, [2]Instituto de Fisica Rosario, Argentina.

Materials with different band gaps are typically used to create heterostructures that enable band sculpting, this is, the manipulation of the resulting electronic states by changing shape and boundaries of the heterostructure. Systems with an optimized band gap can be used in diode lasers and high-speed transistor devices. Potential material candidates for such heterostructures at the monolayer level are the family of transition-metal dichalcogenides, MX2 (with M=Mo,W and X=S,Se), especially interesting materials with strong spin-orbit coupling and valley degrees of freedom. In this work, lateral interfaces between pairs of these materials are considered, by studying the effect of different boundary geometries, motivated by recent experimental reports of the growth of such interfaces. Using an effective 3-orbital tight-binding model, attention is focused on monolayer ribbons and triangular flakes. The formation of edge/interface states for different gap nesting materials is analyzed, by considering the spatial distribution and orbital character of the wave functions throughout. It is found that the model used can reproduce the low energy physics necessary for describing these systems and that the interface termination changes substantially the resulting electronic structure. The theoretical optimization of the electronic structure in these systems will facilitate building the necessary components for spintronics devices. Supported by NSF DMR-1508325.

09:15 - GRAPHENE: A CONCRETE ADDITIVE FORMED BY SHEAR EXFOLIATION. Mica L Brooks (mica.brooks@gmail.com). 2427 Covington Road Akron, Ohio 44313.

The objective of this experiment was to determine whether graphene could be a viable concrete additive to increase its compressive strength. The graphene in this experiment was produced by shear exfoliation which greatly reduced the cost of experimentation and possible production. The predicted outcome of experimentation was that concrete cylinders containing graphene would yield the best compressive results, with the cylinders containing graphite as second strongest, as compared to control cylinders. Fifteen two inch tall by two inch diameter samples were prepared in three batches; the first containing no mineral additives, the second containing graphite, and the third containing graphene. The cylinders were cured for twenty-seven days at an average temperature of 65°F and 30% humidity. The cylinders were tested for compressive strength using ASTM standard compression methods. The average stress withstood by the control samples was 3360.8 PSI. The average stress withstood by the graphite samples was 2884.0 PSI. The average stress withstood by the graphene samples was 3722.7 PSI. All samples showed vertical failure. The average compressive strength for the graphene samples corresponds with the hypothesis; the samples containing graphene were an average 361.9 PSI (10.8%) stronger than the control samples. The data also shows that contrary to the hypothesis, the cylinders containing graphite were an average 476.8 PSI (14.2%) weaker than the control samples and an average 838.7 PSI (22.5%) weaker than the graphene samples. The data suggests that the graphite was weaker because it acted as a concrete contaminant rather than strengthening the cylinders.

09:30 - AN APPLICATION OF SOUND WAVES TO THE SPECIAL RELATIVISTIC DEFINITION OF SIMULTANEITY. Gerald B Harris (gbharris57@gmail.com). 335 Sentry Hill Road, Toledo OH, 43615.

Einstein's Special Theory of Relativity defines simultaneity as: if two spatially separated events occur such that the light waves generated by these two events arrive at the midpoint of the line adjoining them, at a same time t, then these two events are considered simultaneous. However, if these two events occur in open still air -- which is disengaged from the motion of a material object through space -- then any sound waves that might also be generated by the events may not arrive at this midpoint, at the same time. The events occur at the endpoints of their adjoining line and form a tandem, of length L, where all the discrete points on the line tandem (e.g., a high-speed train) are moving at a constant velocity v along a line parallel to the line adjoining them. Through still air then, the sound waves generated by light flash events at the endpoints will not arrive at the midpoint simultaneously. The speed and direction of the tandem reference frame relative to the still air reference frame may then be mathematically determined using a modified formula from the Michelson-Morley experiment in which the value of c is switched from the speed of light to the speed of sound, due to the velocity constancy of wave phenomena. This methodology of using sound waves to investigate the motion of a material object through air thus calls into question the classical principle of relativity by dispensing with the need for a Galilean or Lorentz transformation between reference frames. All needed physical information is available from within a single reference frame whether that frame is stationary or in motion.

09:45 - IMPROVEMENT OF THE WATER DISTRIBUTION SYSTEM IN CHAGUARPAMBA, ECUADOR. Halle A. Miller (mille728@miamioh.edu). 13684 Janell Drive, Columbia Station, Ohio 44028.

The Miami University Student Chapter of Engineers Without Borders (EWB-Miami) is in the process of concluding a water supply project in the community of Chaguarpamba, Ecuador. Approximately 1,100 people reside in Chaguarpamba, where the main concern is water distribution. In January 2016 EWB-Miami sent a team to implement hydraulic modeling software (EPA NET). The main goal was to train the municipality engineers to effectively use EPA NET through tutorials and hands-on learning. EWB-Miami also conducted monitoring and evaluations, including community surveys and quantitative data collection pertaining to previous projects, such as a chlorination system and fences to protect water sources from livestock. Additionally, the education program was expanded at the local schools to instruct the children about the importance of water and sanitation. The initial EPA NET model of Chaguarpamba's system was constructed before the trip. Analyses and troubleshooting were run on this network to ensure model quality. The main calculations done were for allocating demands for each node in the network. The number of meters recorded by EWB-Miami varied from the value of total users given by the community. To fix this, each meter recorded from an AutoCAD map previously developed by the chapter was assigned to a node in the EPA NET model and multiplied by an adjustment factor of 0.006. This calculation was done based on the average usage per day and estimated number of users, as found in water bill records from the city's municipal office. The software has given the community the basis to assess the possibility

improvements to the existing system, as well as expansion projects as the community grows. While in Chaguarpamba, EWB-Miami members assisted the engineers in designing the next phase of improvements to the existing system. This included incorporating a third break tank, increasing the size of piping in the main city area, and rerouting pipes from a storage tank.

10:00 - VALLEY POLARIZATION IN GRAPHENE WITH OUT-OF-PLANE DEFORMATIONS. Dawei Zhai (dz990311@ohio.edu) and Nancy Sandler (sandler@ohio.edu), Department of Physics and Astronomy, Ohio University, Athens, Ohio 45701.

At low energy, the energy dispersion of graphene shows a conical valley structure with the conduction and valence bands touching at the Dirac points. The existence of two inequivalent Dirac points in the Brillouin zone, thus two valleys, suggests that they may be used as new degrees of freedom to carry information. Several schemes based on different mechanisms have been advanced to achieve valley separation in this material. However, the proposed setups remain challenging for experimental observation. In this work we investigate graphene with out-of-plane deformations- one of the most naturally occurring and practically realizable settings- as a candidate system to produce valley polarization. Local strains produced by the deformations serve as scattering potentials for electronic states. A second-order Born approximation calculation based on the continuum model reveals the existence of valley polarization and its dependence on the geometrical parameters of the deformations. The efficiency of valley filtering for different geometries and energies is calculated and their possible implementation in currently available experimental setups is discussed.

10:15 - INDUCED SPIN ORBIT COUPLING IN GRAPHENE BY PROXIMITY TO TRANSITION METAL DICHALCOGENIDE MONOLAYER. Abdulrhman Alsharari (aa249512@ohio.edu), Sergio Ulloa (ulloa@ohio.edu), Mahmoud Asmar (asmar@lsu.edu). 38 N McKinley Ave Apt 414 Athens Ohio 45701.

Proximity effects resulting from depositing a graphene layer on a substrate may induce spin-dependent interactions that change the topological properties of graphene. A suitable candidate to study this effect is a transition metal dichalcogenides (TMD) substrate. A 2D layer of these materials has a large spin-orbit coupling (SOC) that in turn induces a sizable effect near the graphene Dirac points. Graphene and 2D TMDs are nearly commensurate lattices, producing an interesting moiré pattern when adhered to one another. We study theoretically the electronic structure of graphene-TMD systems using a tight binding formalism. It is found that graphene exhibits a strong proximity SOC, in addition to other perturbations that strongly affect the states; the linear dispersion near the neutrality point becomes gapped. Based on symmetries allowed by the heterostructure, we find the effective Hamiltonian to describe the low energy states. Also, it is found that diagonal SOC and staggered potential terms characterize the wave functions, akin to the structure in TMDs. A relative voltage between the layers enhances the proximity SOC in graphene, providing a tunable effect that will impact the optoelectronic properties of the hybrid system.

10:30 - STRAIN FIELDS AND ELECTRONIC STRUCTURE OF CrN. Tomas Rojas (tr074112@ohio.edu) and Sergio E. Ulloa (ulloa@ohio.edu). Clippinger Labs 251B Dept. of Physics and Astronomy, Athens, Ohio 45701.

Chromium nitride (CrN) has a promising future for its resistance to corrosion and hardness, and very interesting magnetic and electronic properties. CrN presents a phase transition in which the crystal structure, magnetic ordering and electronic properties change at a (Neel) temperature ~280K. Thin films have been found to exhibit different conductance behavior at low temperature. A study of the unusual electronic and magnetic properties of thin layers is presented here. For that purpose we develop a tight binding Hamiltonian based on the Slater-Koster approach, and estimate the interaction between the Cr-3d and N-2p orbitals. The band structure was analyzed also with *ab initio* calculations using the LSDA+U method. These calculations show the system to behave as a semiconductor below the Neel temperature. We analyzed the effect of strain fields in the electronic structure in order to understand the electronic behavior near the phase transition and determine the carrier effective masses.

9:00 - 11:00 AM
Podium Session
Session 06
Human and Public Health
Room 135

09:00 - LEADING REPORTABLE INFECTIONS IN OHIO, 2014. Sarah Holbrook (sarah.holbrook1@otterbein.edu), Kara Lehner (kara.lehner@otterbein.edu), Jeff Vasiloff (jvasiloff@otterbein.edu). Otterbein University, 1 South Grove St., Westerville, OH 43081.

Over 100 infectious diseases are mandated as reportable by the Ohio Department of Health (ODH). Cases are identified by practitioners and laboratories and reported to local public health, and ultimately, to ODH. This statewide data allows prevention and control activities by the public health and medical sector. The purpose of this work-in-progress is to rank the major reportable infectious diseases in Ohio in 2014. Further, case characteristics of leading 2014 infections will be analyzed to guide focused and efficacious prevention activities. Finally, longitudinal trends of selected diseases will be analyzed. For example, previous work was reported (SH and JV) in which HIV incidence rates were found to be increasing through 2013. Examination of 2014 data will allow further characterization of this and other trends. ODH tabulates reportable infectious disease cases, demographics, and in some infections, risk factors. 2014 data has recently been accessed and analysis has begun. Previously obtained 2013 data has been preliminarily analyzed: annual case counts of all reportable infections were used to rank the leading 10 infections in 2013. 2014 rankings and analysis of case characteristics are pending. In 2013, the highest ranking reportable infections were: 1) Chlamydia (53,336 cases); 2) Gonorrhea (16,667 cases); 3) Influenza-associated hospitalizations (4,197 cases); 4) Pertussis (1,667 cases); 5) Salmonellosis (1,190 cases); 6) *Streptococcus pneumoniae* (1,112 cases); 7) Total syphilis (1,096 cases); 8) Human Immunodeficiency Virus (HIV) (1,060 cases); 9) Campylobacteriosis (1,023 cases); and 10) Varicella (648 cases).

09:15 - HAND SANITIZER USE BEFORE GRAPPLING DECREASES BACTERIAL LOAD ON WRESTLERS. Brooke Kohls (b-kohls@onu.edu) [Advisers: Linda M. Young (l-young@onu.edu), Vicki A. Motz (v-motz@onu.edu) and Ron E. Beaschler (r-beaschler@onu.edu)].

To determine whether hand cleaning prior to wrestling decreases bacterial load and likely infection transmission, 20 wrestlers were recruited for an IRB approved controlled study. Wrestlers' hands were swabbed using a rayon swab moistened with Stuart's medium, then the right hand was cleaned using either an alcohol wipe, alcohol gel, Clean Contact® 0.13% benzalkonium chloride wipe, or Clean Contact® 0.1% benzalkonium chloride hand

foam, and re-swabbed. At the end of 1.5 hours of practice, both hands were swabbed. Swabs were placed in 2 ml of Mueller-Hinton broth and thermoagitated to extract bacteria. Ten microliter samples were inoculated onto blood agar plates and incubated (24 hours, 37°C, 5% CO_2). Colony forming units (CFUs) were quantified and visually identified by color, morphology and hemolytic properties; *Staphylococcus aureus* was confirmed via coagulase. Of 10,368 CFU counted, 94.7% were S. epidermidis, 3.4% S. pneumoniae, 1.5% *S. aureus*, 0.06% *B. subtilis* and 0.4% were classified "other". Prior to practice, wrestlers' right hands were variably clean with an initial count of 9.1+/- 19.2 CFU. Cleaning significantly decreased load to 1.5 +/- 4.8 CFU (p [paired t- test] = 0.03) . Post practice, load rose to 48.3+/- 21.5 CFU; as compared to unwashed left hands (66.7 +/- 52.9 CFU), indicating that hand cleaning does decrease bacterial load. Wipe-washed hands had 36.7% fewer CFU than hands cleaned with the equivalent gel antiseptic. Additionally, benzalkonium chloride cleaned hands had 40.1% fewer CFUs than the alcohol based cleaner; and all residual cleaners significantly decreased bacterial load on right hand to 72% of unwashed left hand control (p [paired t- test] = .0210) thus residual activity may decrease infection risk in the wrestling environment.

09:30 - MULLEIN EXTRACT ANTIBIOSIS SUPPORTS ETHNOBOTANIC USE AS A RESPIRATORY THERUPUTIC AGENT. Emma Ranney (e-ranney@onu.edu), Angelica Polizzi (a-polizzi@onu.edu) and Rebecca Lifer (r-lifer@onu.edu). 402 W. College Ave. unit 2560 Ada, OH 45810. [Advisors Vicki A. Motz (v-motz@onu.edu), Linda M. Young (l-young@onu.edu) and Christopher P. Bowers (c-bowers@onu.edu)]

Common mullein, *Verbascum Thapsus L.*, can be found across the United States. Tribal medicinals agree that both flowers and leaves effectively treat respiratory ailments but vary by location in recommending teas, oil infusions or smoking the leaves. Geographic variations have been noted in chemical constituents of both mullein flowers and leaves and in genetic profiles of *Verbascum* species. This study hypothesized that locational differences in constituents may correlate with antibiotic efficacy against respiratory pathogens. In July 2015, mullein flowers and leaves were harvested from Ohio, West Virginia, and Virginia. Leaves were dried and flowers were preserved in 91% isopropanol; the alcohol was evaporated off. Leaves and flowers were extracted in pH 4 phosphate buffer, filtered, evaporated, and reconstituted in buffer to a 1 gm/ml extract concentration. Extracts were analyzed by liquid chromatography and used to perform Kirby Bauer assays at a concentration of 100 µg/disc on the following bacterial lawns: *Staphylococcus epidermidis*, Staphylococcus aureus, *Streptococcus pneumoniae*, *Bacillus subtilis*, *Escherichia coli*, and *Klebsiella pneumoniae* (prepared at a 0.5 McFarland standard) and incubated (24 hours, 37°C, 5% CO_2). Although no significant geographical differences in antibiosis were noted, extract constituents vary with region. This may have been due to early season collection dates. Zones of inhibition were significantly (by t-test, p=.0019) larger against *Streptococcus pneumoniae* (11.5 +/- 1.7 mm) than against all others (8.4 +/- 1.2 mm), greater against gram positive species than gram negative and greater against *Klebsiella pneumoniae* (8.9 +/- 1.2 mm) than *Escherichia coli* (7.1 +/- 0.8 mm). Notably in both gram negative and positive, the most sensitive species to mullein were respiratory pathogens, validating ethnopharmacological use.

09:45 - VALIDATING ANTIBIOSIS ACTIVITY OF *OENOTHERA CAESPITOSA* (TUFTED EVENING PRIMROSE), A PLANT USED BY SOUTHWEST NATIVE AMERICANS FOR TREATMENT OF TOPICAL INFECTIONS. Lisanne K. Sprague (l-sprague.1@onu.edu), David H. Kinder (d-kinder@onu.edu), Vicki A. Motz (v-motz@onu.edu) and Linda M. Young (l-young@onu.edu). Ohio Northern University, 115 E. Highland Ave. Ada, OH 45810.

Oenothera caespitosa Nutt., tufted evening primrose, is native to the western United States. The leaves of the plant were used as a topical antibiotic by various Native American tribes, most notably the Navajo. This study seeks to validate antibiosis and topical as opposed to internal use by comparing extracts antibiosis against *Staphylococcus epidermidis*, a common skin pathogen, *Streptococcus pyogenes*, a common internal organism and *Staphylococcus aureus*, which is found both externally and internally (n=3 for each species). *O. caespitosa* was collected from NM and OH in summer 2015, dried and extracted in 50% acetone, filtered, and solvent removed in vacuuo. Extract was reconstituted to 1 gm plant material/ml ethanol. The ethanol was then removed and the ethanol insoluble portion, which was completely water soluble, reconstituted at 1 g/ml distilled water. The equivalent of 100 µg of each extract was applied to 6 mm Whatman #3 disks for Kirby-Bauer analysis (with ethanol controls). Bacterial populations, diluted to 0.5 McFarland standards, were applied to Mueller-Hinton agar for *S. aureus* and *S. epidermidis*, and Mueller-Hinton agar with SRBC was used for *S. pyogenes*. Plates were incubated in 5% CO_2 at 37°C for 24 hours prior to measuring zones of inhibition as a measure of efficacy against the species tested. The ANOVA test indicated a significant difference in diameter of zones of inhibition between species (p= 0.0002) with S. epidermidis significantly more inhibited than *S. aureus* (t-test p= 0.011). Results showed greater efficacy against both Staphylococci than against *S. pyogenes* supporting the ethnopharmacological use.

10:00 - LEGIONNAIRES DISEASE IN OHIO, 2005-2014. Jeff Vasiloff (jvasiloff@otterbein.edu). Otterbein University, 1 South Grove St., Westerville, OH 43081.

Legionnaires disease (LD) is caused by *Legionella pneumophilia*. This sometimes-fatal pneumonia is acquired by inhalation of aerosolized water containing the bacterium. LD incidence has increased nationwide from 0.39/100,000 to 1.15/100,000 (2000-2009). We hypothesized a similar increase in Ohio. Thus, statewide LD incidence rates were calculated and analyzed from 2005 to 2014. Surveillance data was obtained from the Ohio Department of Health. Using case counts and census data, annual incidence rates were calculated from 2005-2014. Cases were characterized by age, sex, and month of disease onset using 2013 data. From 2005-2010, annual incidence rates were fairly stable, with a mean of 2.1/100,000. Annual rates were higher from 2011-2014, with a mean of 3.4/100,000. In 2013, 80% of cases occurred in those 50+ years of age. Male/female was 1.5/1. Infections were most common from June-August. LD incidence in Ohio was fairly stable from 2005 to 2010. However, from 2011 to 2014, mean incidence was 62% higher than over the preceding 6 years. While incidence in Ohio did rise over the 10 year period, most of this rise occurred later than that of national rates. It is possible that LD occurrence in Ohio truly did not rise very much from 2005-2010, or, more likely, that some cases during that time period were not diagnosed and/or not reported. More important is that despite widespread efforts to prevent contamination of water sources, rates of infection have increased. Better methods are needed to decrease incidence of this sometimes fatal illness.

10:15 - RISING INCIDENCE OF LYME DISEASE, OHIO. Jeff Vasiloff (jvasiloff@otterbein.edu). Otterbein University, 1 South Grove St., Westerville, OH 43081.

Lyme disease (LD) is the most frequently reported vectorborne disease in the nation. Caused by the bacterium Borrelia burgdorferi, it is transmitted by the blacklegged tick *Ixodes scapularis*. LD incidence increased 8% nationwide from 2010 to 2014 (7.3/100000 to 7.9/100000). Entomological data shows the increasing spread of this vector in Ohio. Thus, we hypothesized that: a) the incidence of LD in Ohio would increase from

2010-2014; and b) that the magnitude of increase would exceed that in the national rate. Surveillance data was obtained from the Ohio Department of Health. Using case counts and census data, annual incidence was calculated from 2010-2014. Cases were characterized by sex, month of disease onset, and in-state versus out-of-state acquisition. From 2010-2014 there were 376 cases of Lyme disease (48% male; 52% female). Annual incidence rates were: 0.38/100000 (2010); 0.46/100000 (2011); 0.58/100000 (2012); 0.80/100000 (2013); and 1/100000 (2014). In-state-acquired LD incidence was 0.15/100000 in 2010 and 0.42/100000 in 2014. Highest county case counts were in Franklin, Cuyahoga, Delaware, Hamilton, and Montgomery. From 2010 through 2014, incidence of LD in Ohio increased. The total LD incidence increased 163% from 2010-2014. In-state-acquired LD incidence increased 180%. These increases were higher than the 8% increase observed nationwide. Because entomological data revealed increasing spread of blacklegged ticks in Ohio from 2010 to 2015, there is a temporal association between vector spread and LD incidence. Whether this is causal is unknown, yet tick bite prevention and control methods need to be increased.

10:30 - RESIDUAL CLEANERS EFFECTIVELY CONTROL BACTERIAL GROWTH ON WRESTLING MATS. Suzanne C. Young (s-young.3@onu.edu), [Advisors: Linda M. Young (l-young@onu.edu), Vicki A. Motz (v-motz@onu.edu), and Ronald E. Beaschler (rbeaschler@onu.edu)]. Ohio Northern University, 417 N. Gilbert St. Ada OH, 45810.

Since wrestling mats act as fomites in the transmission of infection between wrestlers, this study measured initial and residual efficacy of agents used to clean wrestling mats to determine which would be most effective in decreasing spread of bacteria. New 30 x 30 cm mat squares (provided by Resilite®) were divided into quadrants and disinfected with one of six cleaning agents: 10% bleach, OxiTitan®, Benefect®, Clean Contact®, Sweat-x® and KenKlean® (N=4 replications for all treatments). Surface sterilization for all treatments was confirmed by swabbing with rayon swabs moistened with Stuart's medium. Swabs were thermoagitated (1000 rpm; 5 minutes; 37°C) in 2 ml of Mueller-Hinton broth. A 10 µl broth sample was inoculated on trypticase soy agar with 5% sheep red blood cells and incubated (24 hours; 37°C; 5% CO_2) and colonies counted. To simulate wrestler contact with mats, an inoculum of 100 µl of a 0.5 McFarland standard of *Staphylococcus epidermidis* was spread evenly over all quadrants and allowed to dry. Mats were sampled at t=0, 1, 2, 6, and 24 hours (swabs handled as above). All mats exhibited an initial post inoculation elevation in load (44.4+/- 44.7 CFU) with Clean Contact® having the lowest count (1.3+/- 0.3CFU at T=0). Within one hour, counts from all mats except OxiTitan® and bleach returned to zero. At T=12, OxiTitan® mats reached 0; but the rise in counts of bleached mats was five times greater in the first hour post-inoculation, implying that all others were residual. Duration of residual activity of single treatment was assessed by weekly re-inoculation of *S. epidermidis* (swabbed post inoculation at T=0, T=6 hrs and T=1 week). Each week, there was a progressive increase in CFU count at T=0 for all treatments with an attenuated drop at 6 hours and a return to zero after one week. Mats treated with Benefect® had lowest counts indicating that Benefect® had greatest residual activity.

Pre-college Poster Session
1:15 – 3:15 pm
Capital Center

Poster Board No. 001 EMOTIONAL INTELLIGENCE AND HEART RATE VARIABILITY. Sara G Yacoub (saragyacoub@yahoo.com). 441 Timberlea Trail Kettering, OH 45429.

Emotional intelligence (EI) is the ability to identify, control, and apply emotions appropriately. The limbic system is the center of perception, storage and analysis of social cues, elements of EI. The effect of EI on the physiology of vital organs can be measured through the functions of these organs in response to social cues. Heart rate is controlled by the central autonomic system. A correlation between heart rate variability (HRV) and EI scores indicates a potential regulating connection between the limbic system and the central autonomic system. To determine correlation between EI and HRV, standardized EI tests were taken by thirty subjects, and scored. HRV was determined by calculating the difference between the highest and the lowest heart rate recorded for these subjects, at baseline and during strong social stimuli, such as watching a video clip. Subjects, who scored highest on the EI test, had the highest HRV. Subjects who scored in the medium range, had medium HRV, and those who scored the lowest, had the lowest HRV. In conclusion, there is a correlation between EI scores and HRV in response to social cues. The regulatory connection between the limbic and the autonomic systems can have a practical implication in the ability to control one system by modifying the other. Improving EI, through behavioral changes and techniques, for example, could potentially have an effect on the health and function of the autonomic system in general and the cardiovascular system in particular.

Poster Board No. 002 PERCEPTION OF TEACHERS AND/ OR SUBJECTS OF STUDY AND STUDENT PERFPORMANCE. Sara G Yacoub (saragyacoub@yahoo.com). 441 Timberlea Trail Kettering, OH 45429.

Many variables affect student performance in various subjects. Student performance does not only depend on student work and cognitive skills. The environment of the classroom, the subject of study, and the teacher's image and behavior play a role in student success. Thirty junior high students took surveys about their teachers and the following subjects of study: math, English, science, religion, reading and social studies. Surveys were scored on a numeric scale from zero to four, zero being the least favorable, and four being the most favorable perception of teachers or subjects. Students' grades on tests and homework were compared to the perception score generated from the surveys. High performing students, with the highest grades on tests and homework, had the highest perception scores of their teachers or subjects. Low performing students had the lowest perception scores of their teachers or subjects. A correlation between performance and perception of students implies potential performance improvement by perception improvement, and possibly by changing teachers' image and behavior, student performance could improve.

Poster Board No. 003 ACTIVATION OF PANNEXIN 1 IS NOT INDICATIVE OF ATP RELEASE, AND OTHER ADENINE NUCLEOTIDES ARE RELEASED VIA PANNEXIN 1. Graham S Lane[1] (glane17@us.edu), Andrea Boyd Tressler[2], George Dubyak[2]. [1]University School, 2785 Som Center Rd, Hunting Valley, Ohio 44022, [2]Department of Pharmacology, Case Western Reserve University, School of Medicine.

During the anti-tumor immune response the pannexin-1 channel (Panx1) is cleaved by apoptotic caspases. ATP is

released which signals for macrophages and dendritic cells to phagocytize the tumor cell. It has been shown that ADP and AMP are also released; however, it's unclear whether the majority of ADP and AMP in extracellular media is due to intercellular or extracellular metabolism. It has also been shown that in EG7 murine thymoma, ATP is not released even after channel cleavage. It is unknown if lack of ATP release is due to lack of channel function. The goals were twofold: to determine whether the presence of ADP and AMP in media was due to intracellular or extracellular metabolism, and to determine if the Panx1 channel was functional. The hypothesis was that ADP and AMP were generated intracellularly and that the channel was functional. To test if media or cell surface activity caused extracellular breakdown of ATP, Ecto-nucleotidase activity was measured separately on RPMI media, basal salt solution (BSS) media and Jurkat cells suspended in RPMI media. ATP levels were measured prior to the addition of 10 uM ATP and for an additional 30 minutes thereafter. Relative florescent units (RFU), indicative of ATP levels, were then measured. The RFU remained steady throughout the 30 minutes at 1,400,000 RFU/s after the initial addition of 10uM ATP, indicating that the majority of the ADP and AMP found in the media was generated intracellularly. Next, YO PRO dye, a chemical with similar kinetics to ATP, influx was measured to indicate channel function in EG7. EG7's treated with staurosporine, a protein kinase inhibitor causing immediate cell death, showed an increase of 5000 RFU/s compared to control EG7's, meaning that there was an influx of dye through Panx1 when treated. This highlights that Panx1 is functional despite no ATP release.

Poster Board No. 004 CYTOTOXICITY OF UNDARIA PINNATIFIDA EXTRACT FUCOIDAN ON 266-4 MELANOMA CELL LINE IN VITRO. George R. Nageeb (gnageeb18@us.edu), Varsha Thakur, Barbara Bedogni. University School, 2875 SOM Center Road, Ohio 44022.

The mutated gene, BRAF, accounts for only 50% of melanoma cases. Because targeted therapy has limited success, a need for an alternative therapy exists. Fucoidan, a sulfated heteropolysaccharide, extracted from sporophylls of the brown seaweed *Undaria pinnatifida*, is reported to exhibit suppression of cancer cell growth. Current drug therapy, lapatinib ditosylate, a dual tyrase protein kinase inhibitor, is used to treat breast cancer and other solid tumors. In this study, BJ (ATCC® CRL-2522™) human fibroblast and 266-4 melanoma cells were seeded as triplicates in a 96-well plate (4000 cells/well). Each triplicate was treated with Dulbecco's Modified Eagle's Medium (control), fucoidan (1 mg/ml), lapatinib (10 μM), or a 1:1000 lapatinib/fucoidan mixture for 24, 48, and 72 hours (n=3 samples per treatment). The goal was to identify a treatment with the most selective cytotoxicity *in vitro*, killing 266-4 cells while reducing fibroblast damage. A fucoidan/lapatinib mixture was hypothesized to be the most effective treatment because of its selective and inhibiting properties. Cell viability was measured using Cell Titer-Glo Luminescent viability assay. After 72 hours, fucoidan alone resulted in increased 266-4 cell viability (35%, $p = 0.047$). Lapatinib alone resulted in lower 266-4 cell viability (-30.65%, $p<0.05$). The fucoidan/lapatinib treatment worked synergistically to significantly decrease 266-4 cell viability (59.21% versus 21.01% decrease in BJ fibroblast cells, $p=0.023$). Trypan blue assay confirmed reduced cell viability was a result of apoptosis rather than growth inhibition. These data suggest that the fucoidan/lapatanib treatment has great potential as a pharmaceutical *in-vivo* due to its increased efficacy in decreasing cell viability.

Poster Board No. 005 COMPARISON OF MUSCLE FATIGUE IN THE DOMINANT AND NON-DOMINANT ARMS. Veronica Adornato[1] (vadornato17@hb.edu), Natalie M. Cole[2], A. Bolu Ajiboye[2]. [1]4177 Far-O-Way Lane Richfield OH, 44286 (Hathaway Brown School), [2]Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH.

Electromyographic recordings are often used as control signals in prosthetic devices as an approximation in force. However muscle tissue fatigues with large loads. The present study sought to determine whether fatigue reduces muscle force output more in the non-dominant arm than in the dominant arm. Surface electromyography (EMG) was used to measure force in the following muscles: biceps, triceps, extensor digitorum communis (EDC), flexor digitorum superficialis (FDS), and the thenar eminence. Recordings were taken from both arms for two experiments. For each experiment, the subject performed bicep curls with four weights ranging from five to twenty pounds. To investigate fatigue, Experiment 1 was conducted with increasing weights and Experiment 2 was conducted with decreasing weights. Pre-processing and analysis was performed in MATLAB. The EMG data was filtered, rectified, and normalized to maximum voluntary contraction. The peaks of each bicep curl were averaged for the EMG values for each muscle. The dominant arm did not have larger EMG values within standard deviation. The dominant arm showed a clear trend of 10% more activation in the flexors. For example, 53% of maximum activation in the biceps for twenty pounds during non-fatigue and 63% during fatigue. There was no clear trend in the non-dominant arm. Current analysis has not yielded a clear answer to the hypothesis. Further investigation will include analysis of the frequency content in the EMG as a less subjective metric for assessing muscle fatigue.

Poster Board No. 006 UMBILICAL CORD TISSUE DERIVED MESENCHYMAL STEM CELLS: THERAPEUTIC DEVELOPMENT FOR CYSTIC FIBROSIS. Sukhmani Kaur[1] (skaur18@hb.edu), Dave Fletcher[2], Morgan Sutton[2], Tracey L. Bonfield[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122, [2]Case Western Reserve University, Cleveland, OH 44106.

Cystic Fibrosis (CF) patients die due to pulmonary infection and inflammation, which has been the focus of human mesenchymal stem cell (hMSCs) therapeutics. hMSCs can be derived from umbilical cord tissue (HCT) which is discarded post-delivery. HCT hMSCs were evaluated for therapeutic potential. Cord Blood Registry® provided HCT hMSCs. hMSCs were cultured with or without lipopolysaccharide (LPS) or peptidoglycan (PEP) for 2 or 24 hours. hMSC supernatants were analyzed for secreted cytokines by Luminex (mean±SEM pg/ml) and cells analyzed for gene expression by RT-PCR (mean±SEM, change in cycle threshold, ΔCT). hMSCs functional activity was measured using *Staphylococcus aureus* (SA) and *Pseudomonas aeruginosa* (PA) for antimicrobial activity (colony forming units, CFUs) or anti-inflammatory activity by adenosine triphosphate (ATP) relative luminescence units (RFUs) using A549 epithelial cells. Statistical analysis was done with GraphPad Prism6. HCT hMSCs secreted MIP-1α (45±23 pg/ml), IL-6 (95,339±81,389 pg/ml), TNFα (9.4±1.2 pg/ml), IL-1ß (2616±1316.49 pg/ml), and IL-8 (93,147±13,684) ($n=3$, $p\leq0.05$). LPS stimulation increased IL-6 and MIP-1α (121940±108,003 pg/ml and 50±26 pg/ml respectively, ($n=3$, $p\leq0.05$). hMSC expressed IL-6 and IL-8 mRNA (-3.89±2.52 and -2.15±3.42 respectively) which did not change with LPS. PEP stimulation increased both IL-6 and IL-8 mRNA synthesis (-6.76±1.5 and -5.93±2.71 respectively). Functionally, HCT hMSC supernatants were antimicrobial against both *PA* and *SA* decreasing CFUs from 37 to 34.5 and 150 to 73.5 respectively. Further, the hMSCs supernatants had anti-inflammatory activity, which was enhanced by LPS (86,655±5725 RFUs to 115,770±1879 respectively, $p\leq0.05$). HCT hMSCs have the potential to provide anti-microbial and anti-inflammatory therapy.

Poster Board No. 007 IMPROVED CANCER DETECTION AND DIAGNOSIS THROUGH A NOVEL COMBINATION OF CELL SEGMENTATION AND ARTIFICIAL INTELLIGENCE TECHNIQUES. Sreeram Venkatarao (sreeram.v181@gmail.com). 4863 Bridge Lane Apartment 7, Mason OH 45040.

Cancer diagnosis is a subjective process that requires manual examination of tissues. This project explores whether a quantitative and computational approach to differentiate cancerous liver tissues from normal liver tissues can be developed, utilizing cellular and nuclear descriptors derived from the image. This task has two primary objectives: 1) Find underlying trends within cancer tissue images and normal tissue images that can help differentiate between the two and 2) Train a machine learning program to diagnose cancer tissues based on complex patterns and algorithms without a human operator. First, normal and cancerous liver tissue images from the Human Protein Atlas were segmented using selective image processing functions in the Fiji and ImageJ applications. Next, the data was processed by a data handler and written to an Excel spreadsheet. The resulting empirical and statistical distributions showed that cancer nuclei were smaller than normal nuclei. When this pattern was tested on eight new images, seven out of the eight images exhibited this identical pattern. Finally, neural network and decision tree classifiers were trained to differentiate between normal and cancerous tissues. Each classifier correctly diagnosed 100% of the images in the test set. This research primarily applies to the field of oncology. Furthermore, one could investigate whether a drug is working or not based on cell and nuclei descriptors. The descriptors that indicate different types of cancerous tissue may change, but the fundamental concepts of image processing and statistical analysis will remain constant, allowing the methodology to be extended to different types of cancer.

Poster Board No. 008 NOVEL SPIRAL TUBE ASSEMBLY FOR SEPARATION OF PROTEINS BY HIGH-SPEED COUNTERCURRENT CHROMATOGRAPHY. Dhweeja Dasarathy (Ddasarathy@gmail.com), Yoichiro Ito. 391 East St Andrews Drive, Highland Heights, OH 44143.

Countercurrent chromatography (CCC) is a relatively new technique that allows high-efficiency separation and purification of proteins compared to conventional chromatography. We have developed a novel spiral tube assembly with an increased in radial grooves from 4 to 12 and 12 narrow spots instead of 4 in each circular loop to interrupt the laminar flow. This assembly improved sample separation with lesser sample run-time compared to the currently used CCC columns. The assemblies were compared for separating 3 proteins including cytochrome C, myoglobin, and lysozyme. A two-phase aqueous-aqueous solvent system composed of Polyethylene Glycol 1000 (25% w/w) and Dibasic potassium phosphate (25% w/w) was used. All samples were run at flow-rates of 1,2, 3, and 5 mL/min at both 800 RPM and 1000 RPM. The three protein samples had high stationary phase retentions at 1, 2, and 3 mL/min, yet separated efficiently at 5 mL/min in 40 minutes. After a comparison of the peak resolutions, theoretical plate numbers, and stationary phase retentions, it was determined that the flat-twisted tubing was more effective in separating these proteins because of sample band broadening. In order to validate the efficacy of this novel assembly, a mixture of five protein samples (cytochrome c, myoglobin, ovalbumin, lysozyme, and hemoglobin) were separated, under the optimal conditions established with the 3 proteins, at 1 mL/min with a revolution speed of 1000 RPM. There were high stationary phase retentions of 60 + 10%, with effective separations, demonstrating the efficiency of the flat-twisted STS assembly. This novel STS separation column allows rapid and efficient separation of mixtures with high yield of constituent components. pH and chemical reactivity may be confounding factors in assessing these results.

Poster Board No. 009 THE EFFECT OF POLYPHENOLS IN SPICES ON THE AGGREGATION OF THE AMYLOID BETA PEPTIDE 1-40: AN IN VITRO STUDY. Swathi Ravi Srinivasan (swathi99@gmail.com). 24018 E. Silsby Rd. Beachwood, OH 44122. Colin Agatisa-Boyle, Department of Chemistry, Case Western Reserve University, 10900 Euclid Ave, Cleveland, OH 44106.

A primary characteristic of Alzheimer's disease is the oligomerization of amyloid-beta (aß) 1-40 random coil structures leading to the formation of amyloid plaques highly resistant to degradation. This study aimed to see the effect of the spices turmeric and chili pepper, with active ingredients curcumin and capsaicin respectively, on the aggregation of the aß peptide. As pure turmeric is not often ingested alone, capsaicin was also studied, both individually and in a mix alongside curcumin, to evaluate its effectiveness in inhibiting aggregation. Circular Dichroism (CD) was utilized to monitor the progress of aß oligomerization each day, using CD sample holders (cells) at 50 mM per sample. A mixture of phosphate buffer and trifluoroacetic acid (TFA) was added to maintain each CD cell's contents at a pH of 7.4. Each cell was kept away from light, maintained at room temperature, and at a consistent pH and concentration in order to maintain as much control as practical. The CD passed light through each sample cell, and the results were plotted as a graph of wavelength (nm) vs. change in ellipticity (mdeg); the position of the minima of the curve at the wavelength of 220 nm signified how far the given sample was from aggregation. By day five, aggregation rates for curcumin, capsaicin and the mix were 6%, 7%, and 9% respectively, while the control aggregated at a rate of 25%. Data obtained indicated that curcumin, capsaicin and the mix had higher efficiency when compared to the control in inhibiting oligomerization.

Poster Board No. 010 A BIOEGINEERED 3D BRAIN MODEL TO INVESTIGATE MALIGNANT GLIOBLASTOMA TUMORS. Rama N. Balasubramaniam[1] (rb0410@gmail.com), Aaron R. Short[2], Jessica O. Winter[2]. [1]Dublin Coffman High School 6780 Coffman Rd, Dublin OH 43017, [2]The Ohio State University, Columbus, OH 43210.

Glioblastoma Multiforme (GBM) is a lethal cancer originating from the glial cells of the brain. Current treatments are unsuccessful partly due to rapid GBM migration along blood vessels and white matter, causing secondary tumors. Previous work has shown that hyaluronic acid inhibits cell adhesion and is found in increasing levels in the GBM microenvironment. It was hypothesized that as HA concentration increased, migration would decrease, and the intensity of associated receptors would increase. A novel assay was created utilizing collagen-hyaluronic acid (HA) hydrogels and polycaprolactone nanofibers representing the extracellular matrix and white matter tracts of the brain. Increasing concentrations of HA represented the gradient that cells migrated through after leaving the tumors. Timelapse microscopy was used to track the migration of individual cells, while expression of HA receptors (i.e. CD44 and RHAMM) and the adhesion protein Vinculin were quantified through immunocytochemistry. As HA concentrations increased (0-10 mg/mL), migration and cell length decreased, as measured by ImageJ. Further experimentation showed collagen gel only migration was the highest; collagen appeared to be a supportive matrix that promoted migration. Examining the HA receptors and Vinculin showed that as HA concentration increased, the former increased while the latter decreased. The results suggest that GBM migration is an inverse function of HA concentration, with HA significantly inhibiting movement. Future work will examine the mechanical properties of the system as well as collagen gel migration. Combining 3D brain mimetic materials greatly enhanced our understanding of GBM migration, which could lead to the development of therapeutic treatments.

Poster Board No. 011 NOVEL METERED DOSE INHALER DESIGN TO IMPROVE DRUG DELIVERY TO THE LUNGS. Aditya Jog (ajog14@gmail.com). 7592 Hunt Club Drive, Mason, OH 45040. (William Mason High School).

To treat pulmonary diseases, aerosol spray particles of medication from a metered-dose-inhaler are inhaled through the mouth to reach the lungs. Current designs lead to particles depositing in the airway, reducing the amount of medication reaching the lungs. Particle deposition in the airways of a 10-year old child was studied by conducting computational flow simulations and experiments with a simplified model of the airway (from the mouth to trachea). It was hypothesized that particle deposition would be reduced if the outer flow was stronger than the inner flow and was introduced at an angle to the axial direction. Simulations were conducted using a 760,000 cell grid and a constant flow rate of 20 L/min in ANSYS-Fluent; no particles were used as it was expected that the small (diameter < 5 micrometers) aerosol particles would follow the airflow. The simulations showed that compared to the current design, outer flow introduced at an angle to the axial direction produces a swirling motion, forcing it to remain close to the wall while the inner flow moves through the center of the airway. Experiments were conducted on the simplified airway model with three different 3-D printed mouthpieces. Saline mist was sprayed into the mouthpiece while airflow was maintained. The deposited liquid was massed using a precision balance. The experimental data supports the hypothesis and shows that dividing the flow into inner and outer sections with the outer flow introduced at an angle (45°) reduces particle deposition in the airway by about 20%.

Poster Board No. 012 INVESTIGATING THE DESIGN OF GOLD NANOPARTICLES TO TARGET DIFFICULT-TO-REACH TUMOR SITES. Isha Lele[1] (ilele18@hb.edu), Prabhani Atukorale[2], Efstathios Karathanasis[2]. [1]Hathaway Brown School, 3400 Old Brainard Road, Pepper Pike, Ohio 44124, [2]Department of Biomedical Engineering and Radiology, Case Comprehensive Cancer Center, Case Western School of Medicine, Case Western Reserve University.

Certain cancers (metastatic breast cancer, invasive glioma) are deadly because of their inability to be treated using existing methods. For example, metastases are buried within other tissue and the blood-brain barrier limits access to the brain. Nanoparticles, can be engineered to access these areas. In previous studies, iron oxide nanochains have shown significant therapeutic effect compared to spherical nanoparticles. Further investigating the design (shape, size, flexibility) of the particles, will give insight into how these attributes can govern the efficiency of these drug-carrying particles to reach these tumor sites. Although literature shows gold and iron oxide function similarly, gold is easier to synthesize in mass quantities. The hypothesis involved two aspects: finding an effective method to synthesize gold particles, and testing these structures. First, spheres and chains were fabricated and attached to the tripeptide-targeted ligand. These shapes were tested in three in vivo mouse models of breast cancer and glioma ($n \geq 15$). The gold content was analyzed and imaged in spleen, brain, kidneys, lungs, and liver using a transmission electron microscope. The amount of gold per organ was measured after digesting the organs using inductively-coupled plasma optical emission spectrometry. A large percentage of targeted spheres have not shown significant drainage in any of the models. Data from in vivo mouse models using chains are still being collected. In conclusion, the ongoing studies suggest that targeting strategies can be custom-engineered to reach difficult-to-target tumor sites, and future studies will focus on the comparison between chains and other structures.

Poster Board No. 013 EFFECTIVENESS OF AMMONIUM NITRATE VS. UREA FOR USE IN INSTANT COLD PACKS. Faith C. Myers (myersfc@embarqmail.com). 4251 N. County Line Rd., Sunbury OH 43074 (Big Walnut Middle School).

The purpose of this experiment was to determine which chemical, ammonium nitrate or urea, in water produces the lowest temperature for use as a cold compress. Research led to the hypothesis: ammonium nitrate will produce lower temperatures in solution than urea. The hypothesis was tested by evaluating minimum water temperatures produced. Eighty grams of ammonium nitrate or urea was poured into a styrofoam cup containing 100 ml of distilled water at 20°C. The infrared thermometer was immediately started, recording temperatures at 1 s intervals. The solution was constantly stirred, and temperature recording continued until the minimum temperature stabilized. The final minimum temperatures (°C) were recorded along with the times (seconds) to produce them. Ten trials were performed for each type of chemical for a total of 20 trials. Mean minimum temperatures, times, and standard deviations were calculated. The mean minimum solution temperature was -12.4 °C (σ=0.5 °C) for ammonium nitrate and -4.1 °C (σ=0.3 °C) for urea. This result supports the hypothesis. The mean time to produce the minimum temperature was 180s (σ=18s) for ammonium nitrate and 228s (σ=26s) for urea. Therefore, all of the data shows that ammonium nitrate produces lower mean minimum temperatures, and reaches them more quickly, demonstrating it is a more effective chemical for use in instant cold packs.

Poster Board No. 014 ROOFING: WHICH TYPE OF ROOFING MATERIALS IS THE MOST ENERGY EFFICIENT? Selena M. Turner (SelenaMarie66@aol.com). 1208 Winter Fern Avenue, Springfield Township, Ohio 44312. National Inventors Hall of Fame Science, Technology, Engineering and Mathematics High School, Akron, Ohio.

The purpose of this project was to find an energy efficient roofing material. Builders might want to change roofing materials when they put on a new roof, or if they build a new house choose something different to save money on the heating and cooling bills. People are frustrated paying high prices for gas and electric. The problem is to determine which type of roofing material is the most energy efficient. The hypothesis is testing of asphalt shingles, steel, plastic, slate, rubber and copper roofing materials, will prove slate to be the most energy efficient. To find out, 7 birdhouses were built and roofing materials were placed on 6 of them. All samples were actual roofing materials and the thickness used on home roofs. Then, an infrared thermometer was used to test the temperature inside the bird houses after placing them under a heat lamp to heat them to 100°F and putting them outside in the winter to lower the temperature to 32°F. The length of time was calculated for each house to reach 68°F which is the most common temperature people keep their thermostat at. The house that takes the longest to lose the heat or cold will be the best roofing material to use for winter heating and summer cooling. The results found that asphalt shingles took the longest to lose its heat. It took 75 minutes. The rubber roofing took the longest to lose its coolness at 81 minutes. Therefore, asphalt shingles are better when heating your home and rubber roofing is the most energy efficient in cooling your home. Obviously, you can't change roofing with the seasons. Therefore, one must take into account where they live and the weather encountered the majority of the year, to decide which of these two roofing materials to use. The objectives were met as I wanted to find out both summer and winter energy efficiency. This contributes to the engineering field in building new homes and remodeling old ones. Most people have to pay for energy, and therefore, it would save money on home heating and cooling bills.

Poster Board No. 015 NO-TILL FARMING AND COW MANURE COMPOST DECREASE SOIL EROSION FROM WIND. Alexandra H. Cox (coxal46@alliancecityschool.org). 300 West Bayton Street Alliance, Ohio 44601.

Soil erosion is a concern worldwide. This project seeks to demonstrate that no-till farming may be used with cow manure compost to slow wind erosion. This project used four plant trays. The control tray had plain garden soil. The test variables consisted of one tray with garden soil with cow manure compost; one tray with garden soil with original plants still in place; and one tray with a slice of garden soil amended with no-till soil topped with cow manure compost. Each tray was weighed prior and following the trials. All trays had the same initial weight. A garbage bag was placed over each tray. A hair dryer was placed over the short edge of each tray. The dryer blew across the trays for five minutes per trial. Each tray had ten trials. Total weight loss for the control tray was 595.34 grams. Total weight loss was 272.16 grams for the cow manure compost tray. Total weight loss for the no-till tray was 510.29 grams. Total weight loss for the no-till and cow manure compost tray was 56.699 grams. The control tray's collected sediment weight was 342 grams and 346 milliliters. The garden soil and cow manure compost tray's sediment total weight was 153 grams and 161 milliliters in volume. The no-till tray's sediment total weight was 50 grams and 64 milliliters in volume. The no-till and cow manure compost tray's sediment weight was 25 grams and 26.5 milliliters in volume. No-till and cow manure compost decreases wind erosion.

Poster Board No. 016 PLANARIA AS A BIOASSAY TO DETECT WATER TOXINS IN LOCAL WATERSHEDS. Anna C. Ganim (annaganim@gmail.com). 5217 Adena Trail, Cincinnati, OH, 45230, Guardian Angels Elementary.

Detection of the presence of toxins in watersheds is important for people living in the United States as well as in third-world countries. There is a need for a simple, inexpensive way to test for the presence of toxins in watersheds. Planaria dugesia, a common species of flatworm, are found all over the world. If planaria are exposed to water containing toxins, the signs of distress or death they exhibit can be used as a bioassay to detect toxins in watersheds. When exposed to serial dilutions of Homemade Toxic Waste (1000 ml water, 1 ml Scott's® pesticide, 1 ml Ortho® herbicide, 1 ml WD-40, 1 ml Dawn® detergent, 500 mg tire grime) planaria did show signs of distress (shaking back and forth, contracting and curling) and/or death (falling apart and not moving). Three planaria where observed in 7 dilutions of HTW (0%-control, 0.01, to 100%). The effect on each planaria was recorded at 12 time points (1 minute to 48 hours). The greater the concentration of HTW and the longer the time of exposure, the greater the effect HTW had on the planaria. Planaria death occurred as soon as 1 minute (100% HTW). Planaria distress occurred at concentrations as low as 1% HTW (3 hours). Nine samples were collected from 6 watersheds around Cincinnati, Ohio. Three planaria where exposed to each sample. Only samples from Mill Creek caused observable effect. Planaria distress was noted at 5 minutes. Planaria death was noted 6 hours. Planaria dugesia can be used as a bioassay, and the Mill Creek contains levels of toxins harmful to Planaria.

Poster Board No. 017 PHYTOREMEDIATION EFFICACY OF *ARABIDOPIS THALLIANA* IN CRUDE OIL SPILL CLEAN UP: REDUCING ENVIRONMENTAL FOOT PRINT. Kavin Vedamoorthy (kavin4804@gmail.com). New Albany High School, 7600 Fodor Rd, New Albany, OH 43054.

Incidences of oil spills are happening very frequently on land as well as underwater. In spite of various cleanup strategies, 100% decontamination is not being possible. The residual crude oil/hazardous components can stay long term and cause growth and genetic abnormalities. Phytoremediation is a process to remove/reduce pollutant concentrations in contaminated soils, water or air, with plants that are able to contain, degrade, or eliminate contaminants. The *Arabidopsis thaliana* (Brassicaceae family), is a model plant used for genetic research [Wild Type: Columbia and Variants – Wassilewskija, Santa Clara and Lovvik] were grown in soil treated/untreated with Crude Oil (CO). Plant shoot (leaves and stem) from 0 and 8% Crude Oil (CO) were harvested in 4 weeks. The CO treated, harvested shoot samples were processed using different solvent extraction methods (chloroform, methylene chloride, methanol: chloroform) and analyzed by Gas Chromatography and Mass Spectrometry (GC-MS) analysis using polar and non-polar columns. Analysis of the mass spectrum/retention time of different components and comparison with the data base of known standard compound identities, high lights the nature of the components (crude oil or its metabolites processed by AT). CO obtained from Gulf of Mexico (GM), Texas (T) and Canada (C) was GC-MS analyzed. The constituents of these different CO did show different spectral characteristics. Various crude oil metabolites (styrene, benzene,1-hydroxycyclohexyl)phenyl-Methanone, 2,3-Dibenzoyl-meso-tartaric anhydride) and plant antioxidant derived metabolites such as butylated hydroxytoluene, sulforaphane were observed in the shoot extracts of SC treated with CO from GM. The presence of these materials indicated the phytoremediation capacity of the SC variant.

Poster Board No. 018 HEAT RETENTION PHENOMENON OF URBAN HEAT ISLAND EFECT: A COMPARATIVE STUDY BETWEEN URBAN AND RURAL SITES. Mai S. Lor (maiseel21@gmail.com. 929 Triplett Blvd., Akron, Ohio 44306.

Urban Heat Island Effect: How cities are warmer than rural areas because of the many buildings, parking lots, and other structures that replace natural vegetation. This results in more of the sun's energy being absorbed and retained in urban areas compared to rural areas; leading to urban areas cooling at a much slower rate than rural areas at night. This study aimed to investigate whether urban areas would retain heat longer than rural areas after sunset. The hypothesis was that urban areas would retain heat longer than rural areas after sunset because of urbanization. Temperature was collected using EL-USB-1 temperature data loggers which were programmed to take surface temperature in Celsius every 30 minutes for seventeen days on a short-grass site in one urban and one rural site during the months of November and December. During seventeen days, seven days urban areas retained its heat at least one hour later than rural areas, averaging differences of 0.5ºC to 2.0ºC between the two sites. After running a Paired t-test (using Graph Pad Software) on each day comparing urban and rural, finding thirteen out of seventeen days showing a statistically significant difference. Uncontrolled variables, such as snow cover or rain, could have influenced inconsistent results. This study is hoped to assist with finding different ways when planning cities to reduce Urban Heat Island Effect phenomenon such as setting aside green space, installing green roofs, and changing the colors of asphalt or painting structures lighter colors to increase albedo.

Poster Board No. 019 OIL SPILL CLEAN-UP: SORBENT EFFECTIVENESS NEAR AQUATIC SHORELINES. Abigail L. Myers (myersa13@embarqmail.com). 4251 N. County Line Rd., Sunbury OH 43074, Big Walnut High School.

Accidental oil spills near aquatic shorelines occur often, requiring effective clean-up methods. This experiment examined the ability of synthetic (polypropylene and polyurethane), and natural organic (cotton) sorbents to remove oil near aquatic shorelines through absorption and/or adsorption. Ten trials were conducted for each sorbent

in two stages, quiescent and non-quiescent waters near shorelines, to test sorbent oleophilicity. Myers' research and previous experimentation led to the hypothesis that cotton will prove most effective, followed by polypropylene, then polyurethane. An aquatic shoreline was simulated in a tilted wave tank containing gravel, 11 liters of 20°C water, and 20 ml of motor oil. Each sorbent was weighed to 1.5 g and placed in wave tank for 5 minutes. Sorbent was removed after 5 minutes and masses of used sorbent were determined. Individual sorbent oil mass ratios (mass of used sorbent containing recovered oil: mass dry sorbent) were calculated for the 60 trials. In quiescent conditions, cotton, with a mean oil mass ratio of 11.4 (σ=0.2), removed the most oil, followed by polypropylene (10.0, σ=0.2), and polyurethane (3.5, σ=0.3), supporting the hypothesis. In non-quiescent conditions, polypropylene, with a mean oil mass ratio of 15.1 (σ=0.4), removed the most oil, followed by cotton (14.9, σ=0.5), and polyurethane (10.4, σ=0.3), which did not support the hypothesis. Although this data does not support the hypothesis, the mean oil mass ratio of each sorbent increased in non-quiescent conditions due to the trapping of oil along the shoreline, especially in the case of polypropylene where the ratio noticeably increased.

Poster Board No. 020 THE EFFECT OF TEMPERATURE ON DIFFERENT LIQUIDS' VISCOSITY. Emily C. Pallaki (mcorrigan@metrohealth.org). 304 Regatta Drive Avon Lake, Ohio 44012.

Viscosity is the measure of internal friction in a liquid, or resistance to flow. Viscosity of a fluid is important because it creates lubrication between moving parts and determines flow rate. This study evaluates the effect of temperature on viscosity of various liquids relative to water. Water's viscosity index is one and was used as the control. Viscosity index is measured by the rate of flow of a liquid over the rate of flow of water. Viscosity was measured by taking 50 ml of the liquid (water, canola oil, 10W-40 motor oil and maple syrup) in a graduated cylinder. A 0.3 g metal ball was dropped into the cylinder, the time it took for the ball to reach the bottom of the cylinder was measured in milliseconds. Twenty trials conducted for each liquid at 3°C, 21°C and 38°C. Maintenance of temperature was accomplished by refrigeration and heating on the stove. Temperature range for cold was 3°- 5° C and hot was 36 - 38°C. The velocity index at 3°C, 21°C and 38°C degrees was Canola Oil: 1.612, 1.673, 1.842 Motor Oil 10W-40: 2.148, 2.217, 1.875 and Maple Syrup 4.158, 3.866, 2.167. The viscosity of all liquids decreased as temperature increased. Canola oil had less change in viscosity across temperatures than syrup, and was comparable to motor oil in its properties. Motor oil is used as a lubricant because its viscosity does not vary as greatly with temperature change. Canola Oil had little change in viscosity with temperature variation. This project is valuable because there are multiple implications of viscosity of fluids and their lubricating properties as well as flow rates. Canola Oil may be an environmentally friendly bio-diesel alternative.

Poster Board No. 021 CAN SUNSHINE DISINFECT CONTAMINATED WATER? Anidya Soni (anidyasoni@hotmail.com), Shivani D. Reddy (sreddy5954@hotmail.com). 7420 Lakota Springs Drive West Chester, OH 45069.

A study was conducted to see if UV light can successfully reduce the amount of bacteria in water. Exposing the bacteria to UV light should reduce the number of bacterial colonies present because UV light can penetrate cell membranes and kill bacteria. Treating water with UV light prior to use has the potential to reduce the levels of harmful bacteria and associated diseases caused by water-borne bacteria. To conduct this experiment, a gallon of home tap water and local creek water samples were collected into plastic milk jugs. One cup of each sample was boiled and put into two clear plastic water bottles each; the remaining water was left alone. To simulate sunlight, a 100-watt blue UV reptile bulb was procured. One water bottle holding creek water and one holding tap water was kept under the UV light for 12 hours while the other two bottles were kept under for 48 hours. Only the untreated water was kept under the UV light and the boiled water was kept as a control variable. All of the samples were placed on tryptic soy agar plates, three plates per sample, using sterilized plastic pipettes and evenly spread using glass stirring rods. All the dishes were observed daily for a total of 96 hours and the bacterial growth was recorded. Access to microscopes and other lab equipment was unattainable therefore the data acquired were the results of estimations. The first attempt showed high amounts of bacterial growth among the untreated creek water samples. But after being exposed to the UV rays for 48 hours there was a decrease of approximately 380 colony forming units (CFUs) of bacteria. The second attempt showed a slightly smaller number of 140 CFUs among the creek water samples, thus proving that sunshine can in fact disinfect contaminated water although it is not the most effective way. Throughout both attempts the boiled water samples had very little, if any, bacterial growth.

Poster Board No. 022 HOW DOES ASPHALT AFFECT SOIL TEMPERATURE. Suzanna Patia Vang (vangsuzanna123@gmail.com). 751 Hudson Avenue, Akron, Ohio 44306-1956.

The purpose of this project was to find out if a surface with high albedo (the amount of light energy that is reflected) such as asphalt, affected surrounding short-grass soil temperature. The hypothesis was the closer the soil is to asphalt the warmer short-grass soil temperature will be. The GLOBE Program protocol for collecting soil temperature was followed using a Taylor 2" Bithermal Dial soil thermometer, spike, and Garmin eTrex Venture GPS. Four data collection points were identified at the site, which was the teacher's parking lot, the edge of the asphalt, five meters and ten meters away from the asphalt into the short-grass. The data was also collected at a depth of 5 centimeters and 10 centimeters into the short-grass soil, at each site. The data supported the hypothesis twelve out of twelve days data was collected. From the asphalt the average soil temperature was 8.5°C at zero meters, 7.3°C at 5 meters and of 6.5°C at 10 meters. The data was collected for 12 non-consecutive days during the month of November. Several factors during the twelve days affecting the data were snow, ice, and rain. The data, however, showed there was minimal affect snow, ice, or rain had overall. Other relevant research can be done in the future such as extending planting seasons in close proximity to asphalt, further understanding the transfer of heat from asphalt to surrounding short-grass, or coloring asphalt a lighter color in an attempt to minimize this phenomenon.

Poster Board No. 023 CLONING AND SEQUENCING OF THE LACC2 LACCASE GENE FROM THE LIGNINOLYTIC BASIDIOMYCETE, P. OSTREATUS. Srinath V. Seshadri[1] (sscavsfan99@gmail.com), Thomas K. Mitchell[2]. [1]7104 Timberview Drive, Dublin, Ohio 43017; [2]The Ohio State University Department of Plant Pathology, Kottman Hall.

Cellulosic bioethanol, an alternative energy source produced by saccharification and fermentation of plant polysaccharides, is a renewable energy source that could replace fossil fuels. However, isolating these polysaccharides from lignin, a compound found in the plant cell wall, requires significant amounts of energy input. White-rot fungi, such as *Pleurotus ostreatus*, can naturally oxidize lignin through extracellular enzymatic activity. The cloning of genes expressing such enzymes may have huge implications bioethanol feasibility. The goal of this research was to clone and sequence the gene, *Lacc2*, which expresses a laccase enzyme in *P. ostreatus*. This gene expresses an isoform of laccase that is most active during the vegetative growth of *P. ostreatus*. The *Lacc2* open-reading-frame is 1,569 base pairs long and the

genomic sequence is interrupted by 21 introns. cDNA from *P. ostreatus* was PCR amplified with *Lacc2* gene-specific primers and the amplicon was ligated into the pGEMt-Easy plasmid. *Lacc2*-pGEMt was cloned into DH10B E. coli competent cells and plated on LB (Ampicillin) media. Colony PCR confirmed the presence of a positive clone, validating the experimental prediction that the *Lacc2* gene could be cloned. This research is still in progress; the gene of interest is currently being transformed into a yeast system so that expression yields and enzymatic activity can be determined.

Poster Board No. 024 THE ROLE OF KRUPPLE LIKE FACTOR 2 (KLF2) ON MACROPHAGES. David S. Buchinsky (dbuchinsky17@us.edu), Neelkantan T. Vasudevan, Mukesh K. Jain. 2103 Cornell Rd. Cleveland, OH, 44106.

Macrophage cells are sentinels of both human and animal immune systems. Macrophages are responsible for both detecting and killing pathogens. They are also responsible for clearing the debris in various tissues, organs and maintenance of homeostasis in our body. Macrophages achieve this by fine tuning the inflammatory responses. Though inflammation is required for homeostasis, uncontrolled inflammation leads to tissue damage, destruction and development of various disease conditions. Inside the macrophage cell, a multiprotein factory known as an inflammasome is involved in the synthesis of IL-1 family cytokines, which are critical regulators of immune responses. Previous studies have unraveled a transcriptional regulator, KLF2 as an important regulator of macrophage mediated inflammation. Because we know that KLF2 already regulates inflammation, we would expect that KLF2 also regulates the activity of inflammasomes. Therefore, we hypothesize that KLF2 regulates inflammasome function and the release of inflammatory cytokines from the macrophages. Using macrophage cells abstracted from a mouse, as well as bone marrow derived macrophages from a mouse, we show that absence of KLF2 leads to increased expression of the inflammasome components and its activation. Macrophage cells from KLF2 knockout mice were cultured and evaluated by PCR for the presence of NLRP3 expression, and Caspase-1 activation in KLF2 macrophage cells and regular macrophage cells was measured using Western blot. Specifically, Lipopolysaccharide (LPS) stimulation resulted in increased expression of NLRP3, an inflammatory component necessary for the assembly of inflammasomes, at the transcript and protein level. In addition, there was a higher quantity of caspase-1 activation in macrophages without KLF2 presence. We did not find any leukocyte activation. This research suggests a novel mechanism by which inflammasome function is regulated in a KLF2 dependent manner, which may have profound implications in inflammatory diseases.

Poster Board No. 025 TUMOR GENE EXPRESSION AND TOXICITY FROM BREAST CANCER TREATMENTS. Oriana Cruz Echeverria[1] (ocruz17@hb.edu), Shikha Parsai[2], Lyndsay N. Harris[2] , Cheryl L. Thompson[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122. [2]School of Medicine, Case Western Reserve University, Cleveland, OH.

Breast cancer affects approximately 1 in 8 American women. Many breast cancer patients receive taxane-based chemotherapy and/or aromatase inhibitors (AIs) as treatment. A possible toxicity of AIs is joint and muscle pain taxanes can result in peripheral neuropathy, or numbness and pain in extremities. To investigate if there were differences in tumors associated with toxicity, measurements were taken of RNA expression of all genes in tumors of 61 breast cancer patients. The laboratory looked for which genes had different expression in those with and without toxicity using a t-test, and looked at which pathways of genes were different using gene ontology enrichment analysis. 6 patients self-reported experiencing significant AI toxicity and 39 patients who took AIs self-reported very limited toxicity, it was found that several pathways were differentially expressed in their tumors, including enzyme activity ($p<0.0001$). Among 7 patients who self-reported treatment-altering neuropathy from taxanes and 21 who reported very mild neuropathy, different RNA expression of pathways involved in pain sensation were found ($p<0.0001$). No individual genes known to be involved in pain sensation were statistically significant associated with toxicity. We hypothesize that genetic variation causes differences in both expression of tumors and responses to treatment in the rest of the body, resulting in these side effects. Additional experiments are being carried out to validate these findings, which could help develop a test to predict toxicity using tumor samples that are already being removed and help patients and physicians customize treatments to provide the most effective treatment with least toxicity.

Poster Board No. 026 THE EFFECT OF INGREDIENTS IN ENERGY DRINKS ON HEART RATE. Lily A. Ganim (lilyganim@gmail.com). 5217 Adena Trail, Cincinnati, OH, 45230, Guardian Angels Elementary

In recent years, there have been numerous reported cases of adverse health effects associated with energy drink consumption, with several resulting in death. Several people have died in the past few years after consuming energy drinks. It is thought that the ingredients in energy drinks had some effect on the heart and may have contributed to these deaths. Previous research has shown that the heart rate of *Daphnia magna* increases when exposed to energy drinks. The purpose of this experiment was to determine which ingredients in Monster® energy drink cause this increase in heart rate. Daphnia were exposed to caffeine, taurine, ginseng, and sugar in concentrations equal to a 1:100 dilution of Monster® energy drink. The Daphnia were tested to see which ingredient in energy drinks increased their heart rate most. My hypothesis was that caffeine would increase the Daphnia's heart rate more than the other ingredients. Ginseng caused an increase of 55 bpm (beats per minute), caffeine increased the average heart rate by 39 bpm, taurine increased it by 14 bpm, and sugar decreased the heart rate by 6 bpm. Results show that ginseng increased the heart rate most, followed by caffeine, then by taurine, with sugar causing a slight decrease in heart rate.

Poster Board No. 027 ASSESSMENT OF ANTIBODY RESPONSES TO MALARIA ANTIGENS AS BIOMARKERS OF MALARIA TRANSMISSION LEVELS IN THE SOLOMON ISLANDS. Rohan Garg[1] (rgarg17@us.edu), Christopher King[2]. [1]University School, 2770 Chesterton Rd. Shaker Heights, Ohio, 44122, [2]Department of Global Diseases at the Case Western Reserve University School of Medicine.

Malaria infections are primarily transmitted by *Plasmodium falciparum* (*Pf*) and *Plasmodium vivax* (*Pv*). The King laboratory is part of an international project to evaluate antibody responses to malaria antigens as potential biomarkers of malaria transmission levels in Ngella Province, Solomon Islands. In this study, plasma samples were collected from 2000 individuals aged 2 to 80 from five geographical regions of Ngella Province to be screened for antibody responses to a selection of 13 *Pf* and 8 *Pv* antigens. Bead-array-immunofluorescence assays were performed to quantify antibody response levels in each plasma sample to each antigen. Once antibody response data were collected, statistical analyses were performed to determine correlations between each region's infection rate (percentage of individuals diagnosed as positive for malaria at time of plasma collection) and seroprevalence rate (percentage of individuals whose antibody response levels exceed the mean antibody response level of 60 North American controls) for all 21 antigens. Significant

correlations were found for four antigens: *Pf* CelTOS (p=0.036, r=0.90), *Pf* MSP2 (p=0.026, r=0.92), *Pv* DBP-AH (p=0.045, r=0.89), *Pv* DBP-P (p=0.019, r=0.94). No significant age-related correlations were detected. The results are significant because they show antibody responses to these four antigens as promising biomarkers of malaria transmission levels and confirm the hypothesized strong correlation between seroprevalence and infection rate for variants of *Pv* DBP. Antibody responses to these four antigens as potential biomarkers of malaria transmission should be further investigated in additional geographical settings in order to improve the efficiency and effectiveness of malaria eradication programs.

Poster Board No. 028 BISPHOSPHONATE EFFECT ON GINGIVAL CREVICULAR FLUID CONCENTRATIONS. Jenna W. Hahn[1] (jhahn17@hb.edu), Hebba A. Shamia[2], Leena Palomo[2]. [1]Hathaway Brown School, 19600 N. Park Blvd, Shaker Heights, Ohio 44122. [2]Department of Periodontics, Case Western Reserve University, Cleveland OH.

The gum disease periodontitis is traditionally treated through mechanical bacteria debridement in an attempt to halt host inflammatory response which hydrolyses the boney socket supporting the tooth. Instead, modulating host response is suggested as the future of therapy. Little is known about bisphosphonate effects on the bone supporting teeth, but they are shown to reduce bone loss in osteoporosis. Case reports link bisphosphonates to a necrotic side effect around teeth, but it is reported mostly in patients using very high doses for hypercalcemia of malignancy rather than the lower doses used for osteoporosis. The objective of this investigation is to compare cytokines and bone turnover marker within the gingival crevicular fluid (GCF-a superfiltrate of serum found in the crevice between teeth and gums) of women receiving bisphosphonate therapy for osteoporosis and those who did not. 60 postmenopausal women participated in this IRB approved investigation. 30 had been using bisphosphonate for osteoporosis and 30 did not. GCF samples were taken by inserting a paper point into the gingiva and stored in -80°C. RANKL, IL1B, and TNFalpha concentrations were measured by enzyme-linked immunosorbent assay (ELISA). There is a significant difference in IL1B between participants who used bisphosphonate and those who did not (167.15ug/ml±46.7vs. 191.15ug/ml±49.55, $p \leq 0.05$). No other significant differences were detected between RANKL and TNFalpha. Bisphosphonates have an effect on inflammatory cytokines in GCF. This supports the assertion that bisphosphonates modulate host response in the periodontium and may be developed for periodontitis treatment.

Poster Board No. 029 EFFECT OF EXTRACEULLAR CALCIUM ION ON THE ACTIVATION OF OSTEOCLAST FUNCTION. Julia C. Immerman[1] (jimmerman17@hb.edu), Morgan Whaley[1], Hyung Jin Jung[2], Ozan Akkus[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122. [2]Department of Aerospace and Mechanical Engineering, Case Western Reserve University, Cleveland, OH.

Osteoblasts, osteocytes, and osteoclasts are the cells that play an important role in bone growth and development. Osteoblasts are responsible for the mineralization of bone, while osteocytes are osteoblasts that have been incorporated into the bone matrix. Osteoclasts are the bone resorbing and remodeling cells that play an important role in the repairing bone damage. The present study was performed to determine if osteoclasts play a larger role in targeted remodeling on damaged bone than undamaged bone. The presence of calcium is greater in damaged bone than in undamaged bone, which is an important factor in differentiating the two conditions. Osteoclasts were seeded on devitalized bovine bone and exposed to different mediums and concentrations of calcium (6 mM and 18 mM). The purpose of using different mediums was to see which one induced a greater response. After the cells were seeded, images of the samples were taken and a TRAP assay was performed to quantify the activity of the cells. Based on the data, the cells seem to be active on the bone samples with the Osteoclastogenic media and slightly active on the Growth media + 6 mM of calcium samples, but even more active on the samples with the Osteoclastogenic media + 6 mM calcium. However, the cells were not active with just the growth media and Osteoclastogenic media + 18 mM calcium. Preliminary observations indicated that the cells were more active when exposed to the media with 6mM of calcium. Future work will seek to increase the number of experiments repeated.

Poster Board No. 030 DETECTION OF ASYMPTOMATIC MALARIA WITH GAMETOCYTOGENESIS. Ananya Kalahasti[1] (akalahasti17@hb.edu), D'Arbra Blankenship[2], Brian T. Grimberg[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122. [2]Center for Global Health and Diseases, Case Western Reserve University School of Medicine, Cleveland, OH.

The *Plasmodium falciparum* (*Pf*) parasite is transmitted between people by the female Anopheles mosquito, which feeds on an infected person's blood, taking up the sexual gametocyte stage of the malaria parasites. However, often gametocytes are present in those who are asymptomatic, acting as undetected reservoirs that allow for transmission of malaria gametocytes. The detection of asymptomatic infections is to treat all malaria reservoirs to eradicate the parasite, which is a problem in Africa and Asia. In order to determine a viable method of detecting gametocyte presence in blood, slides of a Liberian patient's blood were examined for presence of parasitemia, specifically gametocytes. The patient did exhibit symptoms, and was used as a test to determine whether or not detection techniques of gametocytes in blood samples were accurate. Samples of the patient's whole blood were incubated and cultured, and slides were made in 2-day increments. The patient did not show signs of gametocytes, only of beginning stage asexual parasitemia, at around 2.2% within the culture, without any presence of gametocytes. However, bacteria also had poisoned the culture, inhibiting the growth of parasites, gametocytes specifically. Future culture testing will use polymerase chain reaction (PCR), to detect gametocyte DNA and RNA in patient blood samples, and to achieve the goal of searching for the presence of gametocytes in symptomatic malaria patients to determine a viable method of detecting gametocytes in blood samples of asymptomatic patients.

Poster Board No. 031 EVALUATING THE PRESENCE OF TOLL-LIKE RECEPTORS AT THE INTRACORTICAL MICROELECTRODE INTERFACE. Grace I. Protasiewicz[1] (gprotasiewicz17@hb.edu), John K. Hermann[2], Jeffrey R. Capadona[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122. [2]Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH.

Intracortical microelectrodes used to record neuronal signals have demonstrated potential to help restore function in people who have been paralyzed, but tend to fail, having decreased signal to noise ratios, over the long term. One major hypothesis for this failure is neuroinflammation, involving the activation of microglia. Microglia can become activated through Toll-like receptors (TLRs), which recognize damage and help perpetuate neuroinflammation, and their co-receptor CD14. Previous work has demonstrated lower levels of microglia exhibiting an activated phenotype around implanted microelectrodes in knockout mice lacking TLR2 ($Tlr2^{-/-}$), TLR4 ($Tlr4^{-/-}$), or CD14 ($Cd14^{-/-}$). Higher neuronal survival was only observed in $Cd14^{-/-}$ mice. Therefore, it is hypothesized that in the absence of one TLR, the other is upregulated.

Cortical tissue slices from TLR4 knockout and wildtype mice (N=3 for each group) implanted with nonfunctional electrode shanks were stained for TLR2. Fluorescent intensity was quantified as a function of distance from the electrode. Both wildtype and TLR4 knockout mice exhibited heightened expression of TLR2 at the electrode interface. TLR4 knockout mice did not demonstrate a significant difference in TLR2 expression from wildtype mice. Expression of TLR2 at the tissue-electrode interface illustrates the importance of the TLR2 pathway as a possible therapeutic target for improving microelectrode performance. The lack of significant difference in TLR2 expression between wildtype and TLR4 knockout mice suggests that the absence of the TLR4 pathway does not induce an upregulation of TLR2. Future studies will investigate the presence of TLR4 and CD14 at the electrode interface.

Poster Board No. 032 ARMS-I A NOVEL ANTIVIRAL DRUG WITH DUAL ACTION MECHANISM AGAINST VIRAL UPPER RESPERATORY TRACT INFECTIONS. Cristina M Rackley[1] (crackley18@hb.edu), Mahmoud Ghanoum[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122, [2]Center for Medical Mycology, Case Western Reserve University, Cleveland OH.

Viral Upper Respiratory Tract Infections (vURTIs) are responsible for complications of substantial morbidity and mortality around the world costing over $100 billion each year. Available treatment and prevention strategies using vaccines have multiple shortcomings, which create a growing need for developing new drugs that target a wider spectrum of viruses. Testing for ARMS-I, a first-in-class oral topical drug spray disrupts the infection through a dual mechanism of direct virucidal activity and barrier formation preventing viral contact, binding, and invasion into host mucosal tissues. The antiviral activity and barrier components (via glycerin, and xanthan gum) of ARMS-I were tested separately using RSV (in A549 cells) and Influenza A/B (in MDCK cells). For each concentration of virus tested, a different concentration of ARMS-I was evaluated. Transmission Electron Microscopy (TEM) was used to determine the effect that ARMS-I had on viral ultrastructures. Virus treated with as little as 1.5% ARMS-I had a 2 log reduction in the viral titer compared to control treatments. The barrier treatments that contained >25% of ARMS-I barrier components showed a >2 log reduction in the viral titer by the TCID50 compared to control treatments. There was no damage to the cells (cytopathic activity) and no presence of the virus by immunofluorescence staining and cell viability. Results from the TEM examination revealed ARMS-I disrupted the viral envelope and its morphology. The data collected shows that ARMS-I is a novel class of drug that is virucidal and has barrier activity against viruses responsible for URTIs.

Poster Board No. 033 FUNCTION OF THE TYPE III SECRETION ATPASE PSEUDOMONAS SECRETION PROTEIN N (PSCN). Alanna Brown[1] (abrown17@hb.edu), Stephanie Zmina[2], Arne Rietsch[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122. [2]Department of Microbiology, Case Western Reserve University School of Medicine, Cleveland, OH.

Pseudomonas aeruginosa is a Gram-negative bacterium that utilizes a type III secretion system (T3SS) to secrete proteins into host cells, allowing the bacterium to cause disease. Because of the complicated nature of this system, understanding how it works is essential to learning how to inactivate the system. The ATPase is necessary for function, but its role is unknown. Using a genetic approach, multiple mutations that allow secretion without the ATPase were identified, including various mutations in *pscU*, *pscB*, and *pcrD*. PscU and PcrD are integral components of the apparatus, whereas PscB is required for preventing secretion of proteins before cell contact. Interestingly, the data showing activity levels of these suppressors suggests a previously unappreciated connection between the role of the chaperone made of Pcr2 and PscB and the ATPase in the T3SS because deletion of the corresponding genes could partially restore secretion in the absence of the ATPase. To determine if increasing the force with which proteins are pulled through the apparatus can overcome the need for ATPase, a mutation that up-regulates the rate of secretion was introduced into the background of the existing mutants. However, this mutation did not significantly increase export activity of the apparatus. The mutants able to suppress the lack of pscN can be used in tests to determine the role of ATPase in the T3SS.

Poster Board No. 034 THE STUDY OF THE GENE(S) INVOLVED IN THE PROTECTION OF THE PSEUDOMONAS AERUGINOSA MUCOID STRAIN, MUCA22, FROM ACIDIFIED NITRITE TOXICITY IN AN ANAEROBIC CONDITION. Wesley R. Wolf (wesleyrwolf@gmail.com). 5095 Shattuc Ave., Cincinnati, OH, 45208.

Pulmonary infections involving *Pseudomonas aeruginosa* (PA) are a complication faced by cystic fibrosis (CF) patients. The bacteria mutate to a mucoid state and form a biofilm that creates an anaerobic environment, decreasing the effectiveness of antibiotics. Acidified nitrite (NO2-) has been shown to be an effective antibacterial agent against the PA mucoid mutant, *mucA22*. This experiment used six double mutants, in an anaerobic environment mimicking the conditions in the lungs of CF patients, to investigate the gene(s) involved in protecting the bacteria from NO^{2-} toxicity. It was hypothesized that at least one double mutant would show increased susceptibility to NO^{2-}. An overnight culture of bacteria was diluted 100 fold into lysogeny broth (LB) (pH 6.5, 50 mM phosphate buffer) containing either 15 mM KNO_3 (control) or 15 mM KNO_3 plus 15 mM of $NaNO_2$ (experiment). Cells were incubated in an anaerobic chamber at 37°C. Tenfold serial dilution was performed at 0, 24 and 48 hours. The diluted samples were spotted on LB agar plates and incubated an additional 24 hours before counting and reporting the colony forming units (CFUs). The experiment was repeated four times. Results showed that the double mutants *mucA22gal*, *mucA22gip*, *mucA22oprH* and *mucA22prlC* were one to two orders of magnitude more susceptible to NO^{2-} compared to *mucA22* while *mucA22fdnG* and *mucA22uspK* were not. It was expected that gene(s) would be identified that played a role in protecting *mucA22* from NO^{2-}, and instead 4 gene alterations were found that increased susceptibility to NO^{2-} toxicity.

Poster Board No. 035 THE INHIBITION OF ROCK SIGNALING AND TRACTION FORCE MICROSOPY IN HUMAN MENSENCHYMAL STEM CELLS. Katerina Aris[1], Kuo-Chen Wang[2], Jean Welter[2], Larissa Rizzi de Freitas[3] (lrr30@case.edu), Dustin Thomas[4] (dgt23@case.edu), Thomas Egelhoff[4] (tte@case.edu), Harihara Baskaran[5]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44124, [2]Department of Biology, Case Western Reserve University, [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, [5]Deparment of Chemical and Bimolecular Engineering, Case Western Reserve University.

The development of engineered articular cartilage could benefit people suffering from osteoarthritis, traumatic injuries or chondrothies by helping increase mobility and decrease pain in those who suffer. Human mesenchymal stem cells (hMSCs) taken from adult bone marrow can undergo chondrogenesis when exposed to transforming growth factor-ß (TGFß) in vitro. This experiment aimed to construct cartilage that can compare to native tissue in strength and function. Past research shows inhibiting canonical Wnt signaling can enhance chondrogenesis but

the role of Rho-associated protein kinase (RhoA/ROCK) signaling, related to non-canonical Wnt signaling, in chondrogenesis is not well known. The authors hypothesized that suppressing RhoA/ROCK signaling following induction with TGFß would enhance chondrogenesis in hMSCs. This hypothesis was tested by treating hMSCs with 10 uM concentrated Y27632 to inhibit ROCK under TGFß1 induction while the seeded hMSCs are cultured at 37°C in a humidified atmosphere of 95% air and 5% CO_2. Construct size was analyzed by taking images of the fresh harvested pellets. The size of the pellets was determined using Image Pro® Plus software and the size of the pellets was calculated from area into volume. Glycosaminoglycan (GAG) and collagen content was measured and histology and immunohistochemistry (IHC) were performed. Increased chondrogenesis was indicated by increases in GAG (33%) and collagen content (18%). ROCK signaling is also involved in myosin-II light chain phosphorylation so it was hypothesized that chondrogenesis needs proper actin cytoskeleton contraction. This was tested through traction-force microscopy experiments. Experimentation measured the force produced by hCMSCs under different conditions including growth maintenance (control), chondrogenic induction and ROCK signaling inhibition. Results show that traction force increased by 1.7 times during chondrogenic induction compared to the control and ROCK inhibition increased by 1.2 times compared to the control. These findings show that chondrogenesis can be improved when the cytoskeleton tension that regulates cell rounding and contraction is reduced.

Poster Board No. 036 CHEMOTAXIS OF MULTIPOTENT ADULT PROGENITOR CELLS TO SECRETED FACTORS FROM ENDOTHELIAL CELL. William O. Lehmann (wlehmann16@us.edu). University School, 18020 South Woodland Rd Shaker Heights OH 44120.

Multipotent adult progenitor cells (MAPC®), a class of adult stem cells derived from the bone marrow, have been shown to reduce the damage caused at sites of inflammation through modulation of the immune system, but the mechanism of homing and migration to these sites is still unclear. Here, the chemotactic activity of MAPC toward factors secreted by endothelial cells derived from lung and umbilical cord is examined. It was predicted that MAPC would migrate toward both the factors secreted from lung and umbilical cord endothelial cells. In order to test this hypothesis, serum-free conditioned media was collected from endothelial cells (human pulmonary microvascular endothelial cells and human umbilical vein endothelial cells) stimulated with and without pro-inflammatory cytokines (TNF-α, IFN-Y, and IL-1B). The conditioned media was placed in the bottom wells of transwell plates and MAPC placed in the transwells above. The migration of MAPC toward the endothelial-conditioned media was quantified using a high-powered microscope to count MAPC stuck on the transwell membrane after four hours. MAPC were shown to migrate towards conditioned media from pulmonary endothelial cells while conditioned media from umbilical vein endothelial cells did not produce migration. We then determined the differences between the secreted factors of the two cell lines through the use of an antibody array to identify potential chemotactic factors for MAPC. Two extracellular matrix proteins, fibronectin and collagen, were identified that induced the chemotaxis of MAPC cells. These experiments have given insight into the migration of MAPC that will facilitate the tracking of MAPC cells following injury and the biodistribution of MAPC.

Poster Board No. 037 BLOOD PLASMA CATECHOLAMINE AND SEROTONIN LEVELS FOLLOWING EPILEPTIC SEIZURES AS COMPARED TO BASELINE LEVELS. Scott Bowman[1] (sbowman17@us.edu), Samden Lhatoo[2]. [1]University School, 2785 Som Center Rd. Hunting Valley, Ohio, 44122, [2]Department of Neurology at the Case Western Reserve University School of Medicine.

Patients with severe epilepsy are more likely to die during seizures from sudden unexpected death in epilepsy (SUDEP). Predisposing factors, including cardiac and respiratory dysfunction, may contribute to SUDEP. Research suggests that plasma epinephrine and norepinephrine levels increase dramatically within 10 minutes of tonic-clonic seizures. This response may be greater for generalized tonic-clonic seizures (GTCS), which are seizures that involve the entire brain, inducing muscle tension (tonic) and rapid muscle contraction and relaxation (clonic). Increases in epinephrine and norepinephrine during GTCS may cause cardiac arrhythmias and exert a direct vasoconstrictor effect, respectively. This study describes catecholamine (epinephrine, norepinephrine, dopamine) and serotonin responses to epileptic seizures, and characterizes differences in responses according to seizure type. It was hypothesized that GTCS produce a greater increase in epinephrine and norepinephrine than non-GTCS. Plasma samples were collected as the patient was coming out of seizure and 12 hours after (baseline) for 25 patients. Patients were put into 2 groups according to seizure type (GTCS or non-GTCS), and samples were analyzed for catecholamine and serotonin levels (catecholamine blood test). Paired t-tests compared post-GTCS and post-non GTCS levels to baseline. Epinephrine increased significantly from GTCS ($p=0.011$) and non-GTCS ($p=0.010$). However, as expected, epinephrine increased more drastically from GTCS (x-bar =1025%) than non-GTCS (x-bar =164%). Norepinephrine increased significantly from GTCS ($p=0.002$), but not from non-GTCS ($p=0.741$). Similar results were seen for serotonin (GTCS, $p=0.003$; non-GTCS, $p=0.855$), but not for dopamine (GTCS, $p=0.066$; non-GTCS, $p=0.376$). These results indicate a difference in catecholamine and serotonin responses for generalized versus non-generalized seizures, which could help identify predisposing factors contributing to SUDEP, impacting its treatment.

Poster Board No. 038 THE ROLE OF TREM2 IN NEUROINFLAMMATION IN AN ALZHEIMER'S DISEASE MODEL. Margaret L. Broihier[1] (mbroihier17@hb.edu), Taylor R. Jay[2,3], Bruce T. Lamb[2], Gary E. Landreth[3]. [1]Hathaway Brown School, 19600 North Park Blvd., Shaker Heights OH 44122, [2]Cleveland Clinic, 9500 Euclid Avenue, Cleveland OH 44195, [3]Case Western Reserve University, 11000 Euclid Avenue, Cleveland OH 44106.

Alzheimer's disease (AD) is a neurodegenerative disorder characterized pathologically by amyloid beta plaques. Additionally, AD brains exhibit increased neuroinflammation. These pathologies are prevalent in the hippocampus and cortex. Variants in the Trem2 (Triggering Receptor Expressed on Myeloid Cells 2) gene confer increased risk for developing AD. AD mice lacking Trem2 (KOs) have a reduced inflammatory response demonstrated by qRT-PCR, which was used to measure levels of pro-inflammatory gene transcripts. The mRNA levels for IL1ß ($p< 0.01$), IL6 ($p< 0.01$), and TLR4 ($p< 0.1$) were significantly decreased (2-tailed t-test) in Trem2 KOs (n=6) as compared to WTs (n=8). It was previously shown that there were also a reduced number of immune cells surrounding plaques in Trem2 KOs. It was then hypothesized that Trem2 KOs had decreased immune cell numbers, due to decreased cell proliferation. Cell proliferation was measured using bromodeoxyuridine (BrdU), a nucleoside that incorporates into DNA of newly synthesized cells. Trem2 KO (n=9) and WT (n=3) mice underwent BrdU injections every day over a 3-day period and were sacrificed 24 hours after the last injection. Using immunohistochemistry, brain tissue of these mice was co-stained for BrdU and the immune-cell marker Iba1, and the colocalization was quantified by counting the number of double-positive cells. The colocalization was significantly reduced (2-tailed t-test) in both the hippocampus ($p<0.01$) and cortex ($p<0.001$) of the Trem2 KO mice compared to

the WT. Thus as hypothesized, decreased proliferation contributes to the reduction in cell number, which may explain the decreased inflammatory response in Trem2 KO mice

Poster Board No. 039 SURFACE VS BULK CHIRAL ORIENTATION EFFECTS IN LIQUID CRYSTALS. Catherine L Areklett[1] (careklett17@hb.edu), Bryce S Murray[2], Charles Rosenblatt[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122, [2]Department of Physics, Case Western Reserve University, Cleveland, OH.

Molecular chirality refers to the asymmetrical qualities in which a molecule is non-superimposable on its mirror. In liquid crystals, chirality causes the director of the liquid crystal to rotate around an axis perpendicular to the molecular length, forming a helical pattern. The director is an imaginary common axis around which molecules arrange themselves. In order to determine whether the director aligns parallel to the surface's "easy axis" as it does for nonchiral liquid crystals, or if the chirality causes it to rotate by some angle at the surface, chiral dopants are added to a nonchiral liquid crystal. To create the chiral dopant mixture, 1% of the combined left-handed chiral dopant, ZLI811, and right-handed chiral dopant, CB15, are added to the nematic liquid crystal, 5CB. The combination of these three molecules displays some of the same properties as a naturally occurring chiral liquid crystal, except for a bulk twist when the concentrations of the chiral dopants are adjusted properly. To determine whether there is a twist at the surface, the surface orientation of the directors of the two different liquid crystals are compared by rotating a sample 15 degrees left and right of a set origin one degree at a time. The transmitted intensities are documented using a polarizing microscope. After analysis, the directors' orientations differed within 2 degrees, suggesting that there is some rotation of the chiral dopant mixture's director along the surface. The project's early successes advance the understanding of the nature of liquid crystals.

Poster Board No. 040 SIMULATED DOMAIN WALL MOTION IN CONCAVE FERROMAGNETIC NANOWIRES. Zoë Solt[1] (zsolt17@hb.edu), Jesse Berezovsky[2]. [1]Hathaway Brown School, 19600 North Park Blvd, Shaker Heights, OH 44122, [2]Department of Physics, Case Western Reserve University, Cleveland, OH.

Spin-based electronics require strong, local, rapidly-tunable magnetic fields to affect individual electron spins. Domain walls (DWs), which form at the boundaries of ferromagnetic domains magnetized in different directions, produce such fields as the magnetization rotates over distances of about tens of nanometers. DWs settle in points of low energy, typically where the wall is shortest, and move relative to that point with the application of an external magnetic field. Thus, different geometries facilitate varying DW motion. To develop a predictable way of controlling DW motion with an applied external magnetic field for spin-based electronic applications, micromagnetic simulations done in OOMMF (Object Oriented MicroMagnetic Framework) of approximately 2 μm long, thin permalloy ferromagnets of different geometries were conducted, where DWs within the magnets were translated with an externally applied magnetic field ranging from 1 to 10 mT. A concave structure that provides a natural point of lowest energy at the vertex of the curve was found to be the best geometry for expected DW motion. As the field was applied, the DW moved linearly across the magnet relative to the vertex until it reached a point where it was no longer stable. A pinning effect was also observed in the simulation, where DWs would settle in imperfections. These simulation results yielded constants needed in an analytical model to predict the motion of DWs in concave nanowires with varying thickness, curvatures, and minimum wire width. These results provide a numerical model to be used on applied experiments with fabricated concave nanowires.

Poster Board No. 041 ANALYSIS OF YBCO SUPERCONDUCTOR MOTION ON NEODYMIUM MAGNET. Kohtaro Yamakawa (kohyamakawa@gmail.com). 8449 Riverside Dr. Powell, Ohio 43065.

The motion of a Type II YBCO superconductor on a bar Neodymium magnet was observed and analyzed to further understand the nature of magnetism and kinetics of the superconductor under the influence of varying magnetic fields and the mixed-state effect. This was done by cooling the superconductor to 77 Kelvin using liquid Nitrogen and observing the motion of the superconductor both qualitatively and quantitatively using cameras and stop watches on the bar magnet. The superconductor was observed to oscillate back and forth from the sides of the magnet without an initial applied force and settle at a point of equilibrium approximately two fifths from the edge of one side of the magnet. Thus an initial hypothesis that the motion was Simple Harmonic was made. Quantitative data showed that the period was related to the magnetic field as $T = 2\pi\sqrt{(1/B)}$ and therefore similar to other Simple Harmonic system's equations of $T = 2\pi\sqrt{(m/k)}$ and $T = 2\pi\sqrt{(l/g)}$. Hence, a hypothesis was made where the motion was caused by the combination of the varying magnetic field of the bar magnet and the system's tendency to reach stability through magnetic field line alignment and magnetic potential. Because of the quantitative data similarity with Simple Harmonic Motion, the superconductor's motion may be Simple Harmonic but without the experimental data showing that it oscillates according to $x=Acos(wt)$ no absolute confirmation can be made. Thus, the superconductor may be exhibiting Simple Harmonic Motion but it is not certain.

College student and Professional Poster Session 1:15 – 3:15 PM Baker Center

Poster Board No. 001 THE RELATIONSHIP BETWEEN TURBIDITY AND CAROTENOID-BASED COLORATION OF CENTRARCHID FISHES IN URBAN STREAMS. T.L. Atkinson (atkinson.153@buckeyemail.osu.edu), Suzanne M. Gray, (gray.1030@osu.edu). The Ohio State University, Columbus, Ohio 43201.

Agricultural and urbanization practices cause increased runoff of nutrients and sediments into aquatic systems, leading to increased turbidity and biodiversity loss. In many fishes of the family Centrarchidae, carotenoid-based colors (red and yellow) are used in sexual signaling. High levels of turbidity, resulting in absorption and scattering of underwater light, can severely alter the effectiveness of these signals. It is energetically costly for fish to acquire carotenoids from their diet, and if signals are interrupted by increased turbidity, the cost of obtaining and displaying carotenoid-based colors may not be profitable. The objective of this study is to investigate if there is a relationship between carotenoid-based colors and turbidity, with the hypothesis that turbidity will influence the saturation (intensity of color) of red and yellow coloration in centrarchid fishes. Centrarchids were sampled at four sites on the Olentangy (n=2) and Scioto (n=2) Rivers during spring, summer, and autumn 2015. Point-in-time turbidity samples (n=3/site/ sampling effort) were also taken. A standard color analysis technique was used to assess the saturation of red and yellow body color for each individual (n=219). This data will be used to test if carotenoid-based coloration is negatively associated with increased turbidity, which could disrupt centrarchid mating systems thus negatively impacting aquatic communities.

Poster Board No. 002 RELATIONS BETWEEN STREAM CHEMISTRY, FISH DIVERSITY, AND LAND USE IN THE UPPER LITTLE MIAMI WATERSHED. Connor J. Gilmour (connorjgilmour@cedarville.edu), Randy S. Howell, David F. Paulding, Charles W. Reynolds, Mark Gathany. 251 N Main St, Department of Science & Mathematics, Cedarville University, Cedarville, OH 45314.

Streams are susceptible to numerous threats to their water quality and biodiversity. In southwest Ohio a major driver of these impacts is associated with current agricultural practices and associated legacy effects. These changes include straightening, embanking, dredging, removal of large rocks and woody debris, increased erosion, and non-point source pollution. These structural and chemical impacts are known to affect biodiversity in these streams. The objective of this study was to determine the relations between stream chemistry with fish species diversity within the Little Miami River Watershed in southwest Ohio. Three streams (Little Miami River, Massies Creek - North Fork, and Massies Creek - South Fork) were sampled in the upper headwaters as well as downstream. Air and water temperature, pH, dissolved oxygen, alkalinity, hardness and turbidity were measured in early September and late November. With the exception of temperature, the measurement of these parameters was generally consistent between sampling periods (CV < 22). A total of 517 fish were collected using an electroshock backpack along 75 m stretches at the sites (N = 6). In total 24 species were identified while individual sites yielded 7 - 12 species each. Dominance (Simpson's D) at sites ranged between 0.14 and 0.23 whereas the Shannon Index (H') was low with values between 0.23 and 0.60. This work will serve as the baseline for future study of land use impacts on fish diversity and phylogeography, and water quality.

Poster Board No. 003 THE ENERGETICS OF NORTHERN BOBWHITE QUAIL (*COLINUS VIRGINIANUS*) EMBRYOS AT DIFFERENT INCUBATION TEMPERATURES. William J. Mainwaring (mainwawj@mountunion.edu), Samantha K. Straits (straitsk@mountunion.edu), Natalie E. Nickles (nicklene@mountunion.edu), Brittany M. Yanik (yanikbm@mountunion.edu), Spiro M. Mavroidis (mavrois@mountunion.edu). University of Mount Union 1972 Clark Avenue Box 1014, Alliance, Ohio 44601.

In oviparous species, incubation temperature plays a major role in the hatching success and energy use of developing embryos. Although birds are endothermic after hatching, embryos don't generate their own body heat and thus metabolism is closely tied to incubation temperature. With bobwhite populations declining, determining possible causes is important. One influence may be unusually high or low temperatures during their breeding season. This study examined the effects of temperature on developing northern bobwhite quail embryos (*Colinus virginianus*). Eggs (N = 72-74 per treatment) were incubated at four temperatures (35.5°C, 36.5°C, 37.5°C, 38.5°C). Incubator temperatures were controlled to ±0.1°C using a proportional controller. After day seven of incubation, metabolic rates (oxygen consumption) were recorded biweekly from five randomly selected eggs at each treatment temperature. Hatching rates were highest at 38.5°C and 37.5°C treatments (77.8% and 76.4%, respectively) and decreased at lower temperatures (29.7% and 19.4% for 36.5°C and 35.5°C, respectively). Incubation length and temperature were inversely correlated. Average incubation lengths were 29.1, 26.9, 24.5, and 23.6 days for 35.5°C, 36.5°C, 37.5°C, and 38.5°C, respectively. Metabolic rate was positively correlated to incubation temperature. Rates increased significantly ($F=154.6$, $df=12$, $p < .001$) across the incubation period and embryos at higher temperatures had significantly ($F=68.2$, $df=1$, $p < .001$) greater metabolic rates than those at lower temperatures. The average total oxygen consumed during development was significantly ($F=4.0$, $df=3$, $p < .009$) different across incubation temperatures. This experiment demonstrates how incubation temperature may influence hatching success and the energetics of developing embryos.

Poster Board No. 004 EVALUATING THE EFFECTS OF A COMBINED INPATIENT DIABETES MANAGEMENT TEAM AND OUTPATIENT TRANSITION OF CARE CLINIC ON READMISSION AND EMERGENCY DEPARTMENT UTILIZATION. Gabrielle M. Mey[1] (gabriellemey@walsh.edu), Colleen V. Duncan[2], Travis D. Macek[2], Nisreen A. Nusair[1] (nnusair@walsh.edu), John M. Moorman[2] (jmoorman@neomed.edu). [1]Walsh University, 2020 E. Maple St. mailbox # 770, North Canton OH 44720, [2]Northeast Ohio Medical University (NEOMED).

Diabetes affects 29.1 million people in the United States, with 20% of diabetes patients readmitted to the hospital within 30 days of discharge. A combined inpatient Diabetes Management team and outpatient Transition of Care Clinic was implemented at Akron General Medical Center to reduce readmissions and emergency department (ED) visitation. The hypothesis is that patients seeing both inpatient and outpatient services will have fewer 30-day readmissions and ED visits than those receiving neither service. A retrospective cohort study analyzed the impact of these combined services on 30-day readmission and ED visitation. The primary objective compared the composite rate of 30-day readmissions and ED visits between patients seen by both services and historical controls. Secondary objectives analyzed patient-, clinic-, medication-, and admission-specific data to predict readmission. Data was collected through patient chart review, which was analyzed using Chi-square analysis, Fisher's Exact tests, and Student's t-tests. Sample size was n=156. 78 patients admitted between May 1, 2010 and April 30, 2014 met inclusion criteria for the intervention group. Data analysis showed no significant difference in readmission and ED visits between intervention and control groups. Results

showed 16 readmissions for the intervention group, and 15 for the controls (p=1.000). Secondary outcomes showed non-significant predictors of readmission, including a non-significant trend toward readmission based on Charlson Comorbidity Index greater than two (OR=2.188, 95% CI 0.874-5.457) and length of stay greater than four days (OR=2.275, 95% CI 0.926-5.681). Although no significant difference in readmissions was found, non-significant trends toward readmission for Charlson Comorbidity Index greater than two and length of stay greater than four days indicate these may be potential predictors of readmission to be analyzed. A larger population is needed to further assess the effects of a combined inpatient and outpatient program on readmission.

Poster Board No. 005 EFFECTS OF CARBOHYDRATE CONSUMPTION ON CREATINE AUGMENTATION OF WORK OUTPUT IN FEMALES. Nicole Berry (n-berry@onu.edu), Sabrina E. Newstead (s-newstead@onu.edu), Carly. A. Thomas (c-thomas.1@onu.edu) 225 N. Gilbert Street, Ada, Ohio 45810 [Advisers: Rema G. Suniga (r-suniga@onu.edu) and Vicki A. Motz (v-motz@onu.edu)].

Creatine, an organic acid, is converted to creatine phosphate in muscle, and used to make adenosine triphosphate for energy. It is in high concentration in red meat. In males, creatine supplements increase physical strength, resulting in improved work output and increased athletic performance. However it is not known if this improvement due to supplementation is seen in females, who have a diet lower in creatine. This study hypothesized that a two week regimen of creatine supplementation would increase power output and work done in females; and that this increase would be augmented when creatine was taken with carbohydrates because ingestion of carbohydrates causes the release of insulin, which aids in the uptake of glucose and also creatine into the muscle cells. Thirty-two females (aged 18 to 23) were randomly placed into a placebo group, a group receiving 10 g creatine twice daily, or a group receiving 10 g creatine with 1.6 g carbohydrate twice daily. A two minute Wingate test was used to measure power (resistance x distance/time) and work output (resistance x distance) prior to and two weeks after supplementation. Power was tracked at 30 second intervals during the testing. Creatine, when taken with carbohydrate significantly ($p = 0.036$) increased endurance over the control group (power at the end of the two minute period; by paired t-test at 95% confidence) whereas creatine alone did not. No significant change in work was observed. Thus those using creatine supplements to improve endurance should consider taking the supplement with carbohydrates.

Poster Board No. 006 DIFFERENCES IN AMPHIBIAN DIVERSITY ACROSS SITES INFECTED WITH CHYTRID FUNGUS IN CENTRAL OHIO. Gabrielle E. Power (gpower@capital.edu), Christine S. Anderson (canders2@capital.edu). Capital University, Department of Biological and Environmental Sciences, 1 College and Main, Columbus, Ohio 43209.

Batrachochytrium dendrobatidis (*Bd*) is a species of aquatic fungus that infects amphibians and causes chytridiomycosis. Chytridiomycosis is the infection of the outermost layers of skin that interrupts respiration, hydration, and osmoregulation. The fungus *Bd* is of major concern because in the last 30 years it has likely caused the significant decline or extinction of at least 200 amphibian species around the world. The purpose of this study was to survey sites in Central Ohio for the *Bd* chytrid fungus and to compare amphibian diversity between sites with positive versus negative chytrid results. We hypothesized that less susceptible species, such as the American bullfrog (*Lithobates catesbeiana*), would be present at both infected and uninfected sites. This study also provides methodology to identify species of tadpoles using mtDNA sequencing in the lab. Surveys were conducted at ponds and wetlands in three local Metro Parks using funnel minnow live-traps and dip nets in September-October 2015 with future data collection planned for March-April 2016. Frogs and tadpoles were measured, then swabbed for the presence of chytrid fungus, and a small tissue sample was collected. Preliminary results show that bullfrogs from two of the three parks tested positive for *Bd*. This project provides park managers with current information so they can direct conservation efforts aimed at more susceptible amphibian species at sites where *Bd* has not yet spread. This project also engaged high school students from a local STEM high school as interns in original place-based research projects in the field and laboratory.

Poster Board No. 007 GIS MAPPING OF DEER DISTRIBUTION AND POTENTIAL IMPACTS ON TREE SAPLING BROWSING IN ACACIA RESERVATION (LYNDHURST, OH). Jeffrey M. Wallace (jwallace13@students.ndc.edu), Robin C. Sallade (rsallade11@students.ndc.edu), Patrick D. Lorch (pdl@clevelandmetroparks.com), Mark Guizlo (mguizlo@lakelandcc.edu), Bobby Oliver (bolivar@lakelandcc.edu) and Tracey T. Meilander (tmeilander@ndc.edu). Notre Dame College, 4545 College Rd, South Euclid, Ohio 44121 .

Acacia Reservation, a former golf course now managed by Cleveland Metroparks, is an example of an ecosystem undergoing secondary succession. Despite beech and maple tree repopulation along the former golf course greens, fairways, rough and sand traps, tree growth appears to be limited by deer browsing. The purpose of this research is to determine browsing patterns of deer in correlation with pellet pile density at four separate, random locations in the reservation. It is hypothesize that deer pellet pile density and location will have a strong correlation with grazing events; higher pellet pile densities will correlate with higher deer browsing events. It is predicted that deer density and browsing events may decrease in areas with high human activity, such as paths or around the borders due to the recent construction of housing developments, major roadways, and traffic. Branching nodes of previously grazed tree saplings will be used as indicators of grazing events. Height of saplings, number of leaves, length and width of largest leaf, and species will also be recorded. ArcMap 10.2 software and mobile mapper will be used to gather GPS coordinates of sapling data. ArcCatalog 10.2 software will be used to compile and organize the data to identify grazing patterns. The goal of this experiment is to recognize patterns between deer activity and browsing events, and contribute new knowledge that will help resource managers to develop practices of promoting secondary tree succession in this ecosystem and deer management.

Poster Board No. 008 THE EFFECTS OF INCUBATION TEMPERATURE ON MORPHOLOGICAL TRAITS OF NORTHERN BOBWHITE QUAIL (*COLINUS VIRGINIANUS*). Brittany M. Yanik (yanikbm@mountunion.edu), William J. Mainwaring (mainwawj@mountunion.edu), Natalie E. Nickles (nicklene@mountunion.edu), Samantha K. Straits (straitsk@mountunion.edu), Spiro M. Mavroidis (mavrois@mountunion.edu). University of Mount Union 1972 Clark Avenue Alliance, Ohio 44601.

Effect of temperature during embryonic development has been found to play a major role in an organism's morphology, growth and physiology. This study examined how incubation temperature may influence hatching success and chick morphology (chick mass and tarsus length). It was hypothesized that the optimal incubation temperature (37.5°C) would result in increased hatching rates and chick quality (e.g., higher chick mass). Northern bobwhite quail eggs (N = 72-74 per treatment) were incubated at one of four treatment temperatures (35.5, 36.5, 37.5, 38.5°C). A proportional controller was used to precisely (i.e. ± .1C) regulate incubator temperatures. Humidity

was maintained between 70-80%, and eggs turned with automatic egg turners. Hatching rates were highest at 38.5°C and 37.5°C (77.8% and 76.4%, respectively), and decreased at the colder incubation temperatures (29.7% and 19.4% for 36.5°C and 35.5°C, respectively). Chick mass and tarsus length were significantly correlated to egg mass (R^2=.71, F=5.2, df=116, P < .001; R^2 =.18, F=30.8, df=1, P < .001). Incubation temperature significantly affected chick mass (highest at 37.5°C) and tarsus length (length increases with incubation temperature: F=11.4, df=3, P < .001; F=13.6, df=3, P < .001; egg mass as covariate). Egg dimensions are good predictors of chick mass, although egg width has a stronger correlation (R^2=.58, F=8.98, df=29, P < .001) than does egg length (R^2=.24, F=2.29, df=46, P < .001) to chick mass. In summary, hens that struggle to maintain optimal incubation temperatures during the breeding season because of unusually warm or cool environmental temperatures may have reduced overall fitness.

Poster Board No. 009 FABRICATION AND CHARACTERIZATION OF POLYMER ELECTROLYTE MEMBRANE FUEL CELL USING HIGH POROUS BIOMASS CARBON SUPPORT. Andrew Ackerman (aackerma1@walsh.edu), Tristan Williams (twilliam11@walsh.edu), Peter J Tandler (ptandler@walsh.edu). Walsh University, 2020 East Maple Street, North Canton, OH 44720.

Polymer electrolyte membrane fuel cells (PEMFCs) show much promise as an emerging energy technology because they are highly efficient and produce only water and heat as byproducts. They operate on the premise that the electrochemical energy stored in H_2 can be harnessed. The PEMFCs most commonly use a platinum-catalyst to increase the rate at which hydrogen is oxidized and oxygen is reduced: 2 H_2 (*g*) + O_2 (*g*) → 2 H_2O (*l*) + heat. Two of the main hurdles to large scale use of PEMFCs are the high cost and low durability of the platinum catalyzed electrodes. The main factor limiting the performance of PEMFCs is the sluggish kinetics of the oxygen reduction reaction (ORR), so much research has been aimed at improving the ORR catalyst. The research presented here investigates the use of a high porosity carbon support derived from soybeans. It is suggested that the soybean-based support acts as a nitrogen-doped carbon framework for the platinum. Soybeans were first dehydrated in an oven at 50°C and then ground. The ground soybeans were carbonized between 600°C to 800°C under nitrogen for at least 2 hours. The black powder was then acid activated prior to platinum impregnation. The membrane electrode assembly was then fabricated by hot pressing. The oxygen reduction electrode was characterized by cyclic voltammetry and the fuel cells were characterized by power performance curves.

Poster Board No. 010 STEPS TOWARD TREATING BREAST CANCER: A COMPUTATIONAL STUDY OF AROMATASE INHIBITION WITH FLAVONES. Halley J. Alberts (s300629041@students.rio.edu), John A. Means (jmeans@rio.edu). School of Sciences, University of Rio Grande, P.O. Box 500, Rio Grande, OH 45674.

Aromatase is an enzyme that is critically involved with the development of estrogen receptor positive breast cancer, which was responsible for 15% of cancer-related deaths in 2014. Aromatase catalyzes the reaction of androstenedione to estrogen and is therefore a promising target for many drug and therapeutic management studies. Performing such experiments can quickly become costly and time-consuming. The results can vary widely depending on the types of assays used, making comparisons difficult. To combat these issues, researchers employ the use of computational docking, a method that predicts the orientation that two molecules will bind to each other. Given insight to preferred binding orientations, one is able to determine the binding affinity between two molecules, often in the form of a docking score. Using PyRx, a virtual screening tool, a sample of 11 naturally occurring flavones was investigated using two popular docking programs, AutoDock4 and Vina, utilizing a variety of parameters. The results of each docking run were compiled and used to study the effects of both Lamarkian and genetic evolution algorithm parameters on docking scores against aromatase. A statistical analysis was then performed in attempt to find a correlation between the docking scores of each of the ligands against aromatase and the corresponding experimental pIC50 value, which is an indicator of the ligands' ability to inhibit aromatase. In addition, previously acquired inhibition data from this experiment in which ligand background fluorescence was accounted for in the results will also be analyzed to explore their correlation with the docking results. Combined, this work will be used to inform future researchers, who conduct similar studies, of computational parameters that lead to inconclusive results.

Poster Board No. 011 DETERMINING WHETHER IL-6 BINDS WITH MYELIN TO POTENTIALLY CAUSE DEMYELINATION IN TRANSVERSE MYELITIS. Aaron M. Landrum (s300628435@students.rio.edu), John A. Means (jmeans@rio.edu). School of Sciences, University of Rio Grande, P.O. Box 500, Rio Grande, OH 45674.

Affecting over 1,400 new patients every year, Transverse Myelitis (TM) is an autoimmune disorder that causes inflammation of the spinal cord. The protective coating of the nerve fibers, myelin, is destroyed in the inflammation process. The destruction of myelin is known as demyelination. When demyelination occurs, the central nervous system (CNS) loses its ability to relay messages through the spine due to the loss of electrical conductivity that the nerve fibers exhibit. Although research has not yet provided any answers to determine the cause of demyelination, there have been some findings that suggest Interleukin-6 is a key factor in the demyelination. Interleukin-6 (IL-6), is a cytokine that the body uses in inflammatory response. Due to the fact that TM is an autoimmune disorder, the IL-6 could potentially bind with the myelin coating of the spinal cord to cause the demyelination. The objective of the research is to determine if IL-6 could potentially bind with myelin, which could potentially lead to demyelination. Electrophoretic mobility shift assays (EMSA) will be used to quantify the binding of myelin and IL-6. The protein bands will be visualized on the gel by using silver-staining, and the resulting image on the gels will be used to determine a dissociation constant (Kd) for IL-6 binding with myelin.

Poster Board No. 012 STABILITY OF POLYPHENOLS IN SIMULATED HUMAN DIGESTION. Andrew C. Lawrence (s300644704@students.rio.edu), John A. Means (jmeans@rio.edu). School of Sciences, University of Rio Grande, P.O. Box 500, Rio Grande, OH 45674.

From a nutritional aspect, polyphenols are suspected to have cancer inhibiting properties. Prior research suggests that on a biochemical level polyphenols can inhibit estrogen receptor positive (ER+) breast cancers. The ability for these polyphenols to withstand the gastrointestinal (GI) tract upon ingestion is controversial. There is some concern that the polyphenols may be digested and lose potency in the acidic environment of the stomach. Determining the chemical stability of polyphenols in the stimulated gastric environment to measure their availability further along in the GI tract is the main objective of this research. Using a UV-Vis spectrometer, the wavelength at which each polyphenol is spectrally active will be determined. Each polyphenol will be added to individual assays of simulated fasted state stomach acid and changes in the absorbance will be tracked for 2.5 hours to simulate the conditions present in normal human digestive processes. If the acidic environment causes degradation in the polyphenols, the absorbance is expected to decrease over time.

Poster Board No. 013 SUPER RESOLUTION IMAGING OF STRETCHED DNA USING MOTION BLUR POINT ACCUMULATION FOR IMAGING IN NANOSCALE TOPOGRAPHY (MBPAINT). Joseph R. Pyle (jp186813@ohio.edu), Kurt W. Sy Piecco (ks939414@ohio.edu), Lei Wang (lw138009@ohio.edu), Jixin Chen (chenj@ohio.edu). 40 Hooper street, Athens Ohio 45701.

Techniques for fluorescent imaging beyond the diffraction limit (super resolution) have been recently developed. These techniques have allowed for many improved biological and physical studies such as live cell imaging plus mapping of specific surface areas such as defects or reaction sites. Super resolution of DNA is important to understand DNA conformation and to improve the resolution of genetic optical maps. Here a super-resolution DNA imaging strategy with the model λDNA is reported. The λDNA has been stretched using a flow cell and immobilized onto the amine modified glass substrate by electrostatic attraction. Super resolved images were reconstructed from the stochastic binding of an intercalating dye of YOYO-1, using the single molecule localization technique mbPAINT (motion blur point accumulation for imaging in nanoscale topography). When bound to DNA, the intensity of YOYO-1 vastly increased. Thus the bound DNA/YOYO-1 appeared to be detected at the single-molecule level.

Poster Board No. 014 INVESTIGATION INTO THE STABILITY OF THE NITRIC OXIDE DONOR NITROSYLCOBALAMIN: A DETAILED STUDY INVOLVING EXPOSURE OF THE COMPOUND TO FLUCTUATING STORAGE CONDITIONS. Morgan G. Stilgenbauer (morganstilgenbauer@walsh.edu), Joseph A. Bauer (jbauer@bauerresearch.org), Amy J. Heston (aheston@walsh.edu), Joseph A. Lupica (jlupica@walsh.edu). Walsh University Department of Math and Science 2020 East Maple St. North Canton, Ohio 44720.

Nitrosylcobalamin (NO-Cbl), a Vitamin B12 analog, is a biologically effective nitric oxide donor that exhibits anti-proliferative activity against human cancer cell lines, via the delivery of nitric oxide selectively to tumor cells. However, the nitric oxide moiety is labile and susceptible to a temporal loss of efficacy, especially in the presence of water, making long term storage problematic. The purpose of this study is to determine the stability of the compound after exposure to environmental conditions, possibly encountered during storage. Initially a standard curve of NO-Cbl, in aqueous buffer, was generated. A Jasco V-650 Spectrophotometer was used to determine maximum absorbance at 480 nm (NO-Cbl absorbance maxima) for all samples tested. Nine identical samples were prepared by dissolving solid NO-Cbl in 200 mM tris-hydroxymethyl aminomethane buffer (pH 7.4), to a final concentration of 0.6 mg/ml. Seven of the samples, along with a powder control, were assigned a specific temperature and subjected to 7 days of: freeze thaw cycles at -80°C, -20°C, and 4°C; heat and cool cycles at 65°C and 90°C; constant temperatures of 25°C and 37°C; two of the samples, along with a powder control, were constantly exposed to white light or ultraviolet light for seven days. After 7 days, spectrophotometric analysis, revealed a 12% to 65% decrease of absorbance in the aqueous samples as compared to 0.0% to 32% in the powdered control. Constant storage in a desiccant at -80°C, as well as 7 day heat/cool cycles at 90°C, of the powder, demonstrated very little degradation. Although humidity was not measured it is theorized that the minimal degradation is most likely due to the low humidity experienced under both of these conditions. Moreover, these results reaffirm the lability of the compound dissolved in aqueous solution, and further supports the hypothesis of storage in powdered form.

Poster Board No. 015 DIRECTED ENERGY DANDELION CONTROL. Mairah Gill-Pillow[1] (Mairah.pillow@gmail.com) Cadance Lowell[1] (clowell@centralstate.edu), Jon Jackson[2] (jon@g-neighbor.com). PO Box 1004, Department Natural Sciences, Central State University, Wilberforce, OH 45384, [2]Global Neighbor, Inc., 84 Compark Drive, Centerville, OH 45459.

Chemical free weed control in the literature includes mechanical, hot water/oil, flame, infrared radiation and laser treatments. These methods may be expensive, variably effective, and cause unacceptable loss to surrounding plants. Commercial herbicides are generally accepted as effective, but they may cause non-point source pollution, health concerns, and certain weed species have adapted to herbicides such as glyphosate. Directed energy may be an effective weed or undesirable plant control method in residential, commercial, natural, aquatic and agricultural settings – anywhere where non-chemical weed control is desired. The purpose of this research was to compare the weed control effectiveness of directed energy to herbicide treatments containing glyphosate. Dandelion (*Taraxacum officinale* L.) seedlings were grown for 4 weeks in a commercial soil-less mix. Nine dandelion plants were used per treatment and an additional 6 plants were left untreated. Treatments included commercial herbicide, and directed energy from a purchased device, NatureZap, designed for residential use. This device delivered an equivalent of 48 suns on average at peak intensity and 1200 joules for a 10 second burst of visible, ultraviolet-A radiation and near infrared light. Herbicide was applied according to directions and delivered 90 mg of glyphosate, isopropylamine salt, per plant. Dandelions were treated by being completely covered to soil level with the light source of the device for 5, 10 or 20 seconds. Plant damage was recorded after 14 days by visual inspection. A pot with no above ground biomass was considered completely controlled. Glyphosate produced 100% dandelion control. Directed energy produced 25, 50 and 100% dandelion control at 5, 10 and 20 seconds, respectively. Directed energy effectively controlled dandelion seedlings within 4 weeks of germination and may be a viable alternative to herbicides for dandelion control.

Poster Board No. 016 NON-CHEMICAL WEED CONTROL OF RAGWEED. Frederick Hayes[1] (ahayes13260@gmail.com), Cadance Lowell[1] (clowell@centralstate.edu). Jon Jackson[2] (jon@g-neighbor.com). [1]P.O. Box 1004, Department Natural Sciences, Central State University, Wilberforce, OH 45384. [2]Global Neighbor, Inc., 84 Compark Drive, Centerville, OH 45459.

The NatureZap DE is a commercially available, hand-held weed control device designed for residential and small commercial applications. It applies light as directed energy with the power equivalent of 48 suns (1200 joules in 10 seconds) of visible, near infrared and ultraviolet-A light to control the growth of a variety of weeds. This technology currently is being translated into a chemical free weed control prototype suitable for sustainable and organic farming practices. The purpose of this research was to measure the effectiveness of directed energy on common ragweed (*Ambrosia artemisiifolia* L.) that blights Midwest crop fields. The NatureZap DE was utilized to control ragweed grown under greenhouse conditions. Ragweed seeds were planted and seedlings transplanted to separate pots in a soil-less mix. Three plants per treatment were exposed to 0, 5, 10 or 20 seconds of directed energy or glyphosate from age 3 to 7 weeks. One week after exposure, weeds were examined for signs of visible stress including discoloration, weakened stems and inhibited growth. The weeds were then rated from a scale of 0 (complete control or killed), 1 (some visible damage) to 2 (no visible damage). Results showed that directed energy provided 100% control across all plant ages tested at 20 second treatment which was comparable to 100% glyphosate control. Plants treated with 5 and 10 seconds exposure showed less damage as these plants grew to flowering. Directed energy, especially at longer exposure times, provides non-chemical weed control of common ragweed up to flowering maturity.

Poster Board No. 017 CONTROL OF CRABGRASS BY DIRECTED ENERGY. Tiffany Hudson[1] (t.hudson5@yahoo.com), Cadance Lowell[1] (clowell@centralstate.edu), Jon Jackson[2] (jon@g-neighbor.com). [1]PO Box 1004, Department Natural Sciences, Central State University, Wilberforce, OH 45384. [2]Global Neighbor, Inc., 84 Compark Drive, Centerville, OH 45459.

Crabgrass (*Digitaria ciliaris L.*) is a common weed in the Midwest, especially in pastures, turf and crop fields. High populations of crabgrass may lead to crabgrass seed contamination in harvested crops. Cultural practices may help decrease incidence, but post-emergent herbicides such as quinclorac, fenoxaprop-ethyl and glyphosate demonstrate effectiveness. There are limited options for non-chemical control for post-emergent crabgrass. Directed energy or high visible light with some infrared and ultraviolet-A has been shown to control a wide variety of forb and grass weeds in greenhouse and field trials. It is non-discriminatory and will damage any plant, however the small bell size housing the light source limits damage to any nearby desirable plants. The purpose of this research was to measure the control by directed energy on post-emergent crabgrass. Crabgrass seedlings were greenhouse grown for at least 2 weeks in soil-less mix with 25-65 grass seeds per pot. A minimum of 150 plants were used per treatment. Positive control used glyphosate treatment; the negative control was left untreated. Plants were treated for 5, 10 or 20 seconds with an average power equivalent of 48 suns and 1200 joules (measured at 10 seconds) of visible, ultraviolet-A radiation and near infrared light. After 7 days, plants were evaluated by visible survey. Glyphosate treated crabgrass was completely controlled with no re-growth. Directed energy treatments for 5 and 10 seconds produced 46% and 50% control without re-growth, respectively. Twenty seconds was the most effective directed energy treatment and was comparable to a kill-rate of 100% by glyphosate. Directed energy may be an effective, non-chemical, post-emergent weed control alternative to currently used herbicides.

Poster Board No. 018 PALEOLAKES OF THE JURASSIC EAST BERLIN FORMATION, HARTFORD BASIN, NEWARK SUPERGROUP: UNDERSTANDING CHANGES IN LAKE GEOCHEMISTRY IN SPACE AND TIME. Alexander A. Conti (ac151813@ohio.edu) and Elizabeth H. Gierlowski-Kordesch (gierlows@ohio.edu). Department of Geological Sciences, Ohio University, 316 Clippinger Laboratories, Athens, OH 45701.

The nonmarine Jurassic East Berlin Formation is one of four understudied sedimentologic units in the Hartford Basin, a fault-bounded half-graben in New England. Limited outcrop and extensive faulting have restricted research across the basin, particularly in the Hartford, CT-area. Six complete lake horizons, or source rocks with kerogen-rich mudrock, were previously identified in the upper 107-m of the East Berlin and correlated between the southern and northern extents of the basin. However, the entire thickness of the East Berlin has yet to be studied; also, rocks of economic value (e.g., hydrocarbon sources) are more spatially heterogeneous in nonmarine basins than marine counterparts and, therefore, require an in-depth analysis. Thus, a new cm-interval sedimentologic analysis—describing grain size, color, fossils, and sedimentary structures—was performed on eight new cores, exposing the entire thickness of the East Berlin in the Hartford, CT-area for the first time and corroborating the lacustrine, playa, and alluvial paleoenvironmental interpretations of previous researchers. The six correlative lake horizons of the southern and northern extents of the basin are found in the new cores; two additional lower lakes have also been exposed for the first time. Since these lakes were likely of a basin-wide extent, it is important to characterize their geochemical parameters (i.e., from biomarkers) with respect to the lake-basin type model derived by Bohacs, Carroll, and others (i.e., over-filled, balance-filled, and under-filled, based on tectonic and climatic controls). Past studies hypothesized balance-filled lacustrine conditions, or fluctuating fresh and saline waters, in the East Berlin because of rare, dispersed evaporites. The objective of ongoing geochemical analyses of each East Berlin paleolake, including the newly exposed two lower lakes, is to understand the spatial and temporal distribution of lake types and geochemistry (e.g., paleosalinity, organic matter type, hydrogen index, etc.) in the Hartford Basin during the Hettangian.

Poster Board No. 019 AGE AND PROVENANCE OF THE ARDARA APPINITES, COUNTY DONEGAL, IRELAND. Logan B. Gabler[1] (lg346714@ohio.edu), R. Damian Nance[1] (nance@ohio.edu), J. Brendan Murphy[2] (bmurphy@stfx.ca). [1]Department of Geological Sciences, 316 Clippinger Laboratories, Ohio University, Athens, Ohio 45701, [2]Department of Earth Sciences, St. Francis Xavier University, Nova Scotia, Canada.

In northwest Donegal, Ireland, a large number of appinitic (hornblende/intermediate plagioclase-rich) intrusions occur around the ca. 405 Ma Ardara granitic pluton. They form a group of coeval, plutonic and hypabyssal rocks, ranging in composition from ultramafic to felsic, in which hornblende is the dominant mafic mineral and typically occurs both as large prismatic phenocrysts and in the finer grained matrix. ICP analyses show the mafic rocks to contain high abundances of Mg, Ni, Si and Fe, indicating a strong mantle influence on the mafic components of the appinitic magma. $^{40}Ar/^{39}Ar$ thermochronology performed on hornblende separated from four samples yield early Devonian cooling ages that are interpreted to closely date igneous emplacement. Sm-Nd isotopic analysis, in concert with the age data, yield quite strongly positive *initial* εNd values, indicating an important juvenile component in the source and a likely origin through melting of the sub-continental lithospheric mantle and/or metasomatized underplated mafic crust, with only limited fractionation during magma ascent. The compositional range of the appinitic intrusions is interpreted to reflect their emplacement along deep-seated crustal fractures that allowed for coeval mafic and felsic magma to mix and mingle.

Poster Board No. 020 INVESTIGATION OF SPATIAL AND TEMPORAL TEMPERATURE ANOMALIES AT ZANESVILLE MUNICIPAL WELL FIELD, OHIO. Stuart W. Holmes (sh181709@ohio.edu), Eung Seok Lee (leee1@ohio.edu). Ohio University, 316 Clippinger Laboratories, Athens, OH 45701.

The exchange between groundwater and surface water is complex but interpretations can be simplified using temperature as a tracer. Groundwater extracted from an alluvial sand and gravel aquifer at the Zanesville Municipal Well Field (ZMWF), Zanesville, Ohio has historically displayed anomalous temporal and spatial temperature patterns, with a few pumping wells routinely and substantially straying from the mean annual air temperature (MAAT), 11.2°C. It was hypothesized that these anomalies could be attributed to zones of pumping-induced riverbank infiltration propagating past air temperatures through the subsurface at a lag. Six pumping wells (depth ~ 60 ft) from the same alluvial aquifer were surveyed and sampled monthly. Groundwater temperatures were recorded in the field, and water samples were extracted and stored for laboratory nitrate and isotope ($\delta^{18}O$ and $\delta^{2}H$) analysis to aid temperature tracing assertions. A temperature sensor was installed in a monitoring well adjacent to ZMWF as a control for the temporal groundwater temperature profile. Potentiometric maps and previous estimates of hydraulic conductivity were utilized in ArcGIS to constrain travel times from the riverbank to each well. Feasibility of different lag periods was determined using the travel times and air temperature data. Wells W-3 and W-9 were found to vary significantly (>9°C) from MAAT, in stark contrast from other wells a similar distance (~85 ft) from the river. River morphometry

was determined to be vital in explaining both the temporal and spatial patterns of temperature distribution, providing scour-favoring conditions up-gradient of W-3 and W-9 to enable bank infiltration during high flow.

Poster Board No. 021 SEDIMENTOLOGY OF THE JURASSIC LOWER PORTLAND FORMATION HARTFORD BASIN, CT. Christopher T. Jorgensen (cj263114@ohio.edu), Elizabeth H. Gierlowski-Kordesch (gierlows@ohio.edu). Ohio University, 316 Clippinger Laboratories Athens, OH 45701.

The Hartford Basin of Connecticut is a Mesozoic rift basin formed during the opening of the Atlantic Ocean, containing sedimentary and igneous fill of the Newark Supergroup. The Portland Formation is the youngest formation (Sinemurian-Toarcian) within the basin, 25 wireline rock cores (>700m of section) penetrating the lowermost Portland Formation were logged and sampled to better understand facies architecture and paleoenvironments within the poorly exposed center of the basin. Primary sedimentological and petrographic data was supplemented by both biomarker analysis and powdered X-ray diffraction of the clay-sized fraction of mudrocks to aid in correlation and interpretation of facies. Volumetrically dominant facies include: (1) rhythmically laminated black mudrock, (2) discontinuously laminated black mudrock, (3) disrupted black-grey mudrock, (4) laminated red-grey mudrock, (5) ripple cross-laminated red mudrock, (6) disrupted to massive red-grey mudrock, (7) ripple cross-laminated to trough cross-bedded sandstone, and (8) planar bedded muddy sandstone. These facies are interpreted to represent sedimentation in three general paleoevironments: sandflat (7 and 8), playa to playa-lake (3, 4, 5, 6, and 7), and perennial saline lakes (1, 2 and 3) sequentially distributed from west to east within the basin. Sandflat and playa-playa/lake facies contain unidirectional ripple cross lamination and a general lack of developed channel features interpreted as ephemeral sheetflood deposits. Facies 1 and 2 contain both continuous dark clay-rich laminae intercalated by lighter continuous to discontinuous or clast-like carbonate laminae, interpreted to represent detrital and authigenic sedimentation respectively. Eleven black mudrock units were correlated across the cored interval; changes in mudrock composition up section are inferred as fluctuations from closed to open basin drainage within a balanced-filled lake regime.

Poster Board No. 022 SHATTER-CONED DOLOSTONE FROM THE UPPER KNOX GROUP FROM THE CENTRAL PEAK OF THE FLYNN CREEK IMPACT STRUCTURE: XRD ANALYSIS INDICATES LOW PEAK SHOCK PRESSURES EXPERIENCED DURING IMPACT. Keith A. Milam[1] (milamk@ohio.edu), Timothy Henderson[2] (hende103@purdue.edu). [1]Ohio University, Department of Geological Sciences, 316 Clippinger Laboratories, Athens, OH, [2]45701 Purdue University, Earth, Atmospheric, and Planetary Sciences Department, 550 Stadium Mall Drive, West Lafayette, Indiana 47907- 2051.

The Flynn Creek impact structure is a buried, but partially exhumed, ~4 km diameter complex impact crater located in north-central Tennessee. It represents a 382 Ma impact into a shallow marine setting. The impact event occurred in Ordovician-aged limestones and Cambro-Ordovician dolostone (Knox Group). The Upper Knox Group is exposed in the central peak of the crater and contains the only known shatter cones from the site. Shatter cones are macroscale indicators of an impact event thought to form from peak pressures ranging from 3-10 GPa and possibly as high as 30 GPa. X-ray diffraction (XRD) patterns were collected from < 25 µm powders made from seven shatter cone specimens collected from thin- and massively-bedded dolostones in the Upper Knox Group in an effort to estimate the peak pressure experienced during the Flynn Creek impact event. Diffraction data were refined using the Rietveld peak refinement technique. Full-width half-max (FWHM) values were calculated as a means of determining the level of peak broadening between unshocked samples and shatter cones from this study. FWHM values for Flynn Creek samples are higher than those of unshocked dolomite (ideally approximating 0), suggesting that they were affected by shock metamorphism from the Flynn Creek impact event. Peak broadening is of a magnitude (<4.6 GPa) expected for shatter cone formation during shock wave passage, as determined by comparison of Flynn Creek samples to experimentally shocked dolomite from another study.

Poster Board No. 023 THE IMPACT OF MEDICAL NUTRITION THERAPY ON GLYCEMIC CONTROL IN AMBULATORY DIABETIC PATIENTS. Michelle R. Ragusa (michelleragusa@walsh.edu), John M. Moorman (jmoorman@neomed.edu), Kelly Reed (Kelly.Reed@akrongeneral.edu), Nisreen Nusair (nnusair@walsh.edu). Department of Mathematics and Sciences, Walsh University, 2020 East Maple Street, North Canton, Ohio 44720.

Diabetes is a chronic illness related to increased levels of glucose in the blood and the body's inability to regulate blood glucose levels. Complications of diabetes are both macrovascular and microvascular (nephropathy, retinopathy, and neuropathy). In the United States, the prevalence of both diabetes diagnoses continues to rise as evidenced by an increase of 176% between 1980 and 2011. Nutrition, lifestyle choices, and medications are all utilized in the treatment of both diabetes type I and type II. Despite this current multimodal treatment regimen, the prevalence of diabetes continues to rise in the United States. The primary objective is to compare the absolute change in hemoglobin A1c among patients who receive medical nutrition therapy from at least one visit with a registered dietitian following an endocrinology visit. Secondary objectives are to compare the absolute change in blood pressure and lipid levels, describe the proportion of patients who achieve goal of hemoglobin A1c, LDL, and blood pressure (decrease towards normal levels for A1c, LDL, and blood pressure), and to identify predictors for achieving each of those goals. Medical nutrition therapy provided by a dietitian in an outpatient setting is hypothesized to improve glycemic control (blood glucose levels decreasing in/towards normal levels) and A1c, lipid levels, and blood pressure in patients with type I or type II diabetes. This multicenter, retrospective cohort study through Akron General Medical Center utilizes chart documentation for baseline endocrinology data, registered dietitian assessment and treatment, and follow-up endocrinology data three months after the visit with the registered dietitian.

Poster Board No. 024 HERBAL ANTIBITOICS: FOLK REMEMDIES AND THEIR EFFICACY AGAINST MICROBES. Amanda B. Baker (S300619211@students.rio.edu), Dana M. Evans (danae@rio.edu). 3051 Bulaville Pike, Gallipolis OH 45631.

Herbal antibiotics are commonly seen in folk medicine, given either as a therapeutic tea preparation or as an essential oil. Nubian mummies have been found with high levels of tetracycline from soil fungi, and Shen Nung's *Pen* Ts'ao, a Chinese herbal list dates back to 3,000 B.C. For millennia, many cultures practice some form of herbal medicine, from the Greco-Roman herbal *materia medica* texts to the medieval physick's gardens. An estimate 80% of the current population use at least one herbal medicine, and over a quarter of prescribed medication contains plant-derived chemicals. As more microbes show antibiotic resistance, new antimicrobial medicines are needed. The purpose of this study is to determine if the presumed antibiotic properties of the herbal remedies have any anti-microbial efficacy, and then to test if the anti-microbial properties are lipophilic or hydrophilic. We hypothesize that the anti-microbial properties will be more lipophilic than hydrophilic. We will prepare aqueous tea extractions

and olive oil extractions from common herbs such as *Salvia officinalis*, *Ocimum basilicum*, *Sambucus nigra*, *Melissa officinalis*, *Mentha spicata* and *Origanum vulgare*, and then test them against common gram positive and gram negative bacteria such as *Escherichia coli* and *Bacillus cerus*. We will do a serial dilution to determine minimum effective dose of the herbal remedy required for an anti-microbial effect. It will be further characterized using a zone of inhibition method to quantitate the anti-microbial effect.

Poster Board No. 025 MACROPHAGE-DERIVED TLR2-INDUCED MYD88 SERVES AS A NEGATIVE REGULATOR OF TLR3 SIGNALING. Lindsey M. Campbell (lcampbell11@students.ndc.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 a vital part of innate immune recognition. These receptors, which are expressed in macrophages, dendritic cells, and epithelial cells, are a crucial piece in recognition of invading microorganisms. Research has indicated that MyD88, a common adaptor molecule used by the majority of TLR signaling pathways, plays a negative regulatory role in the signaling of TLR3, as a genetic knock-out of MyD88 results in increased TLR3 activity. As TLRs are highly expressed and regulated on macrophages, the macrophage cell line J774 will be utilized. Macrophages will be treated with Pam_3CysK_4 (a synthetic triacylated lipopeptide and a TLR2 agonist) alone, Poly(I:C) (TLR3 agonist) alone, and a combination of Pam_3CysK_4 and Poly(I:C). At the conclusion of the exR2 agonist) ll activation will be evaluated by nuclear translocation of NF-κB and cellular production of CCL5/RANTES. In agreement with previous MyD88 gene knock-out studies, it is expected that both NF-κB nuclear translocation and cellular production of CCL5/RANTES will be increased in the group receiving both Pam_3CysK_4 and Poly(I:C). Presumably, as MyD88 is utilized for signaling via TLR2, its negative impact on TLR3 signaling will be relieved, and therefore, TLR3 activation can proceed with more intensity. As the specific details of these pathogen recognition pathways are revealed, the impact of bacterial infections (TLR2) upon viral infection (TLR3) will be better understood.

Poster Board No. 026 MACROPHAGE-DERIVED TLR5-INDUCED MYD88 SERVES AS A NEGATIVE REGULATOR OF TLR3 SIGNALING. Kala J. Istre (kistre12@students.ndc.edu), Angela C. Johnson (acjohnson@ndc.edu). Notre Dame College, 4545 College Road, South Euclid, OH 44121.

Toll-like receptors (TLRs) are a class of transmembrane proteins that play a vital role in the innate immune response. Specifically, TLRs are responsible for detecting pathogen-associated molecular patterns (PAMPs) of invading microorganisms and triggering signal transduction pathways. Studies have shown that in the absence MyD88 (a common adaptor molecule utilized in the signaling pathways of the most TLRs) TLR3 activity increases, suggesting that MyD88 may play a negative regulatory role for TLR3 signaling. This research aims to expand upon this concept by utilizing the combined signaling of TLR5 (which utilizes MyD88) and TLR3. As TLRs are highly regulated and expressed by macrophages, the macrophage cell line J774 will be utilized in this study and treated according to the following scheme: FLA-PA Ultrapure (TLR5 agonist), Poly(I:C) (TLR3 agonist), and both FLA-PA Ultrapure and Poly(I:C) in combination. At the end of this experiment, cell activation via TLR3 will be assessed by nuclear translocation of NF-κB and cellular production of CCL5/RANTES. Theoretically, as MyD88 is used for signaling by TLR5 its negative regulatory role on TLR3 will mollified. Thus, leading to an increase in TLR3 activity. Overall, the goal of this experiment is to provide a better understanding of how bacterial infections (TLR5) impact viral infections (TLR3).

Poster Board No. 027 INVESTIGATING THE ROLE OF TOL-1 IN *C. ELEGANS* IMMUNITY. Corinne M. Kowal (ckowal12@students.ndc.edu), Angela C. Johnson (acjohnson@ndc.edu) Notre Dame College, 4545 College Road, South Euclid, OH 44121.

Toll was originally identified in *Drosophila melanogaster* and recognized for its role in both embryonic dorsal-ventral gene patterning and immune defense against fungal infection. Studies have identified Toll-Like Receptors (TLRs) in a variety of other species such as mouse and human and recognized their significant role in innate immune defense. A single TLR in *Caenohabditis elegans* (*C. elegans*) *tol-1* has also been identified. While TLRs in other organisms are clearly linked to immune response to infection, a direct role in immunity for *C. elegans* tol-1 has been controversial. At least one study has provided evidence in support of a role for *tol-1* in response to *Salmonella enterica* infection and invasion of the pharynx and production of the antimicrobial peptide ABF-2, indicating that *C. elegans* is capable of responding to this pathogen with a relevant immune reaction. To the contrary, however, studies have indicated that *C. elegans* respond via *tol-1* to the pathogens *Pseudomonas aeruginosa* and *Serratia marcescens* through the behavioral reaction of avoidance, indicating a distinct role for *tol-1* in the nervous system. Therefore, the role of *tol-1* in the *C. elegans* immune response to infection remains controversial and requires additional study. To this end, this study endeavors to determine if *C. elegans* is able to generate an immunological response, as measured by infection, survival, and antimicrobial peptide production, to the Gram positive bacteria *Staphylococcus aureus*.

Poster Board No. 028 INFLUENCE OF HABITAT TYPE ON WHITE-FOOTED MICE (PEROMYSCUS LEUCOPUS) ACROSS MULTIPLE YEARS. Tori M. Hanlin (thanlin@capital.edu) and Christine S. Anderson (canders2@capital.edu). 'Capital University, Department of Biological and Environmental Sciences, 1 College and Main, Columbus, Ohio 43209.

Peromyscus leucopus, the white-footed mouse, is a generalist rodent distributed across the eastern United States. They tend to prefer forests containing structurally-complex understory vegetation. White-footed mice are important because they are considered a primary host for the bacterium that causes Lyme disease. The goal of this study was to estimate population abundances in two habitats at Capital University's Primmer Outdoor Learning Center in Logan, OH during the summer months (May-August) of 2012-2015. A 4x8 grid of 32 Sherman live-traps were placed in a deciduous forest ('Woods' grid) while a transect line of 24 Sherman live- traps were placed in a fencerow between an agriculture field ('AG' line) and a grassland habitat. Traps were set for a total of 27 nights over the four years. Mice were confirmed as *P. leucopus* using multiplex PCR methods. Data analysis showed that densities of mice differed between habitats across years ($\chi^2 = 26.1$, df = 3, $P < 0.001$). *Peromyscus leucopus* were more abundant in the 'AG' line in 2012, 2013, and 2015 compared to the 'Woods' grid. Overall, abundances in both habitats were highest in 2015. This work suggests that these rodents, which serve as prey for birds and large mammals, are excellent dispersers that are often found in a variety of habitats. Future research includes estimating genetic diversity and differentiation between populations and examining whether this switch in habitat preference could be due to food availability, competition, or weather (specifically precipitation).

Poster Board No. 029 IMPROVEMENT OF THE WATER DISTRIBUTION SYSTEM IN CHAGUARPAMBA, ECUADOR. Halle A. Miller (mille728@miamioh.edu). 13684 Janell Drive, Columbia Station, Ohio 44028.

The Miami University Student Chapter of Engineers Without Borders (EWB-Miami) is in the process of concluding a water supply project in the community of Chaguarpamba, Ecuador. Approximately 1,100 people reside in Chaguarpamba, where the main concern is water distribution. In January 2016 EWB-Miami sent a team to implement hydraulic modeling software (EPA NET). The main goal was to train the municipality engineers to effectively use EPA NET through tutorials and hands-on learning. EWB-Miami also conducted monitoring and evaluations, including community surveys and quantitative data collection pertaining to previous projects, such as a chlorination system and fences to protect water sources from livestock. Additionally, the education program was expanded at the local schools to instruct the children about the importance of water and sanitation. The initial EPA NET model of Chaguarpamba's system was constructed before the trip. Analyses and troubleshooting were run on this network to ensure model quality. The main calculations done were for allocating demands for each node in the network. The number of meters recorded by EWB-Miami varied from the value of total users given by the community. To fix this, each meter recorded from an AutoCAD map previously developed by the chapter was assigned to a node in the EPA NET model and multiplied by an adjustment factor of 0.006. This calculation was done based on the average usage per day and estimated number of users, as found in water bill records from the city's municipal office. The software has given the community the basis to assess the possibility improvements to the existing system, as well as expansion projects as the community grows. While in Chaguarpamba, EWB-Miami members assisted the engineers in designing the next phase of improvements to the existing system. This included incorporating a third break tank, increasing the size of piping in the main city area, and rerouting pipes from a storage tank.

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REGISTRATION POLICIES

125th Annual Meeting
The Ohio Academy *of* Science
Hosted by Ohio University, Columbus, Ohio

April 16, 2016
Advance registration must be received by March 27, 2016 to qualify for lower rates.

ALL attendees must register.
An Adobe PDF online fill-in form is available at http://www.ohiosci.org/am-2016

ALL MEETING ATTENDEES: Access to sessions by name tag only. Name tag, information and receipt will be available at the meeting. Please return the completed registration form along with the appropriate fees to the address printed below.

ONLY first authors have pre-paid registration when they submitted their abstracts and DO NOT NEED to return this form. First authors are already registered for the meeting. However, you do need to order a lunch if you wish.

STUDENTS, SPOUSES, PARENTS OR RELATIVES: To promote and encourage participation of undergraduates, pre-college students, non-science spouses, parents or relatives, a special discount schedule has been approved. All students, non-science spouses or relatives must register using a separate form. This registration does not include membership or lunches which must be paid separately. **$20**

BOX LUNCHES AND DRINK: **These box lunches must be ordered by March 27 and will not be available to order the day of the meeting - $10**

DISCOUNTED RATES FOR STUDENTS WHO ARE NOT FIRST AUTHOR: (Does not include membership.)

1-4 from same institution $35 by March 27, 2016; $35 thereafter.
5-10 from same institution $20 by March 27, 2016; $25 thereafter.
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The All-Academy Lecture is open to the public without cost.

Please use a SEPARATE REGISTRATION FORM for each person.

Copy the form on the reverse side as needed.

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Online registration option: h***ttps://oas.memberclicks.net/index.php?option=com_mc&view=mc&mcid=form_203212***

PREREGISTRATION DEADLINE: March 27, 2016

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